

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Safe Drinking Water

DOCUMENT NUMBER: 393-2129-003

TITLE: Policy for Determining When Loss of Positive Pressure Situations in the Distribution System Require One-Hour Reporting to the Department and Issuing Tier 1 Public Notification

EFFECTIVE DATE: October 3, 2009
Minor revisions made to document. (~~December 21, 2017~~[May 11, 2018](#))

AUTHORITY: Pennsylvania's Safe Drinking Water Act (35 P.S. § 721.1 *et seq.*) and regulations at Title 25 Pa. Code Chapter 109

POLICY: Public water suppliers and Department of Environmental Protection (DEP) staff should follow the guidance and procedures presented in this document to respond to loss of positive pressure situations in the distribution system.

PURPOSE: The purpose of this document is to establish uniform instructions and protocol for responding to loss of positive pressure situations in the distribution system to ensure the protection of public health.

APPLICABILITY: This guidance will apply to all public water systems.

DISCLAIMER: The policies and procedures outlined in this guidance are intended to supplement existing requirements. Nothing in the policies or procedures shall affect regulatory requirements.

The policies and procedures herein are not an adjudication or a regulation. There is no intent on the part of DEP to give the rules in these policies that weight or deference. This document establishes the framework within which DEP will exercise its administrative discretion in the future. DEP reserves the discretion to deviate from this policy statement if circumstances warrant.

PAGE LENGTH: 9 pages

DEFINITIONS: See Title 25 Pa. Code Chapter 109

POLICY FOR DETERMINING WHEN LOSS OF POSITIVE PRESSURE SITUATIONS IN THE DISTRIBUTION SYSTEM REQUIRE ONE-HOUR REPORTING TO THE DEPARTMENT AND ISSUING TIER 1 PUBLIC NOTIFICATION

I. PURPOSE:

This document is intended to provide a policy to public water suppliers and Department of Environmental Protection (DEP) staff for evaluating and responding to possible contamination of water distribution systems during loss of positive pressure situations caused by a physical disruption (i.e., line breaks, valve repairs, new construction, etc.) or an operational disruption (i.e., pump failure, power outage, telemetry failure, extreme fire flows, source outage, depletion of storage, etc.). This policy provides uniform procedures to ensure water supplies are safe for potable use during a loss of positive pressure situation and after pressure is restored.

II. BACKGROUND:

Any disruption of a water distribution system that results in a loss of positive pressure may allow contaminants to enter the distribution system. Water suppliers can minimize contamination by implementing acceptable department and water industry standards and practices. Pursuant to Chapter 109 of the Department's regulations and *Part II of the Department's Public Water Supply Manual*, water suppliers shall adhere to the [most recent edition of the](#) American Water Works Association (AWWA) Standard C-651-~~05~~—Disinfecting Water Mains, when repairing or replacing water mains to ensure that water quality is not compromised or degraded. Standard C-651-~~05~~ includes procedures for adequate flushing, disinfection and microbiological testing. Refer to Section V for more information about Standard C-651-~~05~~.

In certain situations, additional measures may be necessary in order to protect public health. This guidance will discuss when one-hour reporting to DEP and issuance of Tier 1 public notification (PN) may be warranted.

III. APPLICABLE REGULATIONS OF TITLE 25 PA. CODE CHAPTER 109 (SAFE DRINKING WATER):

- A. § 109.4. Requirement to effectively operate and maintain public water system facilities and to take whatever investigative or corrective action is necessary to assure that safe and potable water is continuously supplied to users.
- B. § 109.408. Tier 1 public notice.
- C. § 109.602(a) - (c). Acceptable design.
- D. § 109.606. Chemicals, materials and equipment.
- E. § 109.607. Pressures.
- F. § 109.701(a)(3). One-hour reporting requirements.
- G. § 109.702. Operation and maintenance plan. [\(a\) A community water supplier shall develop an operation and maintenance plan for the community water system.](#) The

operation and maintenance plan must generally conform to the guidelines contained in the Department's *Public Water Supply Manual* and contain at least the following information: ... (3) Procedures for repairing and replacing water mains that conform to the Department and water industry standards.

- H. § 109.709. Cross-connection control program.
- I. § 109.710. Disinfectant residual in the distribution system.
- J. § 109.711. Disinfection of facilities prior to placing them into service. (b) After repairing a facility or performing other activities which place the facility out of service, and before returning the facility to service, the public water supplier shall disinfect the facilities in accordance with the most recent procedures established by the American Water Works Association.

IV. OTHER APPLICABLE REFERENCES:

- A. "Public Water Supply Manual, Part II: Community System Design Standards", DEP #393-2125-004, May 6, 2006. All DEP publications are available on DEP's website at www.dep.pa.gov.
- B. "Policy for Issuing and Removing Water Supply Warnings", DEP #393-2129-004, 2009.
- C. Latest standards issued by the American Water Works Association (AWWA) and the American National Standards Institute (ANSI), including [the most recent edition of ANSI/AWWA Standard C651-05 - Disinfecting Water Mains](#).

AWWA Standards are copyrighted materials. To place an order, please call AWWA Customer Service at 800-926-7337. ~~Or, you can download a Bookstore Order Form from AWWA's website at www.awwa.org/, complete it, and mail or fax it to:~~

~~Customer Service
AWWA
6666 West Quincy Avenue
Denver, CO 80235-3098
FAX: 303-347-0804~~

Individual AWWA Standards may also be ordered online [from AWWA's website at www.awwa.org/](http://www.awwa.org/).

- D. "Disinfection of Pipelines and Storage Facilities Field Guide", AWWA, 2006.
- E. "Recommended Standards for Water Works", Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers, [2007-most recent](#) edition. These Standards are otherwise known as 10 State Standards, ~~and are available from Health Research Inc., Heath Education Services Division at www.highereducationservices.org/.~~

V. POLICY:

A. One-Hour Reporting Requirements for Loss of Positive Pressure Situations.

Under § 109.701(a)(3)(iii), a public water supplier shall report the circumstances to the Department within 1 hour of discovery when circumstances exist which may adversely affect the quantity or quality of drinking water including, but not limited to, a situation that causes a loss of positive water pressure in any portion of the distribution system where there is evidence of contamination or a water supplier suspects a high risk of contamination.

To ~~further~~ clarify this requirement, a water supplier shall notify DEP within 1 hour **if ANY of the following circumstances occur when:**

1. A loss of positive pressure within the distribution system is caused by a situation other than a main break, ~~such as including~~ (but not limited to) a power outage, pump failure, source outage, or depletion of storage. Situations such as these are likely to result in widespread impacts, increasing the likelihood of potential pathways for contamination, and making it extremely difficult to fully and effectively evaluate the situation to rule out the risk of contamination within all affected portions of the distribution system.
2. A loss of positive pressure within the distribution system is caused by a main break, repair or replacement **AND:**
 - There is evidence of contamination **OR,**
 - A high risk of contamination.

Each main break, repair, or replacement needs to be evaluated on a case-by-case basis to determine whether there is evidence of or a high risk of contamination exists. These evaluations are considered process control decisions as defined in Title 25 Pa. Code Chapter 302 (Administration of the Water and Wastewater Systems Operators' Certification Program). Section 302.104(a) requires process control decisions to be made by an appropriately certified operator, and Section 302.901(a)(5) identifies Class E as the appropriate classification for water distribution systems.

Therefore, it is critical to note that a Class E Distribution certified operator needs to be on site if possible, or at a minimum, be available for consultation by phone with someone who is on site and can clearly convey observations; in order to evaluate each situation. **If a Class E certified operator is not available to**

evaluate the risk of contamination, the situation is assumed considered to be a high risk for contamination and the 1-hour reporting requirement applies.

Some examples of evidence of contamination within the distribution system may include, but are not limited to:

- Changes to the physical characteristics of the water, such as unusual discoloration, taste or odor, or increased temperature due to backflow from a hot water heater.
- Changes to the water chemistry as evidenced by field test results.

Some examples of situations with a high risk of contamination include, but are not limited to:

- A flooded trench that cannot be properly dewatered or remedied by best management practices where the water level is at or above the level of the pipe being repaired.
- Evidence of contamination of nearby soils caused by from leaking sewer lines near the site of the main break.
- Evidence of contamination of nearby soils caused by nearby from failing on-lot septic systems near the site of the main break.
- Evidence of contamination caused by back flow or a cross connection entering the main distribution system in the area of the main break or other impacted area.
- High system unaccounted for water loss (> 20%) due to leaks in the distribution system, near the site of the main break.
- Low system water storage as a result of a main break, which results in causes loss of service to customers, including any customers located outside of the immediate area surrounding the break, such as those located in lower pressure zones or a higher elevation.
- Evidence of contamination caused by a stream or river crossing near the site of the main break.
- Any condition that allows contaminated water to enter the distribution system.

According to Section 109.701(a)(3)(iii) provides that, if there is loss of positive pressure in “any portion of the distribution system”, the 1-hour reporting requirement may apply. During a repair completed while maintaining positive pressure in the immediate area, other portions of the distribution system, including higher elevations or other lower pressure zones, may be vulnerable to a loss of pressure. The Class E certified operator evaluating the situation should consider the need to monitor pressure in areas of the system outside the immediate- area surrounding the break. **If any portion of the distribution system experiences a loss of positive pressure, a potential public health threat may exist; therefore that therefore, that portion of the system needs to be evaluated to determine if the 1-hour reporting requirement applies.**

3. Repairs to a main break associated with a loss of positive pressure cannot be completed as per the requirements under Standard C-651-05 and this policy. [ChapterSection 109.711 requires public water suppliers to follow the most recent procedures established by AWWA for disinfection of facilities before returning the facility to service after repair. Therefore, all public water suppliers should have access to a copy of the standard; at a minimum, they should ensure that their staff and/or contractors conducting repairs have access to and are following Standard C-651 for any main break repairs.](#)
4. Special bacteriological samples collected as per Standard C-651-05 and this policy are positive for ~~fecal coliform or~~ *E. coli*.

[It is important to note that distribution pressures should be monitored using all available data, and the need for 1-hour reporting should be routinely reevaluated, throughout any situation with the potential for loss of pressure in the distribution system. For example, a main break may be repaired under reduced operating pressure, but at any point during the repair if the operator determines that positive pressure has been lost in any portion of the distribution system during the repair, that portion of the system needs to be evaluated to determine whether the 1-hour reporting requirement applies. If so, the time clock for 1-hour reporting would begin upon that determination.](#)

B. Tier 1 PN Requirements for Loss of Positive Pressure Situations.

For any of the situations listed above, a water supplier shall also consult with DEP regarding the need for and issuance of Tier 1 PN in the form of a Boil Water Advisory (BWA) or some other water supply warning, ~~according to as provided in Section 109.408(b)(3)~~. Tier 1 PN will generally be required for situations meeting the criteria in 2, 3 or 4 above. Situations meeting the criteria in 1 above may require a Tier 1 PN.

Refer to the *Department's Policy for Issuing and Removing Water Supply Warnings* for more information about PN and additional follow-up actions. For example, additional follow-up actions for a BWA may include: repairing/replacing water lines, establishing and maintaining higher chlorine residuals, flushing lines, collecting check samples, etc.

C. Best Management Practices for Main Breaks Which Result in a Loss of Positive Pressure (ANSI/AWWA Standard C-651-05).

Pursuant to Chapter 109 and *Part II of the Department's Public Water Supply Manual*, water suppliers shall adhere to department and water industry standards and practices when repairing or replacing water mains to ensure that water quality is not compromised or degraded. Industry standards and practices include procedures for adequate flushing, disinfection, and microbiological testing. Practical application procedures based on the standard may also be found in AWWA's field guide entitled, "Disinfection of Pipelines and Storage Facilities."

The following check list summarizes the best management practices. Please refer to the AWWA standard for more details.

D. Best Management Practices Check List for Main Breaks Which Result in a Loss of Positive Pressure (ANSI/AWWA Standard C-651-05).

The following check list summarizes the best management practices to address main breaks resulting in a loss of positive pressure. It is important to note that this check list is intended only to summarize the key points in AWWA Standard C-651; it is not intended to be used in place of following the standard. Please refer to AWWA Standard C-651 for more details and full procedures.

1. Minimize entry of contaminants:

- Isolate the affected main segment.
- Shut off all affected service connections that lack adequate backflow prevention, where practical.
- Dewater excavation trenches prior to repairs. Disinfect wet trenches where practical or where evidence of contamination exists.

2. Disinfect the pipe:

- Swab or spray pipe interiors and associated fittings with a 1% solution of hypochlorite prior to installation.
- Where practical or where evidence of contamination exists, disinfect the entire affected main segment using the slug chlorination method one of the chlorination methods in Standard C-651. Refer to Standard C-651 for detailed disinfection procedures.

Note: Leaks or breaks that are repaired with clamping devices while the main remains full of pressurized water may present little danger of contamination and therefore may not require disinfection.

3. Remove contaminants and dechlorinate chlorinated-waste discharge:

- Flush the affected main segment until discolored water is eliminated and the disinfectant residual concentration in the water exiting the main is no higher than the residual disinfectant concentration in the distribution system.
- Dechlorinate the chlorinated-waste discharge by applying an adequate amount of reducing agent to thoroughly neutralize the chlorine residual remaining in the water. Refer to Standard C-651 for information about dechlorination procedures.

4. Determine effectiveness of procedures:

- Measure the disinfectant residual concentration to verify establishment of an acceptable residual.
- ~~As per Standard C-651, e~~Collect special follow-up total coliform bacteriological samples in accordance with Standard C-651 to confirm that contamination did not occur during repair or replacement activities. Refer to Table 1 for the minimum number of required samples. Bacteriological Samples must be analyzed by an appropriately accredited environmental laboratory. Representative sampling locations must be downstream of the main break or repair. If the direction of flow is unknown, samples must be taken both up and downstream.

Population Affected¹	Minimum # of Samples
1 – 500	1
501 – 1,000	2
1,001 – 2,000	3
2,001 – 3,000	4
3,001 – 4,000	5
4,001 – 5,000	6
5,001 – 7,500	7
7,501 – 10,000	8
10,001 – 25,000	9
25,001 – 50,000	10
> 50,000	11

¹Population affected = # service connections x 2.7 people

- Sampling shall be continued until **two consecutive days of negative samples** are obtained.
- If follow-up total coliform sample results are negative for two consecutive days, go to ~~the last~~ check list item #5 and record the details in your Repair Log.

Where practical or where evidence of contamination exists, repaired or replaced water mains must be completely installed, flushed, disinfected and satisfactory bacteriological sample results received prior to returning the main to service.

As per Standard C-651, and as per the properly certified operator's best professional judgment, after the appropriate disinfection and flushing procedures have been completed, the existing main may be returned to service prior to the completion of bacteriological analysis in order to minimize the time customers are without water.

- If any follow-up total coliform samples are positive, ensure that the lab is also analyzing the samples for ~~fecal coliform or~~ *E. coli*.
- If results are total coliform-positive only**, continue flushing, disinfecting and collecting follow-up samples until ~~such time as~~ samples are negative for total coliform bacteria.
- If results are positive for ~~fecal coliform or~~ *E. coli***, notify DEP within 1 hour and issue a BWA as soon as possible, but no later than 24 hours. Refer to the *Department's Policy for Issuing and Removing Water Supply Warnings* for additional information about follow-up actions.

~~Where practical or where evidence of contamination exists, repaired or replaced water mains must be completely installed, flushed, disinfected and satisfactory bacteriological sample results received prior to returning the main to service.~~

~~As per Standard C-651, and as per the water supplier's best professional judgment, after the appropriate disinfection and flushing procedures have been completed, the existing main may be returned to service prior to the completion of bacteriological testing in order to minimize the time customers are without water.~~

~~In certain situations, and as per the water supplier's best professional judgment, the collection of bacteriological samples may be avoided. In order to avoid collecting bacteriological samples, **all of the following criteria must be met:**~~

- ~~• There is no evidence of contamination or a high risk of contamination.~~
- ~~• All repair parts are disinfected as per Standard C-651, or if service connections are shut off, the main is disinfected utilizing the slug chlorination method.~~
- ~~• Any area of repair is flushed thoroughly and background chlorine residual levels of at least 0.2 mg/L (as free chlorine or its equivalent) are re-established.~~
- ~~• The water supplier has had no coliform MCL violations in the last year.~~
- ~~• The water supplier is in compliance with the requirements of The Water and Wastewater Systems Operators' Certification Act and associated regulations. Specifically, an available operator with the appropriate level of certification must make all process control decisions related to repairing or replacing the water main.~~
- ~~• The crew must utilize written standard operating procedures that are in conformance with Standard C-651 and this policy.~~

~~If a water supplier cannot comply with Standard C-651 and this policy for responding to a loss of positive pressure situation, water quality may be compromised. The water supplier shall notify DEP within 1 hour of the loss of positive pressure to discuss whether Tier 1 PN is necessary.~~

5. Complete recordkeeping:

- Record details of the main break in a Repair Log, including all follow-up coliform sample results, ~~or an indication that all criteria were met to avoid bacteriological sampling~~. Retain the Repair Log on-site, and make it available to DEP upon request.

If a water supplier cannot comply with Standard C-651 and this policy for responding to a loss of positive pressure situation, water quality may be compromised. The water supplier shall notify DEP within 1 hour of discovery of the loss of positive pressure to discuss whether Tier 1 PN is necessary.

E. Special Considerations

AWWA Standard C-651 requires collection of bacteriological samples following all main repairs. However, in certain situations, the Department may waive this requirement. If it is in the best professional judgement of an appropriately certified Class E operator, the collection of bacteriological samples may be avoided. In order to avoid collecting bacteriological samples, all of the following criteria must be met:

- There is no evidence of contamination or a high risk of contamination.
- All repair parts are disinfected ~~as per~~ in accordance with Standard C-651, or if service connections are shut off, the main is disinfected utilizing the slug chlorination method.
- Any area of repair is flushed thoroughly and background disinfectant residual levels of at least 0.2 mg/L (as required by 109.710) are re-established.
- The water supplier has had no Level 1 or Level 2 assessments triggered under the Revised Total Coliform Rule in the last year.
- The water supplier is in compliance with the requirements of The Water and Wastewater Systems Operators' Certification Act and associated regulations. Specifically, an available operator with the appropriate level of certification must make all process control decisions related to repairing or replacing the water main.
- The crew must utilize written standard operating procedures that are in conformance with Standard C-651 and this policy.

F. Maintain a Repair Log for Loss of Positive Pressure Situations:

Water suppliers should record details of the ~~main break~~ loss of positive pressure event in their repair log. This log should include:

- Date, location and cause of the loss of positive pressure.
- If the cause is a main break, the type of repair needed to correct the break.
- Time it was discovered.
- Population affected.

- [Time of notification to DEP, name and phone number of DEP representative notified, and summary of conversation.](#)
- Length of time required to repair.
- Type of disinfection method used.
- Date and time disinfectant residuals were detected.
- Date and time coliform bacteria samples were collected, or an indication that appropriate criteria were met to avoid bacteriological sampling.
- Results of the coliform bacteria samples and the date results were obtained.

The log should be made available to DEP upon request.

VI. DEP FIELD OPERATIONS REGIONAL OFFICES:

**For more information,
call the DEP regional office in your area or contact:**

**Department of Environmental Protection
Bureau of Safe Drinking Water
P.O. Box 8467
Harrisburg, PA 17105-8467
717-787-9633**

To determine the contact information for your local DEP office, follow this link:

<http://www.depgreenport.state.pa.us/elibrary/GetDocument?docId=8435&DocName=DEP%20OFFICE%20AND%20COUNTY%20HEALTH%20DEPARTMENT%20CONTACT%20INFORMATION%20BY%20COUNTY.PDF%20www.elibrary.dep.state.pa.us/dsweb/Get/Document-117310/3930-FM-BSDW0560.pdf>