



Fire Hydrant Inspection and Maintenance Procedures

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Background

The City of Minot has over 2,300 public fire hydrants. All public fire hydrants are maintained by the Water Department. The Water Department has prepared this document to provide guidance for conducting tests and inspections of public hydrants. This information may also be used as guidance for the operation and maintenance of privately-owned hydrants connected to the water system.

Privately-Owned Hydrants

Fire hydrants spend most of their time unused and ignored, yet they are called upon in a moment's notice to provide fire flow for the protection of a business or home. They are an indispensable facet of the overall fire protection features of a building. Because of the way land is platted and easements are granted, there are a large number of private fire hydrants within the City. These hydrants are required for the fire protection of a building, but they are useless unless regularly maintained.

City of Minot Code of Ordinance

Sec. 31-44.1. – Private hydrant maintenance. A private hydrant, along with all associated infrastructure, including pipes, stems, valves, and watermains, shall be kept in good operating condition at all times at the expense of the owner. Private hydrants shall be maintained accessible and free from obstruction at all times by the owner. All private hydrants shall be inspected and tested on an annual basis. The inspection and testing shall be completed by a qualified contractor.

Guidance Manuals and Publications

The following should be used when installing, testing or inspecting fire hydrants. These publications were also used in the preparing of this document.

Installation, Field Testing, and Maintenance of Fire Hydrants (AWWA M17)

Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems (NFPA 25)

Standard for the Installation of Sprinkler Systems (NFPA 13)

Recommended Practice for Fire Flow Testing and Marking of Hydrants (NFPA 291)
AWWA Standard for Dry-Barrel Hydrants (C502-94)

AWWA Standard for Disinfecting of Water Mains (C651-99)

AWWA Standards for Installation of Pipe (C600 thru C606)

Dynamics of Water

When performing any sort of flow test or exercising of hydrants, there are several important concepts that must be understood to avoid causing damage to the hydrants and to the water system in general.

WATER HAMMER

Water hammer is caused by an abrupt change in the velocity of flowing water. It is most often the result of shutting down a valve too quickly. Imagine driving into a brick wall at 60 mph. The energy of your momentum has to be transferred somewhere. In this case it is shared, though unequally, by you, the car, and the brick wall. Water is incompressible. It will not absorb ANY of the energy it gives off by being forced to suddenly decelerate. Therefore, the system, pipes, hydrants, and ground have to absorb all of the energy. If a valve is shut down too quickly, the weak link in the system will go first. The weak links are almost always at the flanges.

BROWN WATER

Brown water is the basic complaint the Water Department receives when people turn on their faucet and see less than clear water coming out. This may be caused by several things. One thing that will often because brown water is a sudden change in the amount of flow in a water main, such as when operating a fire hydrant. During normal conditions, water flows through the center portion of a water main. Because of friction between water and the wall of the pipe it is easier for the center portion to flow than the outer portion. As the average velocity increases, so too will the velocity of the water close to the wall of the pipe. As this water moves faster, it begins to kick up sediment that usually stays at the bottom of the pipe. This sediment gets stirred up and does not settle back down until the velocity slows. Once the sediment has been kicked up into the center portion of the pipe, it is now in the main stream of flow.

Purpose and Uses of Fire Hydrants

FIRE SUPPRESSION

Although fire hydrants are often used for other purposes, their primary function is to supply water for fire protection. Any other use is considered of secondary importance and rigorously controlled for the protection of the water distribution system.

LINE FLUSHING

The fire hydrants ease of operation and high flow capability make it a natural for use in flushing distribution system main lines. When line flushing is done in conjunction with systematic hydrant inspection, the primary function of the fire hydrant is kept in proper perspective.

TESTING SYSTEM

The City often uses fire hydrants to test the hydraulic capabilities of the distribution system. These tests, like line flushing, should be conducted in conjunction with tests to evaluate distribution system flow capacities in accordance with fire flow requirements as well as customer flow and pressure needs.

OTHER USES

Fire hydrants are also commonly used as a water source for street cleaning, sewer cleaning, commercial construction, street construction, and as a watering point for other commercial applications.

BACKFLOW PREVENTION REQUIREMENTS

Anytime a public or privately-owned hydrant is used for purposes other than fire suppression, flushing, or flow testing, a backflow prevention device must be used to protect the City water system. The Water Department has backflow prevention devices that can be installed by City personnel. Further information on using a hydrant for purposes listed under 'Other Uses' above, may be obtained by contacting the City of Minot Water Department at 857-4150.

Notification to Water Division

PRIOR TO OPERATION

The City of Minot Water Department should be contacted prior to performing any maintenance, repairs or other work on any privately-owned fire suppression system connected to the public water system. The Water Department must be notified before a private fire hydrant is used for purposes other than emergency fire suppression. Often, when a large volume of water is moved through a device such as a hydrant, sediment in the line will be stirred up and the Water Department will receive complaints about brown water. If the Water Department knows the reason for the brown water, it is easier to reassure the customer and explain the cause and time required to clear up the brown water in the system.

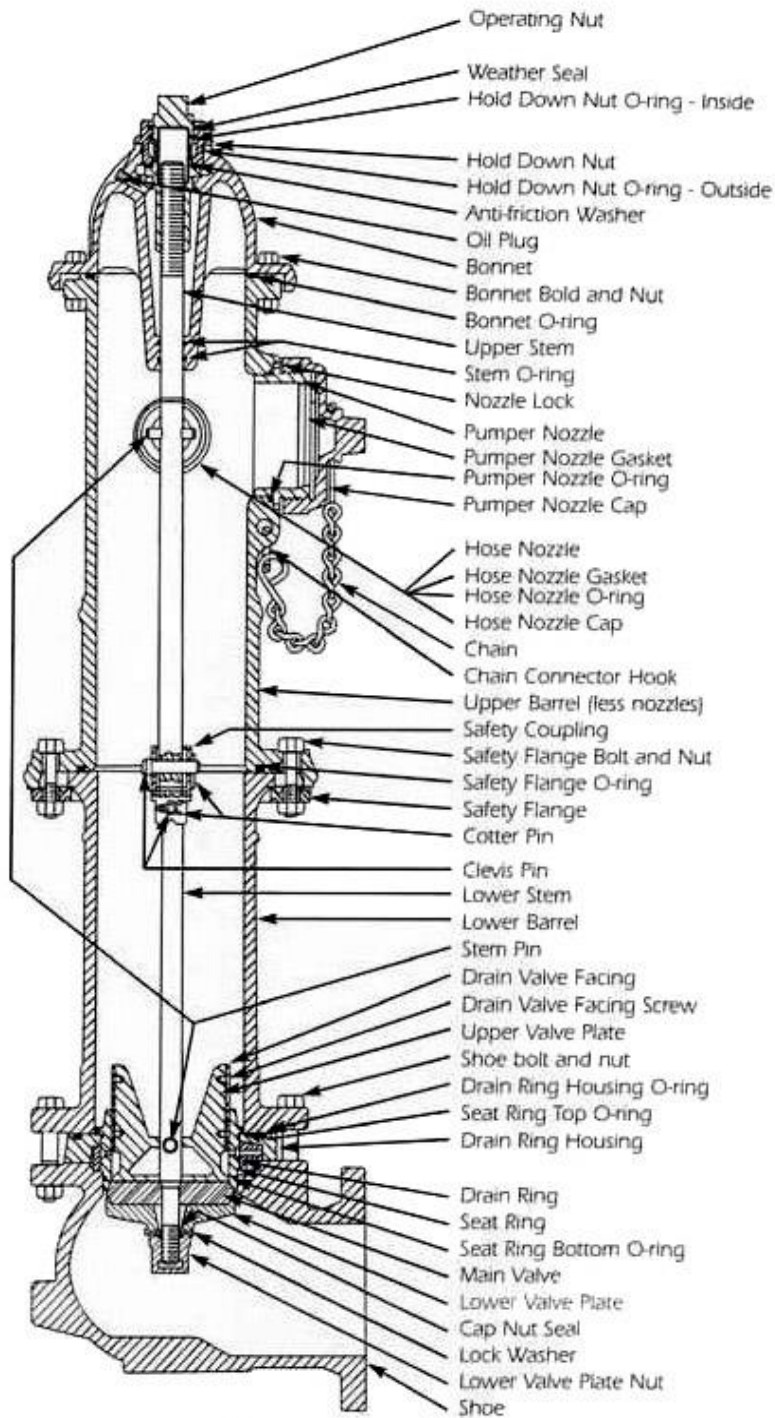
AFTER OPERATION

After operating a private hydrant, the Water Department should again be notified. This is especially important during cold weather. The Water Department will check the hydrant to ensure the barrel is dry to prevent freezing and ensure the hydrant is shut off completely. The owner of a private hydrant is responsible to ensure it is shutoff correctly and pumped.

Dry Barrel Hydrants

The City of Minot uses dry barrel hydrants. Dry barrel hydrants are manufactured in accordance with AWWA Standard C-502. Dry barrel hydrants have the main valve located below ground and the section that extends above ground is void of water except during operation. These hydrants are equipped with drain valves to allow the portion of the hydrant above the main valve to automatically drain.

Typical Hydrant Parts Names for Dry Barrel Hydrants



Painting and Color-Coding Fire Hydrants

PURPOSE

The appearance of fire hydrants has a direct impact on the public's confidence in the quality of the drinking water and Fire Divisions' ability to protect their homes and businesses. Therefore, it is necessary to maintain the appearance of the hydrants by painting.

Fire hydrants are also color coded to indicate if they are public or privately owned

CITY OF MINOT HYDRANT COLORS

All fire hydrants in the City of Minot shall have the bonnet of the hydrant painted RED and the body painted TRAFFIC YELLOW. These colors make hydrants more visible and separates them from surrounding landscaping and structures.

PRIVATE HYDRANTS

All privately owned fire hydrants shall be painted RED. This will separate public from privately owned hydrants. Each hydrant shall be given two coats of good weatherproofing paint before leaving the factory and another after installation. The portion of the hydrant below ground shall be painted with black paint and the portion above ground shall be painted RED.

Hydrant Repairs and Maintenance

RESPONSIBILITY

The Water Department is responsible for all repairs to the public fire hydrants in the City. If during inspection or operation, a public hydrant is found to be inoperable, or in need of major repairs, the hydrant should be reported to the Water Department at 701-857-4150.

The owner of private hydrants is solely responsible for testing, maintenance and marking of all privately- owned fire hydrants. The Fire Department is responsible for keeping records pertaining to the certification and maintenance of private hydrants but does not assume any responsibility for the testing and maintenance of privately-owned hydrants.

All out-of-service hydrants should be immediately reported to the Fire Department and Water Department.

Installation of Hydrants

RESPONSIBILITY FOR INSTALLATION

Public fire hydrants are installed by the owner/developer of land incident to subdivision or by the Water Department. In either case, a Contractor hired by the City or developer may perform the actual work. A general specifications diagram will be provided showing general requirements for installation of a new hydrant. All water mains, valves, and other devices, connected to the City of Minot water system, must conform to municipal specifications and must be approved by the City of Minot Engineering Division prior to installation. Information on City of Minot Specifications may be obtained by contacting the Engineering Division at 701-857-4100.

INSPECTION OF NEW HYDRANTS All new public and private hydrant installations shall be inspected by the Water Department and/or Engineering Department. Inspections shall include the checklist shown below and a fire flow test.

Routine Inspection

FREQUENCY

In freezing climates, AWWA fire hydrant standards committee recommends that hydrants be inspected in the fall, in the spring and after each use. Lack of experience with the brands being inspected and time between inspections increase the length of time necessary to inspect a fire hydrant. To control these factors, the City specifies the types of hydrants that may be installed and endeavors to inspect public hydrants on a regular schedule. Routine inspection of common fire hydrants by experienced operators should take approximately 30 minutes per hydrant.

PROCEDURE

(A simplified check list is included at the end of this document)

1. Visually inspect the area around the hydrant.
 - a. In order to protect landscape, vehicles, etc. in the surrounding area, it may be necessary to use a diffuser or hose to direct water away from the area.
2. Visually check the hydrant for any defects.
 - a. Remove all caps and check the threads. Remove the first cap slowly to ensure there is no pressure on the hydrant. Clean threads with a wire brush. Lubricate the threads if necessary. Currently the City uses Fuchs, from Certified Labs, as a thread lubricant.
 - b. Check for water or ice in barrel.

- c. Replace caps.
 - d. If hydrant is equipped with safety chains, ensure the chains are loose and do not bind on the cap.
 - e. Check the breakaway flange for damage or loose bolts.
 - f. Lubricate the operating nut if required. Detailed manufacturer specific instructions for most hydrants are available in the Water Distribution office or online.
3. Install 3" gate valve
4. Install hose or diffuser if necessary to protect surrounding area.
5. Open the hydrant SLOWLY approximately 3 to 5 turns. Allow time for the air to escape from the hydrant barrel. Then SLOWLY open hydrant to the fully open position to check operation.
- a. Open gate valve to fully open position.
 - b. Flow may then be reduced if desired.
 - c. Check for leakage at the flanges, operating nut, nozzles and nozzle caps.
 - d. Allow the water to flow for a minimum of 3 to 5 minutes to flush the hydrant and water lines.
 - e. Attention should be paid to pressure and flows for each hydrant. Note any decreased flows on specific hydrants as compared to hydrants in the similar vicinity. If a decreased flow is noted. Make sure to report this to the Water Department to investigate.
6. Once the water is clear close down hydrant VERY SLOWLY.
- a. Be aware that some hydrants may not seem to slow down when you turn them. This usually means the hydrant may slam (it will have some slop in the stem and may make a thump sound when closing). This causes water hammer and could cause major damage to the water distribution system. This is why it is imperative that hydrants are closed VERY SLOWLY.
7. Wait to make sure the hydrant stops dripping. It should not be necessary to close the hydrant with great force.
- a. If the hydrant does not shutoff completely, there may be debris stuck between the disc and seat. Over tightening of the hydrant can do permanent damage to the disc. Open the hydrant to flush the debris, then close down the hydrant

again. If the hydrant will not shut off completely, notify the Water Department.

8. After the hydrant is closed, back off on the operating nut about 1/4 turn.
 - a. This removes the pressure from the operating nut and stem. The main valve will remain closed.
9. Check to insure weep wholes are draining water from the barrel. If water does not drain pump the barrel out.
10. Remove gate valve or hoses and replace the caps.
 - a. Tighten the cap and then back off slightly. Caps should be tight enough to prevent removal by hand but loose enough to be removed with ease using a spanner wrench.
11. Repair any damages from running water.
12. Paint the hydrant if necessary.
13. Locate, clean and paint hydrant gate valve.

Fire Flow Testing

PURPOSE

Fire flow tests are conducted to determine pressure and flow-producing capabilities at any location within the distribution system. The primary function of fire flow tests is to determine how much water is available for fighting fires, but the tests also serve as a means of determining the general condition of the distribution system. Heavily tuberculated water mains or those with heavy wall deposits can reduce flow-carrying capacities of pipe; this reduced capacity can be detected by means of a flow test. Flow tests can also help detect closed valves in the system. The results of flow tests are used by insurance underwriters as a factor in setting rates for insurance premiums and by designers of fire-sprinkler systems.

It is good practice to conduct flow tests on all parts of the distribution system approximately every 10 years (or whenever needed) to identify the service areas affected by significant changes in the distribution system.

RECORD KEEPING

An accurate record, filed systematically so it is readily available, should be kept of each test. The Engineering Department uses a data base program called "City Works". This program stores and calculates the test information with a graph. Static, residual and pitot pressures are used for test information. Also, hard copies are filed in a notebook in the Engineering Department.

Public Works maintains a water model of the City's water system. This model is updated every 5 years and calibrated during the updates. Flow information is valuable data and results should be submitted to the Public Works department anytime a flow test is done, to provide a comparison to the water model and aid in calibration of the water model.

PLANNING

It is important to plan ahead when conducting fire flow testing. Review distribution-system maps and determine which hydrants will be used to measure flow and which will be used to measure the static and residual pressures. Review previous tests to estimate the flow and pressures that can be expected. Select a day for testing when system consumption will be normal and weather predictions indicate that conditions will be reasonable. The Water Department should be notified as to the time and location of the tests so necessary adjustments to the system can be made. As flow testing can greatly increase the velocity in the main, this may cause brown water complaints. The Water Department and possibly the customers in the affected area should be notified of potential water quality issues in advance of the testing. Investigate traffic patterns, as the tests may affect traffic flow.

RESPONSIBILITY FOR TESTING

The City of Water Department shall operate any and all valves or hydrants tested. Anyone who wants flow information for fire sprinkler design or other items, shall complete the flow test themselves. These entities shall schedule and coordinate with the Minot Water Department for these tests so that Minot water personnel are operating any and all hydrants and valves, but the party requiring the flow test, shall be responsible for performing the actual test.

CAUTIONS TO BE OBSERVED WHEN FIELD TESTING

Opening a hydrant rapidly can cause a negative pressure fluctuation. Therefore, hydrants should be opened slowly until fully opened. Closing the hydrants is more critical, and it must be done very slowly. Closing a hydrant rapidly causes a pressure surge, or water hammer, and this could cause a weakened main to fail.

Hydrants should be opened and closed one at a time to minimize the effect on the distribution system. Dry-barrel hydrants must be opened fully because the drain-valve mechanism operates with the main valve. A partially opened hydrant could force water through the drain outlets under pressure, eroding the thrust support from behind the hydrant. After the test, the hydrant barrel should be drained before tightening the outlet-nozzle cap. A tight outlet-nozzle cap could prevent proper drainage and possibly cause ice blockage in either the upper or lower barrels.

Gauge measurements should be taken only when the water is running clear because sediment could damage the instruments. Use a solid white cup to check water clarity before testing and again before shutting down the hydrant to ensure water is clear.

PROCEDURE

It is recommended that the procedure outlined in AWWA Manual M17, 'Installation, Field Testing, and Maintenance of Fire Hydrants', be used for conducting flow testing.

Using Hydrants for Hydrostatic Testing

PURPOSE

At certain times, usually during the installation of a new water main, fire hydrants may be used to conduct a pressure test at pressures above main pressure. Certain steps should be followed to ensure the safety of the persons conducting the pressure test and to protect the system.

WARNING! Hydrostatic testing described in this section shall be conducted with water because of the inherent safety hazard potential associated with testing components and systems with compressed air or other compressed gases.

NOTIFICATION

The City of Minot Water Department should be contacted prior to performing any maintenance, repairs or other work on the public water system or private system connected to the public water system.

PROCEDURE

Visually inspect the hydrant for any defects. Check the bolts and breakaway flange. Check the nozzle-caps and gaskets. Ensure the caps are tightened; a loose cap or damaged nozzle can blow off under pressure. Visible leaks shall be stopped. Defective elements shall be repaired or removed and replaced and the test repeated until the test requirements have been met.

To prevent damage to the system it is imperative that hydrants are opened and closed slowly. When the test is completed and the pressure is removed from the main, close the hydrant slowly. Once all testing is done, ensure that the hydrant is pumped to prevent freezing.



Fire Hydrant

Simplified Inspection Checklist

Hydrant # _____ Location _____

Date _____ Inspected by _____

- Visually inspect the area.
- Visually check hydrant.
- Remove caps. Clean and lubricate threads with food grade (Fuchs) grease. Replace caps.
- Install 3' gate valve
- Install hose or diffuser if necessary.
- Open hydrant SLOWLY to fully open position.
- Check for leakage.
- Check water clarity
- Reduce flow SLOWLY and shut off hydrant.
- Watch to see hydrant stops dripping. Re-flush if necessary.
- Check to see if weep wholes are draining the barrel of hydrant.
- Pump barrel out if weep whole is not draining.
- Remove hose or fittings, replace cap.
- Repair any damage to surrounding area.
- Paint Hydrant per spec.
- Locate, clean and paint hydrant gate valve.

Problems Identified:

Date:

City of Minot

Office of the Fire Chief



Dear Property Owner:

Our records indicate that you have privately owned fire hydrant(s) on your property. It is your responsibility to maintain these hydrants to ensure that they are in proper working order in the event of a fire incident. We are requiring that these hydrants be inspected, serviced and maintained on an annual basis.

According to the Fire Code, Section 508.5.2, "Fire hydrant systems shall be subject to periodic tests as required by the fire code official. Fire hydrant systems shall be maintained in an operative condition at all times and shall be repaired where defective. Additions, repairs, alterations and servicing shall comply with approved standards."

Please notify the City of Minot Water/Wastewater at 701-857-4150 at least 24 hours in advance of scheduled service on your hydrant(s). Following maintenance, please complete the form below and return to Minot Fire Department no later than _____. Please contact Minot Fire Department with any questions at 701-857-4740 or see Private Hydrant Maintenance on the City of Minot webpage under the Minot Fire Department tab.

Property Owner _____

Address _____

Number of Hydrants _____

Description of Maintenance:

Date Performed:

Performed By:

Flow tested		
Flushed		
Pumped Down		
Lubricated		

Describe any problems found and/or corrected:

Thank you for your help in keeping our community safe,

Fire Chief Kelli Kronschnabel