



**Northern Illinois
University**

Water Quality Management Program
Fire Hydrant Flushing, Water Main
Breaks, and Boil Orders

September 2022

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FIRE HYDRANT FLUSHING, WATER MAIN BREAKS, and BOIL ORDER PROCEDURES

1.0 Purpose

The Water Quality Management Program (Program) has been developed to document the evaluation procedures and protocols necessary for maintaining water quality at Northern Illinois University's (NIU) campuses. This Program is intended to ensure compliance with applicable regulations and university policies as noted in section 4.0 as well as applicable, industry guidelines, and/or best management practices in regard to fire hydrant flushing, water main breaks, and boil orders. The following sections outline the standard operating procedures and identifies NIU personnel responsible for performing various tasks associated with the Program.

2.0 Scope

The scope of this Program is to ensure applicable regulations, industry guidelines, and/or best management practices are implemented in regard to fire hydrants flushing, water main breaks, and boil orders.

3.0 Application

This program applies to the DeKalb campus as well as all satellite campuses.

4.0 Regulatory References and University Policies

- Illinois Environmental Protection Agency (IEPA)
- Illinois Administrative Code (IAC) Title 35, Subtitle F, Part 607
- NFPA 25, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems – Chapter 7 (Private Fire Service Mains)
- Dekalb County Health Department
- NIU Facilities Management and Campus Services EH&S Policy
- NIU Health and Safety Policy

5.0 Responsibilities

The following NIU personnel are responsible for implementation of this Program:

Task	Responsible Organizations/Programs
Program Oversight	Plumbing Shop Foreman
Sample Collection	Plumbing Shop Foreman/Physical Plant Director
Data Evaluation and Reporting	Plumbing Shop Foreman/Physical Plant Director
Equipment Maintenance	Plumbing Shop Foreman
Program Development and Consultation	Environmental Health and Safety

6.0 Fire Hydrant Overview

All fire hydrant equipment shall be maintained in proper working condition, consistent with the manufacturer's recommendations. Hydrants shall be lubricated annually to ensure that all stems, caps, plugs, and threads are in proper operating condition. Hydrants shall also be kept free of snow, ice, or other materials and protected against mechanical damage so that free access is ensured.

Hydrant flushing is part of a routine maintenance program necessary to maintain the integrity of the water system. The purpose of fire hydrant flushing is to expel contaminants, remove sediment and loose deposits, scouring, decrease water age in dead-end mains, restore chlorine residuals, prevent nitrification, and comply with applicable fire codes.

7.0 Fire Hydrant Flushing Procedures (NFPA 25, Chapter 7)

- Hydrants shall be tested annually to ensure proper functioning
- Flushing should be scheduled to prevent disruption to vehicle and pedestrian traffic and building operations.
- It is important to consider hydrant location to assure poor quality water is not pulled toward areas of otherwise high-quality water, especially if flushing for nitrification.
- Open and close hydrants (and valves) slowly to prevent surges.
- Restrain flow dissipaters to limit damage to property.
- Discharge water directly to storm drain sewer when possible to prevent flooding. Flushing in areas where there is a potential to create sediment release into local bodies of water will

require silt baskets be installed to protect storm drain openings. Care should also be taken to avoid flooding the oil/water separators currently installed in the storm drain system.

- Record time of flushing to estimate the amount of water used.
- Open hydrant valves completely to prevent water from discharging through the barrel drain.
- Flow shall be maintained for not less than 1 minute. For thorough scouring, pipe velocities should be targeted at 6 feet per second.
- After operation, dry barrel and wall hydrants shall be observed for proper drainage from the barrel. Full drainage shall take no longer than 60 minutes.
- Where soil conditions or other factors are such that the hydrant barrel does not drain within 60 minutes, or where the groundwater level is above that of the hydrant drain, the hydrant shall be plugged and the water in the barrel shall be pumped out.
- Dry barrel hydrants that are located in areas subject to freezing weather and that have plugged drains shall be identified clearly as needing pumping after operation.
- The City of Dekalb's Public Works Department recommends flushing the hydrants once per year.
- It is recommended to contact the Public Works Department twenty-four (24) hours before flushing hydrants and provide the location of scheduled flushing. Contact information is as follows: (815) 748-2050 or email Bryan Faivre at bfavre@cityofdekalb.com

8.0 Fire Hydrant Sampling

When collecting water quality samples, taps may not be available or accessible in some areas of the system, therefore, hydrants must be used for sample collection. Dry barrel hydrants are the most common type of hydrant. They are designed to be operated with their valves fully open. The hydrant sampler referred to in this procedure was designed to allow the hydrant valve to be fully open while collecting samples in a controlled and safe manner.

Hydrant Sampler Procedures:

- Determine the time needed to flush the sample line using the procedure calculated flush time (CFT).

1. The CFT is determined using the following steps:
 - a.) Estimate the total length and diameter of hydrant piping. Utilize the operator's knowledge of the system, a system site map, and/or design standards, as needed. Vertical length/diameter: The hydrant riser diameter is typically 6 inches, unless indicated differently. Assume the hydrant riser is 6 feet based on design standards, unless indicated differently. Horizontal length/diameter: The hydrant lead diameter is typically 6 inches, unless indicated differently. Measure or estimate the length of hydrant lead pipe between the main and hydrant base. If the location of the main is not known, measure the horizontal distance between the auxiliary valve to the hydrant and add one foot to account for distance from the main to the auxiliary valve.
 - b.) Determine the necessary flush time from the table on Appendix D based on the vertical and horizontal pipe lengths and diameters. Assume a 20 gpm flow rate due to the flow control valve on hydrant sampler.
 2. The rule of thumb approach assumes a 3-minute total flush time before sampling. Easy to use and acceptable for one-time sampling. Assumes the pipe diameter is 6 inches or less, and the length of the hydrant lead pipe is less than 20 feet.
- Ask the system operator for the system pressure at the sampling location. If the pressure is > 125 psi at the sample location, install a pressure-reducing valve (PRV) adapter.
 - Prepare the hydrant for sampler installation by having the system operator remove the outlet cap.
 - Close the gate valve on the sampler (turn the valve clockwise).
 - Install the sampler. Sampler is affixed to the hydrant outlet by turning clockwise.
 - Slowly open the hydrant by turning the operating nut counterclockwise until it is fully open (the system operator should operate the hydrant).
 - Open the gate valve (turn the valve counterclockwise) on the sampler and start the timer. The hydrant sampler operates at a constant flow rate of 20 gallons per minute (gpm). Either (1) allow the sampler to flush for twice the CFT or (2) flush for the time designated by the "rule of thumb."
 - After flushing and when ready to collect a sample, reduce the flow rate using the gate valve to a rate that allows for safe sample collection. Detach the discharge hose using the cam and

groove fitting and then take a sample. Close the gate valve between sample collection. If the PRV Adapter is not being used (i.e., the system pressure is ≤ 125 psi), record the pressure reading from pressure gauge when both the sample and flush valves are closed.

- Close the valve on the sampler (turn the valve clockwise) and have the system operator slowly close the hydrant (turn the operating nut clockwise).
- Slowly open the gate valve (turn the gate valve counterclockwise) to release any remaining water pressure and confirm that the hydrant is closed.
- Remove the sampler (have the system operator remove the sampler from the hydrant). Sampler is removed by turning the sampler counterclockwise.

9.0 Water Main Break Overview

If a water main break occurs the IEPA and Illinois Pollution Control Board has regulations for boil orders and the Dekalb County Health Department (DCHD) has guidelines for food services during boil order events. The following information provides the regulations and guidelines for water main breaks and/or water pressure falling below 20 pounds per square inch (psi) in any part of a public water supply's distribution system.

Operational Requirements:

- The Heating Plant staff shall submit an impairment to Global Risk Consultants (GRC) in the event such break adversely affects building fire suppression systems.
- The Heating Plant staff shall notify the respective building representatives to provide updates on the status of breaks and associated service and repairs.

10.0 Boil Orders (if required) (35 IAC 607.103(b))

Boil Order Procedures:

- Under the Illinois Pollution Control Board's regulations, any event which results in water pressure falling below 20 pounds per square inch (psi) in any part of a public water supply's distribution system requires the issuance of a boil order for affected customers.
- Section 607.103(b) requires a boil order to be issued unless the Heating Plant staff takes two samples for bacteriological examination, one immediately after the pressure falls below 20 psi and the second at least 12 hours later. The Heating Plant staff must also test hourly for

residual chlorine and turbidity in the affected area for several hours. If the testing reveals a decrease in chlorine residual or an increase in turbidity, a boil order is required.

Additionally, the Heating Plant staff must have a historical record of adequate chlorine residual and approved turbidity levels to avoid issuing a boil order.

- Any community public water system that expects to follow the boil order exception criteria in the regulation should develop a standard operating procedure (SOP) that meets the requirements of the regulation. The exception criteria are usually intended for small areas (e.g., less than a few city blocks) within the distribution system that are typically isolated for a water main repair. A boil order must be issued for a system-wide pressure loss or a loss that affects an abnormally large area.
- All water mains within the area of the pressure loss should be thoroughly flushed following restoration of adequate pressure. Flushing will allow for a satisfactory chlorine residual throughout the affected area and should remove any contamination that may have infiltrated the water main. If known infiltration does occur, e.g., water from the trench enters the main being repaired, an immediate boil order is required, and the boil order exception criteria cannot be used. The recommended flushing velocity is at least 2.5 feet per second. If more than one branch of water main experiences low water pressure, flushing is required at each dead-end.
- Coliform samples must be collected from the affected area immediately after flushing and again 12 hours later. The second sample can be collected 12 hours later, plus or minus 1 hour, unless the laboratory is closed. If closed, the collection of the second sample can be timed so that it is delivered to the laboratory at the beginning of the next business day, but no later than 18 hours after the first sample.
- At least four chlorine and turbidity tests are required at not more than hourly intervals. The duration of the interval between the first and last test must be at least three hours. These test results are compared to the historical average of the monthly samples to determine if a significant decrease in residual chlorine or a significant increase in turbidity has occurred.
- Test results for residual chlorine in the affected area shall be compared to the historical average for residual chlorine from the nearest routine coliform sample site or closer designated location. The tests can also be compared to current data from another part of the distribution system not affected by the loss of pressure that has a similar historical average for chlorine. If any chlorine residual test is below the historical average or below the current reading from a comparison site, an immediate boil order is required, unless a follow-up test 15 minutes later shows the chlorine residual is at least the historical average.

- Test results for turbidity in the affected area are to be compared to the historical average for turbidity from the nearest routine coliform sample site or closer designated location. This comparison is more difficult for chlorine, because flushing will likely temporarily increase the turbidity level. If turbidity is above the historical average, a boil order does not have to be issued as long as turbidity results are dropping for each subsequent test. If turbidity test results do not return to the historical average after the last of the four required tests has been collected, issuance of a boil order is required.

Boil Order Notifications:

- The Steam and Power Plant V will initiate the notification process by contacting the following stakeholders (at a minimum):
 1. Building representatives of those impacted areas on campus
 2. Public Safety Dispatch to initiate the mass notification process
 3. Public Information Officer, and
 4. City of DeKalb Public Works Department at 815-748-2050
 5. Post Boil Order Door Tags in appropriate locations
- Boil Order Notification Example, Boil Order Lifted Notification, and Door Tag Examples are presented in Appendix A, B and C.

APPENDIX A

Boil Order Notification

The following example should be printed on the Public Water Supply Letterhead

*****Public Water Supply Boil Order in Affect*****

DATE: January 5, 2012
TO: Affected Main Street Area Water Customers
FROM: John Smith, Water Superintendent, Springton Water
Commission
SUBJECT: **BOIL ORDER**

A water main break occurred early this morning on Main Street south of Washington Street. Repairs are underway and we anticipate that service will be restored late this afternoon or early this evening, Monday January 5, 2012.

It was necessary to shut down the water main on Main Street between Washington Street and Adams Street. Once service is restored, **Customers in that area who are NOW experiencing a service outage should boil water at least FIVE minutes before using.**

The **BOIL ORDER** will remain in effect until laboratory sampling confirms that water quality has been fully restored. This will be Tuesday afternoon at the earliest. You will receive notification at that time.

Please call our Utility Office at 555-1212 if you have any questions or need further information.

APPENDIX B

Boil Order Lifted Notification Example

The following example should be printed on the Public Water Supply Letterhead

*****Boiling Water No Longer Required*****

DATE: January 7, 2012
TO: Affected Main Street Area Water Customers
FROM: John Smith, Water Superintendent
SUBJECT: **BOIL ORDER LIFTED**

A water main break occurred early Monday on Main Street south of Washington Street. Service was interrupted for customers on Main Street between Washington Street and Adams Street.

Repairs are complete and the necessary flushing and purification verification steps have also been completed.

Water samples have been confirmed to be free of coliform bacteria by a certified laboratory. You may return to normal use of your water service.

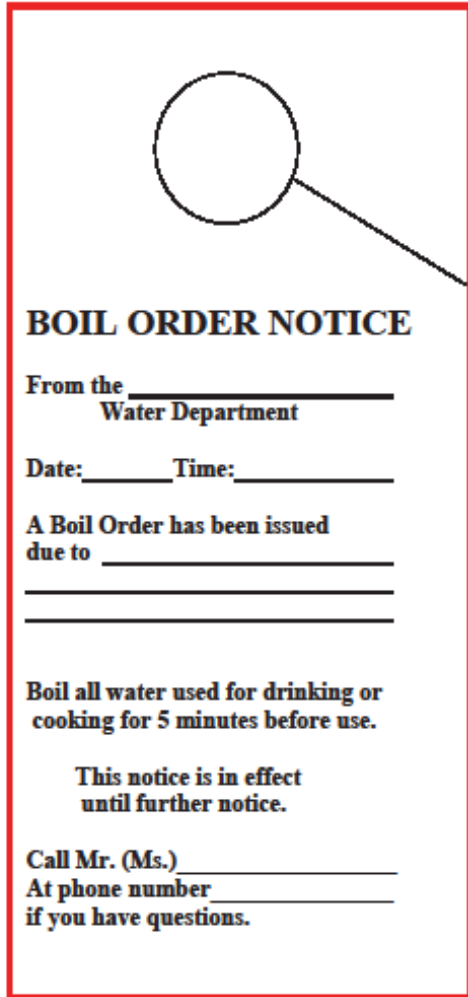
Please call 555-1212 if you have any questions. The Springton Water Commission apologizes for any inconvenience.

John Smith
Water Superintendent
Springton Water Commission

APPENDIX C

Door Tag Example

SAMPLE BOIL ORDER DOOR TAGS FOR
SMALL AREA WATER OUTAGES



BOIL ORDER NOTICE

From the _____
Water Department

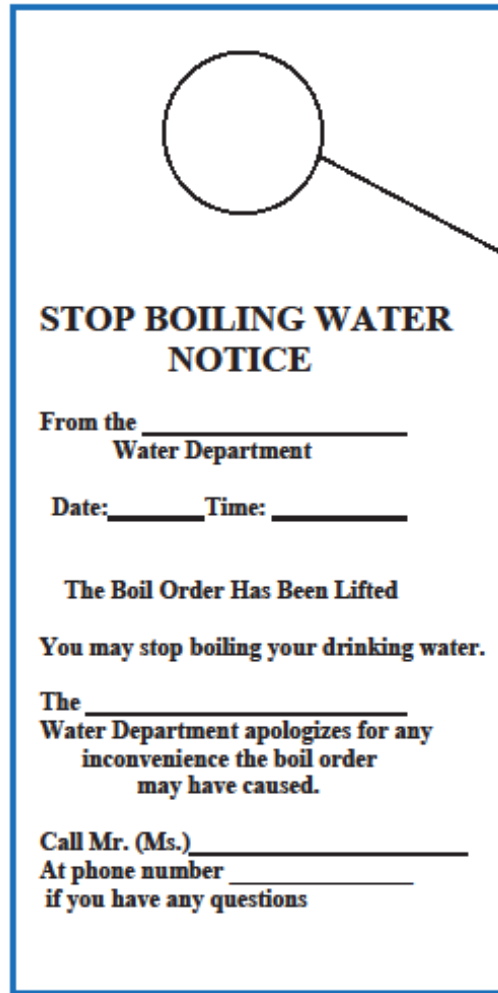
Date: _____ Time: _____

A Boil Order has been issued
due to _____

Boil all water used for drinking or
cooking for 5 minutes before use.

This notice is in effect
until further notice.

Call Mr. (Ms.) _____
At phone number _____
if you have questions.



**STOP BOILING WATER
NOTICE**

From the _____
Water Department

Date: _____ Time: _____

The Boil Order Has Been Lifted

You may stop boiling your drinking water.

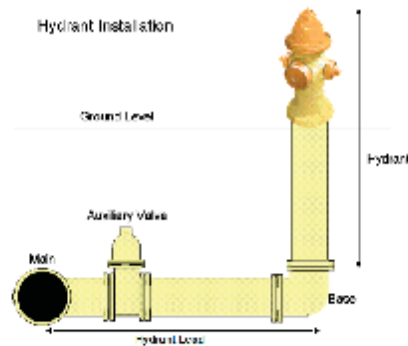
The _____
Water Department apologizes for any
inconvenience the boil order
may have caused.

Call Mr. (Ms.) _____
At phone number _____
if you have any questions

APPENDIX D

Hydrant Calculated Flush Time Table

Hydrant Sampler Procedure



Number of minutes needed to flush hydrant at 20 GPM:

Length of Hydrant Pipe	2-inch Diameter	4-inch Diameter	6-inch Diameter	8-inch Diameter	12-inch Diameter	16-inch Diameter
1 foot	0.0	0.0	0.1	0.1	0.3	0.5
5 feet	0.0	0.2	0.4	0.7	1.5	2.6
10 feet	0.1	0.3	0.7	1.3	2.9	5.2
15 feet	0.1	0.5	1.1	2.0	4.4	7.8
20 feet	0.2	0.7	1.5	2.6	5.9	10.4
25 feet	0.2	0.8	1.8	3.3	7.3	13.1
30 feet	0.2	1.0	2.2	3.9	8.8	15.7
35 feet	0.3	1.1	2.6	4.6	10.3	18.3
40 feet	0.3	1.3	2.9	5.2	11.8	20.9
45 feet	0.4	1.5	3.3	5.9	13.2	23.5
50 feet	0.4	1.6	3.7	6.5	14.7	26.1
55 feet	0.4	1.8	4.0	7.2	16.2	28.7
60 feet	0.5	2.0	4.4	7.8	17.6	31.3
65 feet	0.5	2.1	4.8	8.5	19.1	33.9
70 feet	0.6	2.3	5.1	9.1	20.6	36.6
75 feet	0.6	2.4	5.5	9.8	22.0	39.2
80 feet	0.7	2.6	5.9	10.4	23.5	41.8
85 feet	0.7	2.8	6.2	11.1	25.0	44.4
90 feet	0.7	2.9	6.6	11.8	26.4	47.0
95 feet	0.8	3.1	7.0	12.4	27.9	49.6
100 feet	0.8	3.3	7.3	13.1	29.4	52.2

Depending on the type of pipe material and degree of corrosion inside the pipe, the inner diameter will vary. These diameters are meant to be approximations.

2. "Rule of Thumb" approach assumes a 3-minute total flush time before sampling. Easy to use and acceptable for one-time sampling. Assumes the pipe diameter is 6 inches or less, and the length of the hydrant lead pipe is less than 20 feet.