Ontario's Watermain Disinfection Procedure

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PART I

BACKGROUND

Concerns of Regulated Community Regarding AWWA C651

- Difficulties in taking bacteriological samples during emergency repairs
- Final water quality test vs. sanitary handling of materials and construction practices for certifying the sanitary condition of the watermain
- Possible delays in returning repaired watermains back to service
- Possible health risks associated with trench treatment by chlorination
- Uncertainty regarding interpretation of which watermain repairs may pose risk of contamination, therefore require disinfection
- Province wide variation in disinfection practices and confirmation requirements

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Water Research Foundation, Project 4307 Main Break Classification By Risk Factors

Type I Break	Type II Break	Type III Break	Type IV Break
Positive pressure maintained during break	Positive pressure maintained during break	Loss of pressure at break site/ depressurization elsewhere in system	Loss of pressure at break site/ depressurization elsewhere in system
Pressure maintained during repair	Pressure maintained until break exposed	Partially or un-controlled shutdown	Widespread depressurization
No signs of contamination intrusion	No signs of contamination intrusion	Possible contamination intrusion	Possible/ actual contamination intrusion
Based on risk factors identified as part of the workshop held during Project 4307, used as the basis for determining appropriate response measures to control public health risk			

New DWWP Condition 2.3.2

All parts of the drinking water system in contact with drinking water which are:

- Added, modified, replaced, extended; or
- Taken out of service for inspection, repair or other activities that may lead to contamination,

shall be disinfected before being put into service in accordance with a procedure approved by the Director or in accordance with the applicable provisions of the following documents:

- The ministry's Watermain Disinfection Procedure, effective May 1, 2016;
- AWWA C652 – Standard for Disinfection of Water-Storage Facilities;
- AWWA C653 – Standard for Disinfection of Water Treatment Plants; and
- AWWA C654 – Standard for Disinfection of Wells.

Implementation date is DWWP specific, continue current practices respecting main breaks or implement the requirements of the new procedures.

PART II – Section 1

ADDITION, MODIFICATION, REPLACEMENT, EXTENSION AND PLANNED EXTENSION

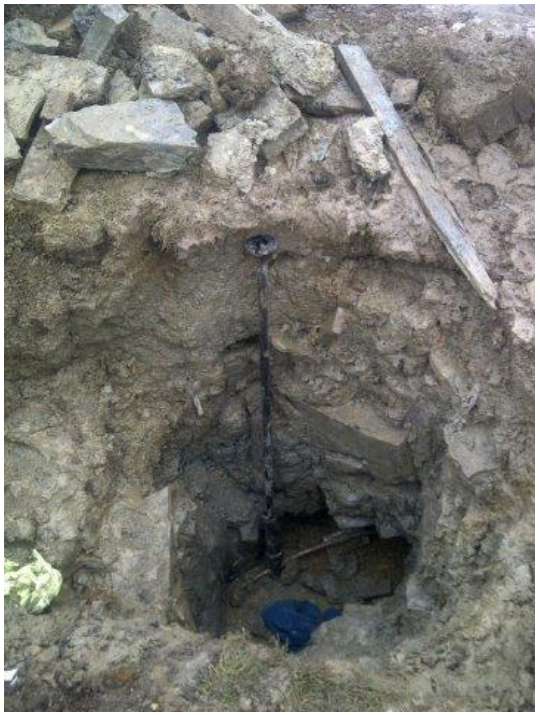
DEFINITIONS - Examples

"**Backflow prevention**" means the prevention of a reversal of normal flow that could introduce Contamination to the potable water supply; accomplished by an Air gap or a CSA approved backflow preventer selected, installed and tested in accordance with CSA Standard B64.10: "Selection and Installation of Backflow Preventers".

"**Flushing"** means post repair valve operation to restore secondary disinfection and discharge suspended materials by flowing water through the repaired section of watermain and out of the system. This definition does not include recharging the watermain or a requirement to achieve scouring velocity within the watermain.

"**Isolate**" means operate valves to ensure that there is no flow of water to the location of the maintenance/repair.

"Service pipe" means a service pipe within the meaning of O. Reg. 170/03.



1. Addition, Modification, Replacement, Extension and Planned Maintenance

AWWA Standard C651-05, as amended, will apply to:

- addition, modification, replacement, extension of watermains, including installation of **temporary watermains**, and **service pipes of ≥ 100 mm ϕ**
- relining of watermains

Requirement for backflow prevention devices under s4.3.9 of C651 standard will become mandatory

Sampling for EC/TC required as per standard, staged sampling procedure defined for longer sections of watermain with limited sampling points

Disinfection procedures for planned watermain cleaning, tapping, and maintenance of appurtenances outlined

1.1 Allowable Decreases in Initial Residual Concentrations for Disinfection of New Watermains and Planned Rehabilitation

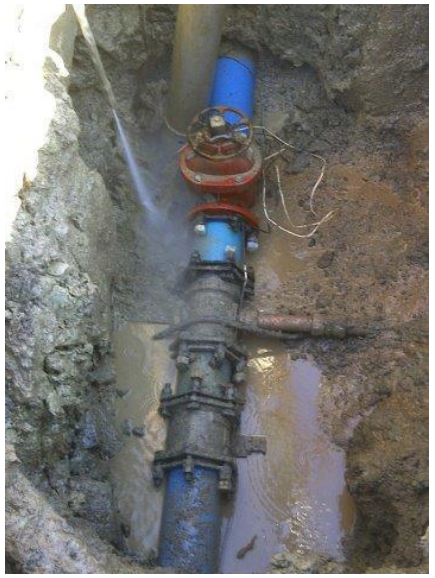
Table 1: Chlorine Concentrations and Contact Times for New Watermains			
Disinfection Method	Minimum Contact Time	Initial Chlorine Concentration	Maximum Allowable Decrease in Chlorine Concentration
Tablet or Continuous Feed	24 hours	≥ 25 mg/L	40% of the Initial Chlorine Concentration to a Maximum of 50 mg/L
Slug	3 hours	≥ 100 mg/L	25 mg/L
Spray	30 minutes	≥ 200 mg/L	Measurement Not Required

Example 1: When using the continuous feed method of chlorination with an initial chlorine concentration of 50 mg/L, the maximum allowable decrease in chlorine concentration is 40% of 50 mg/L, or 20 mg/L. Therefore, at least 30 mg/L of chlorine must be present after 24 hours.

Example 2:When using slug method of chlorination, initial concentration of 150 mg/L, allowable chlorine concentration decrease is 25 mg/L, so if concentration goes below 125 mg/L, flow is stopped and chlorine added to restore the slug to 150 mg/L.

1.2-1.5 Relining of Watermains, Planned Watermain Cleaning and Maintenance of Appurtenances, Tapping

- Procedures for disinfecting, backflow prevention and sampling new watermains will apply to relining of watermains
- Return to service allowed prior to receiving microbiological test results if Medical Officer of Health consulted, and watermain is isolated from system
- Swabbing and hydraulic flushing, restoration of secondary disinfection procedures in s3.2.6 followed
- Air scouring, ice pigging, site specific procedures required
- Planned maintenance of appurtenances and fittings, follow Section 3 for Category 1 watermain break procedures
- Tapping of Watermains, disinfect pipe surfaces and parts used for tapping including drill bits, mainstops etc. as per s1.5, using 1% sodium hypochlorite solution



1.6 Service Pipes

AWWA Standard C651-05, as amended, will apply to:

- Addition, modification, replacement, extensions of watermains, including installation **service pipes of ≥ 100 mm ϕ**
- **Service pipes of** < **100 mm ϕ**, requirement to maintain sanitary condition, clean and flush prior to placing in service
- Disinfection procedures for copper pipe in 1.1.1, continuous feed, initial 50 mg/L concentration, no minimum after 24 hours
- Microbiological sampling required as per 1.1.2

PART III – Sections 2 and 3

EMERGENCY/UNPLANNED REPAIRS, WATERMAIN DISINFECTION PROCEDURES

2. Emergency/Unplanned Repairs

- Must be undertaken by a person authorized to perform the repairs
- Operating Authorities must develop and document operating procedures within their system
- May use best management practices that go beyond minimum requirements

3. Watermain Disinfection Procedures for Emergency Repairs

- Categorization of watermain breaks based on risk of contamination
- Requirement for OIC to determine category and document
- Agency Notification and reporting of observation of improper disinfection, Sch. 16-4
- Watermain Break Common Disinfection Procedures

Note: Where watermain remained pressurized prior to excavation, unlikely potentially contaminated water was delivered to users before or after flow reduction following break

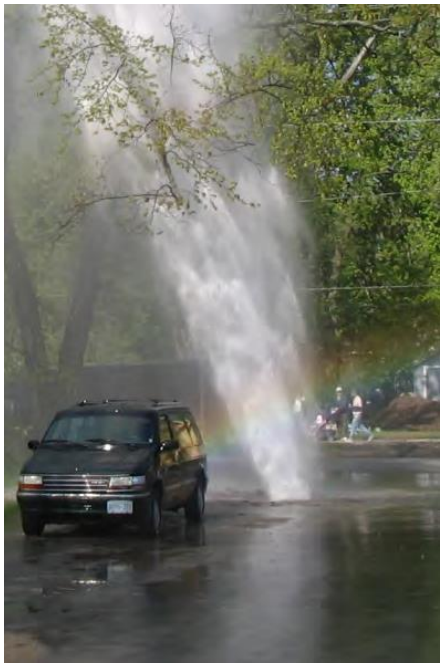
3.1 Categorization Watermain Disinfection Procedures for Emergency Repairs

Categorization of watermain breaks based on risk of contamination, by OIC before or after flow reduction following break:

- Category 1, no “evident of suspected contamination intrusion”
- Category 2, there is “evident or suspected contamination intrusion”
    - Repairs of more than 6 meters of replaced pipe classified as Category 2

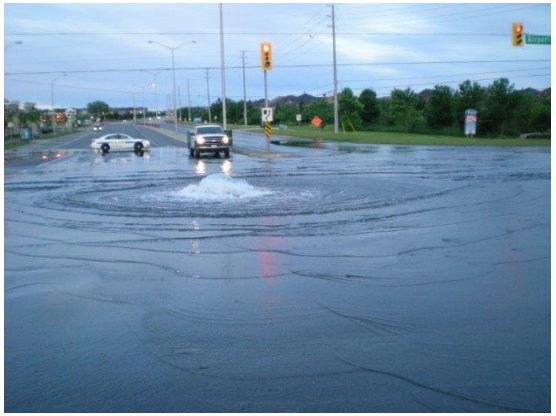
3.1.1 Category 1

- No evident or suspected contamination, follow s3.2 and 3.3
- Circumferential breaks or small leaks
- Flow maintained till air gap created and maintained
- If air gap not maintained, or contamination evident or suspected, reclassify to Category 2
- Not an observation of improper disinfection per Sch. 16-4, report to SAC not required
- Notification to MOH not required, unless they have requested
- May notify or seek advice from MOH at any time



3.1.2 Category 2

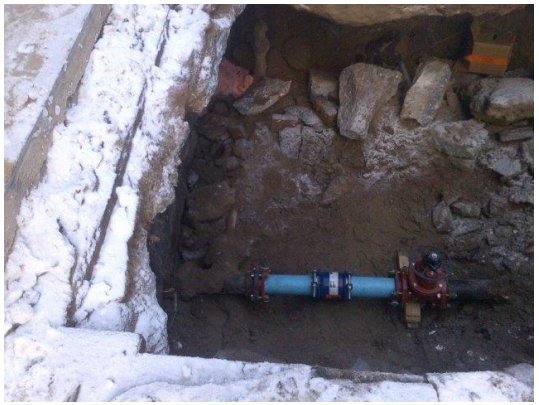
- Evident or suspected contamination, follow 3.2 and 3.4
- Spiral or longitudinal water break
- Air gap not maintained
- Not an observation of improper disinfection unless contaminated water was directed to users, in which case Reg. 170 followed
- Notification of MOECC not required unless water advisory declared, or is a special case in 3.4.4 or 3.4.5
- Notification to MOH not required, unless they have requested
- May notify or seek advice from MOH at any time



3.2 Watermain Break Common Responses

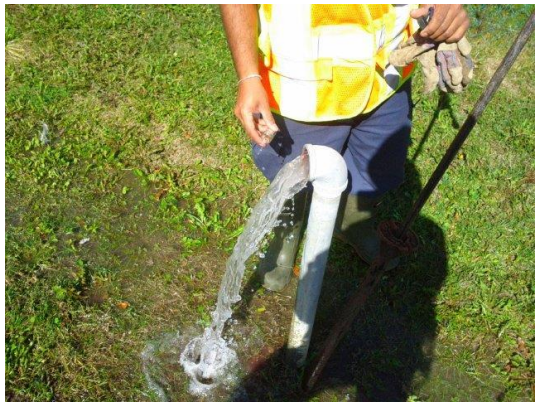
Basic disinfection procedures, regardless of category to ensure sanitary conditions

- Maintenance of flow prior to watermain excavation;
  - Risk to safety, property, environment
- Reduction of flow by throttling valves
- Switching flow to uni-directional mode
- Maintain positive flow until excavation completed and break exposed
- Discontinue flow after air gap created, maintain gap by dewatering for duration of repair
- Examination for evidence of contamination
  - OIC



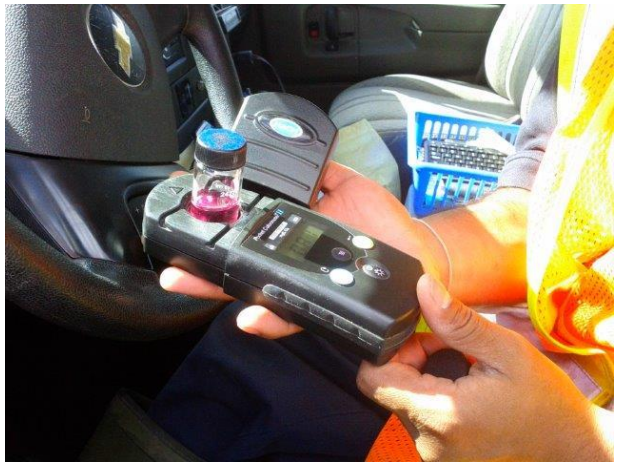
3.2 Watermain Break Common Responses (Continued)

- Disinfection of surface of pipe and repair parts
  - Clean all surfaces, 1% sodium hypochlorite, repeat as needed
- Installation of repair part, prevent contamination
- Uni-directional flushing by creating temporary dead end
  - Flush through repair, to hydrant, plumbing or appurtenance, or tap downstream
  - Free of discoloration, secondary disinfection restored, discharged water is dechlorinated



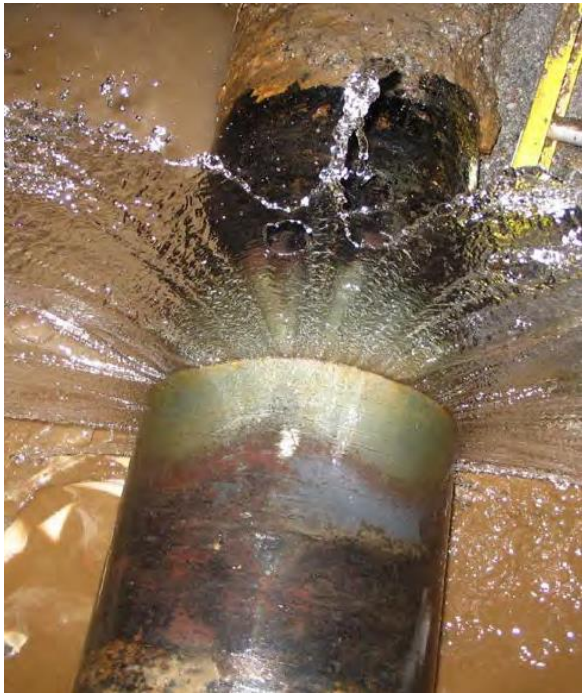
3.2 Watermain Break Common Responses (Continued)

- Restoration of secondary disinfectant prior to return to normal service
  - Continue flushing until at least 0.2 mg/L free chlorine at discharge point
  - Disinfectant residual should be representative of that in the break area, upstream/downstream sampling
  - Can also use documented benchmarks for residuals in area
  - Minimum residual of 0.05 mg/L as per Sch. 16-3
- Return system to normal service



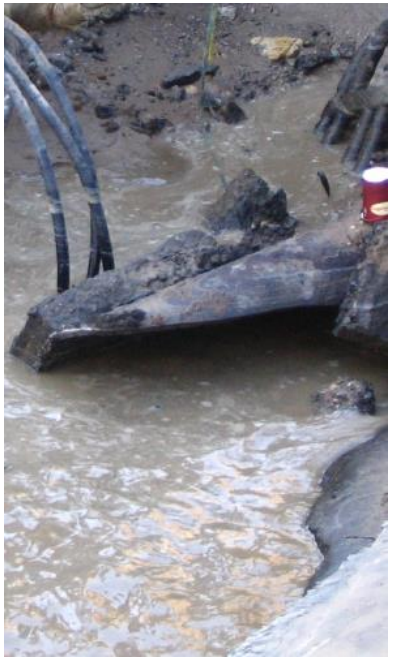
3.3 Additional Steps for Category 1 Watermain Break Repair Procedure

- No mandatory requirement for bacteriological sampling
- Where bacteriological samples collected, considered distribution samples as per Reg. 170/03, reporting/corrective actions in Sch. 16, 17 and 18 apply



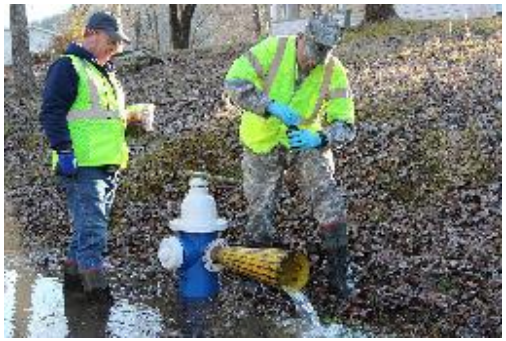
3.4 Additional Steps for Category 2 Watermain Break Repair Procedure

- Additional steps for removal of contaminants from watermain
  - Mechanical
  - Flushing into excavation
  - Higher velocity flushing
- Site specific disinfection procedures, including disinfecting as per new watermains in 1.0
- Microbiological sampling mandatory
  - Representative of water passing through repair site, point of flushing
  - Considered distribution samples as per Reg. 170/03, reporting/corrective actions in Sch. 16, 17 and 18 apply
  - Watermain can be returned to service prior to receipt of results



3.4 Special Cases - Sewage Contamination, Chemical Contamination

- Site specific procedures for disinfection/ decontamination and sampling
- Sewage contamination, disinfect and sample as per MOECC and MOH direction
  - Minimum two samples, 24 hours apart, no return to service until results received, or BWA
- May disinfect using new watermain procedures in 1.1.1
- Site specific disinfection procedures, including disinfecting as per new watermains
- Chemical contamination, decontaminate and sample as per MOECC and MOH direction
  - Complete sampling, no return to service until results received, or Water Advisory declared

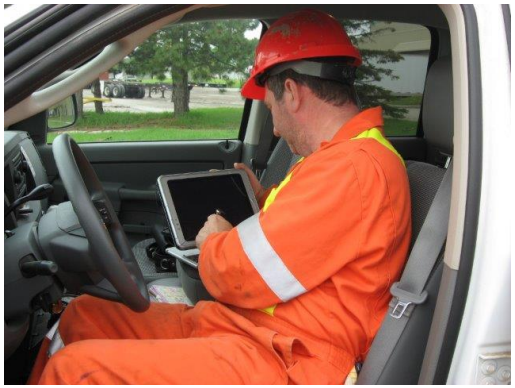


PART IV – Section 4

DOCUMENTATION

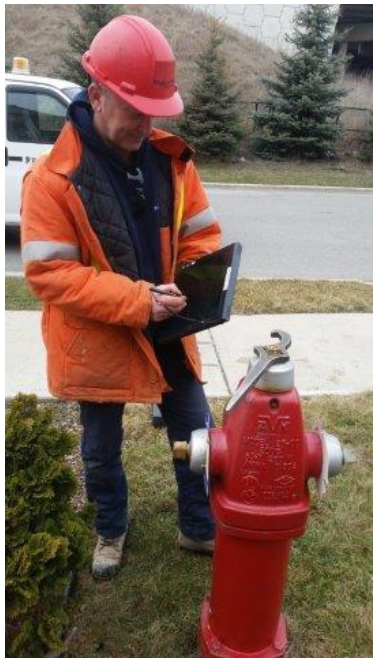
4. Documentation

- Applies to maintenance and repair activities, 1.4 and 3
- Record keeping requirements of Reg. 128/03, and Condition 13, Sch. B of MDWL
  - Not all information has to be on single form
- Documentation overview:
  - Responses can be yes/no/not applicable
  - Date, location of break
  - Watermain size and material
  - Flow maintained until air gap created, air gap maintained throughout repair
  - Evident or suspected contamination
    - Name of OIC who classified break
  - Type of break (spiral, longitudinal, leak appurtenance)
  - If planned maintenance, type (valve, hydrant)



4. Documentation (Continued)

- Type of repair (clamp, cut out)
- Pipe and repair parts disinfected
- Post repair flushing
- Category 2, additional steps under 3.4.1, 3.4.2
- Category 2, Special Cases, site specific plans
- Disinfectant residual after post repair flushing, if less than 0.2 mg/L free chlorine, upstream residual or documented benchmarks
- Microbiological samples taken, chain of custody
- Date and time of return to normal service
- Water Advisory Declared
- Public agency notification
  - Local ministry office
  - SAC
  - Local MOH



Note: These are minimum requirements, no specified format

PART IV – Section 4

APPENDICES

Appendices

- Appendix A – Tools to Help Determine the Category of Watermain Break – Flowchart
- Appendix B - Tools to Help Determine the Category of Watermain Break – Pictures, Category 1&2
- Appendix C – Category 1 Flowchart
- Appendix D – Category 2 Flowchart
- Appendix E – Special Case (Sewage/Chemical Contamination) Flowchart

Next Steps

- Have developed “Made in Ontario” implementation of AWWA C651-05 based on stakeholder input organized by OWWA/OWMA, including opportunity for comment on draft
- All comments were discussed with the working group prior to finalization of document in November 2015
- Procedure is consistent with new AWWA C651-14
- Implementation planned through license renewal, by updating DWWPs February-September 2016, with lead times for Operating Authorities to develop local SOPs, incorporate into Operational Plans in accordance with DWQMS if applicable
- Licenses renewed prior to document finalization will be reviewed to amend DWWP
- Ministry will continue to provide interpretation and advice on implementation

Questions

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