

# Iowa Main Break and Depressurization Guidance

Any disruption in a water system that results in a loss of positive pressure may allow contaminants to enter the system. This document is intended to provide guidance to public water supply owners and operators in evaluating and responding to pressure loss situations from distribution system issues such as main breaks, valve repairs, or extreme fire flows, and operational disruptions such as a pump failure, power outage, telemetry failure, source failure, or storage depletion.

During a main break or other work that opens the system, the loss of positive pressure within the water system may allow disease-causing microorganisms from surrounding soil or groundwater to enter a distribution system pipe. The loss of pressure may also allow disease-causing microorganisms and chemical contaminants to be drawn into the pipe through backsiphonage due to the pressure differences. In addition, during the process of repair, contamination of the system may occur if the pipe has been opened to the environment and has come into direct contact with groundwater, runoff, soil, or contaminants in the area of the repair.

During any pressure loss situation, protection of public health and safety are the priority and primary concern. At the same time, it is important to minimize the disruption of water service to the customers. For this reason, boil water or bottled water advisories may be recommended or required while bacteriological sampling is completed so the repaired water main may be returned to service. It is critical that sanitary procedures are followed throughout the process of response, repair, and returning the line or system to service.

## **AWWA Standard C651**

For water main breaks, AWWA Standard C651-14 must be followed. The standard includes the following preventive and corrective measures to accomplish the repair in a sanitary manner:

- Keep the new pipe, fittings, valves, etc. clean and dry (protected from contamination)
- Prevent contaminants from entering the existing pipe by maintaining positive pressure as long as possible - until the pipe is fully exposed and the trench is dewatered to below the existing pipe
- Inspect, clean, and disinfect (by spraying or swabbing with a 1% chlorine solution) all exposed portion of the existing pipe, all materials used in the repair, and all tools used to make the repair
- After repairs are complete, flush, measure chlorine residuals, and collect bacteria samples if required

AWWA Standard C651-14 is available for review at the DNR Field Offices and at the DNR Water Supply Engineering Office in Des Moines. It may also be purchased from the AWWA Store online.

This standard includes specific practices for the repair of water main breaks and classifies breaks into four (4) categories listed below. Each category includes actions, recommendations, and requirements based on the contamination risk.

*Controlled pipe repair without depressurization:* The repair activities are well controlled and positive pressure is maintained to the area of the break and at the site at all times. The repair site is exposed and the trench is adequately dewatered so that the repair site can be cleaned and disinfected. These are main breaks that are repaired with clamping devices while the main remains under pressure. See the flushing recommendations below. No bacteria sampling is recommended or required. A boil water or bottled water advisory is not recommended or required.

*Controlled pipe repair with depressurization after shutdown without opening the pipe:* After the repair site has been exposed and secured from trench soil and water contamination (the trench is adequately dewatered so that the repair site can be cleaned and disinfected), the water main is depressurized by a shutdown to complete the repair. The repair site should be cleaned and disinfected. See the flushing recommendations below. A boil water advisory and bacteria sampling are typically not warranted. In the case of potential contamination from a high hazard business in the affected area, consult with the DNR Field Office to determine if a boil water, bottled water, or alternative source advisory and bacteria or other sampling may be recommended or required.

*Controlled pipe repair with depressurization after shutdown with opening the pipe:* After the repair site has been exposed and secured from trench soil and water contamination (the trench is adequately dewatered so that the repair site can be cleaned and disinfected), the water main is depressurized by a shutdown to complete the repair. The pipe has to be opened (cut into) so the interior surfaces of the water system are exposed. The existing pipe should be inspected and cleaned by flushing water into the trench, where possible. The repair site must be accessible and the trench adequately dewatered so the repair site can be disinfected. All new pipe, valves, etc. must be disinfected before installation. See the flushing recommendations below. Bacteria sampling is recommended. A boil water, bottled water or alternative source advisory is recommended if any contaminants could have entered the pipe. A boil water, bottled water, or alternative source advisory may be required if a high hazard business or high risk/vulnerable population is located in the affected area. Consult with your DNR Field Office for guidance.

*Uncontrolled pipe break with a likelihood of water contamination or loss of sanitary conditions during repair:* When the existing main could not be protected or kept free from contamination (such as muddy trench water flowing into the break, a leaking sewer line, catastrophic pipe failure or blowout, etc.) or when a controlled repair situation turns into a situation in which the internal pipe and water have become contaminated, then chlorination similar to that for a new main should be followed where practical. A boil water, bottled water or alternative source advisory, flushing, and bacterial sampling are required.

### *Flushing*

In all situations, flushing is advised after the repairs are completed. Flushing is recommended to obtain three volumes of water turnover in the area of the repair. When the pipe has been depressurized, flushing should be at a velocity of at least 3 ft/sec or greater to scour the pipe in the area of the repair. If this is not practical, contact and consult with the DNR Field Office. In all cases, the water should be clear at the end of the flushing and normal chlorine residuals should be obtained throughout the area that was depressurized. Properly dispose of chlorinated water used for disinfection and/or flushing.

In all depressurized situations, advise customers in the impacted area to flush their internal plumbing after the repairs are completed. Customers should be advised not use colored water for drinking or cooking and to continue to flush their internal plumbing until the water is clear.

In all situations, the repaired line may be returned to service immediately after flushing. In situations where the pipe has been depressurized, issuance of boil water, bottled water or alternative source advisories and bacteria sampling following the guidance above is required when the repaired line is returned to service.

### **Boil Water, Bottled Water or Alternative Source Advisory Situations**

*Pressure loss situations that may require a boil water, bottled water or alternative source advisory and bacterial sampling include:*

- Water main breaks with controlled pipe repair with depressurization after shutdown with opening the pipe or uncontrolled pipe break with a likelihood of water contamination or loss of sanitary conditions during repair (see section above)
- No or low pressure in the distribution system and not contained (time or geographical area)
- Situations where the source(s) or treatment facilities are interrupted or unusable, including power loss situations
- Situations where a tower or storage facility has been emptied
- Pressure losses located near a contaminant source, such as near a river crossing, feedlot, co-located with a sewer line break, etc.
- Pressure losses located in an area with significant elevation differences
- Confirmed backflow or backsiphonage situation backflow or backsiphonage situation with bacterial contamination. If the backflow or backsiphonage situation is chemical or unknown, issue a "No Use" advisory instead.
- Pressure losses located in an area with the potential to create a high hazard backflow incident
- Pressure losses where a high hazard business is located in affected area (boiler, funeral home, industry, etc.)
- A situation where the minimum disinfectant residuals cannot be maintained in or around the impacted area

- Situations including high risk or vulnerable populations, such as a school, day care, hospital, nursing home, dialysis center, other medical facilities
- An inexperienced operator or individual from the water system dealing with the situation

Consult with the DNR Field Office to determine if sampling and a boil water, bottled water or alternative source advisory is necessary.

During normal business hours call the appropriate DNR Field Office to consult about sampling, boil water, bottled water and alternative advisories, and public notice. After hours, call the 24 hour emergency response hotline. If a boil water, bottled water, or alternative source advisory is required or recommended, determine:

- The extent and method of distribution (door hanger, hand delivery, phone, press release, Code Red or other method)
- The notification must include critical users (nursing homes, hospitals, schools, wet industries, etc.)
- The content of the notice

There is no federally mandated language for boil water, bottled water and alternative source advisories. Advisory templates are included in Appendix 2. Consider the following when issuing an advisory:

- Systems with Nitrate above 7 mg/L or Nitrite above 0.7 mg/L at the SEP or in the distribution, must include language that infants must use an alternative source, such as bottled water, due to the potential to increase the nitrate or nitrite levels above the MCL with boiling.
- Systems with manganese levels above 0.22 mg/L at the SEP or in the distribution system, must include language that infants must use an alternative source, such as bottled water, due to the potential increase in manganese levels above the acute Health Advisory Level with boiling.
- Systems with manganese levels above 0.7 mg/L at the SEP or in the distribution system, must include language that all persons use an alternative source, such as bottled water, due to the potential increase in manganese levels above the acute Health Advisory Level with boiling.
- Systems with colored water must use the alternative source language as manganese levels are elevated.
- Systems that do not know their manganese levels, must use the alternative source language. Systems test nitrate once per year at a minimum and test nitrite if they have a risk of nitrification. These levels should be available to the operator.
- If a backflow or backsiphonage event has occurred, do not issue a boil water advisory as this will concentrate the chemical contamination. Instead, issue a “No Use” advisory.
- Determine if a water conservation advisory should be issued

The advisory must remain in place until absent (clean) bacteria sample results are received.

**Bacteria Sampling**

The minimum number of samples to be collected and analyzed for total coliform and chlorine residual is based on the number of service connections and the type of services in the area. See the information above for the explanation of high hazard service connections and high risk/vulnerable populations. The presence of high hazard service connections or high risk/vulnerable populations may increase the number of bacteria samples that are needed.

The number of samples is specified in the chart below for all water systems including consecutive systems (those that purchase water). For rural water systems, a minimum of 1 sample per every 5 miles of pipe depressurized is recommended. If this is not practical, consult with the DNR Field Office.

<b>Number of Service Connections Impacted by the Depressurization</b>	<b>Controlled Repair with Depressurization Minimum Number of Samples Recommended*</b>	<b>Uncontrolled Pipe Break Minimum Number of Samples Required**</b>
1 – 25	1	1 + 1 or 1 + 2***
26 – 50	2	2 + 2
51 – 100	3	3 + 3

<b>Number of Service Connections Impacted by the Depressurization</b>	<b>Controlled Repair with Depressurization Minimum Number of Samples Recommended*</b>	<b>Uncontrolled Pipe Break Minimum Number of Samples Required**</b>
101 – 500	4	4 + 4
501 – 2000	5	5 + 5
>2000	As directed by DNR	As directed by DNR

\*Samples should be collected from each side of the repaired break if flow direction is uncertain/unknown or if it is a looped line. If the main is a dead-end line or a looped line that has been isolated (valve closed to force water in one direction) and flushed in one direction, then sample downstream of the repair.

\*\*These are the minimum number of samples required from the same sample sites. Samples must be taken at least 16 hours apart.

\*\*\*If the water flow is in one direction, take 1 sample downstream of the break, then another sample at the same location at least 16 hours later. If it is a looped line and opened to flow in either direction after the repair and flushing, collect the first sample downstream of the repair and collect two samples, one on each side of the repaired break, for the second sampling event at least 16 hours after the first sample.

Chlorine residuals must be measured at the same locations in the distribution system where the bacteria samples were collected.

### **DNR Field Office Notification and Contact Numbers**

The DNR Field Office must be notified as soon as practical but no later than 24 hours after discovery when any of the following occur:

- A boil water, bottled water, alternative source or no use advisory is issued
- A boil water, bottled water, alternative source or no use advisory is lifted
- A loss of positive pressure occurs outside the area of isolation (a main break is isolated but a pressure loss occurs outside of this area)
- There is a high risk or vulnerable population, such as a school, day care, hospital, nursing home, dialysis center, other medical facilities, in an area that has been depressurized
- More than 25% of the system is depressurized

FO1 (Manchester): 563-927-2640

FO2 (Mason City): 641-424-4073

FO3 (Spencer): 712-262-4177

After Hours Emergency Response Hotline: 515-725-8694

FO4 (Atlantic): 712-243-1934

FO5 (Des Moines): 515-725-0268

FO6 (Washington): 319-653-2135

### **Documentation**

A water system is encouraged to document all water main breaks or pressure losses and the actions taken in a Water Main Break Log. See Appendix 1.

### **Before you have a situation, develop a communication plan that includes:**

- public notice templates,
- identification of critical users and their contact information,
- identification of primary contacts, partners with trusted experts, and agencies, and
- identification of your local media including contact information and after hours contact information.

See Appendix 2 for an example of a communication plan.

It is recommended that a media contact be designated prior to a situation so all communication with the media is conducted with that designated person.

### **Main break categories and response:**

The table in appendix 3 was developed to help guide operators in determining the category of the main break and the necessary responses.