



WATER MAIN DISINFECTION AND TESTING PROCEDURES

This package includes:

Definitions

Disinfection and Testing Process Descriptions

Testing and Tie-In Process

FORMS:

Flushing & Leakage / Pressure Testing Results Form

Disinfection & Bacteriological Testing Results Form

Request for Watermain Tie-In Form

For more information, contact:

City of West Kelowna

Utilities Department

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City of West Kelowna

WATER MAIN DISINFECTION AND TESTING PROCEDURE

Based on AWWA C651-14

DEFINITIONS

Approved analyzer – Digital analyzer confirmed to be accurate by comparison with CWK handheld analyzers.

Approved sampling method – A method of collecting samples described in the Water Main Disinfection and Testing Plan that is approved by the CWK to incorporate best lab practices.

Approved sample sites – Sample sites described in the Water Main Disinfection and Testing Plan, able to be disinfected, unlikely to contribute to bacteriologically contaminated samples (e.g. no dry barrel hydrants, etc...), and approved by CWK as being representative of water quality throughout the main.

Approved de-chlorination method – If the discharge water is to be released into a watercourse, storm drain or body of water, then it shall be treated to reduce the concentration of Total Residual Chlorine (TRC) below the levels established by the Government of British Columbia Ambient Water Quality Criteria for Chlorine. At no time shall water from the CWK water system be released into the environment with a TRC concentration greater than 0.1 mg/L.

Approved temporary water supply – Potable water confirmed to meet field WQO and approved by CWK in Water Main Disinfection and Testing Plan submitted by the contractor.

- CWK approved supplies may require Hydrant or Temporary Use Permit or use of the Bulk Water Filling Station in the Powers Creek Water Service Area (PCWSA) at Asquith & Shannon Lake Rd

CWK Water Quality Objectives (WQO):

- Field WQO: FCR = ≥ 0.2 mg/L & Turbidity = ≤ 1.0 NTU
- Bacteriological WQO: <1 Total Coliform / 100ml <1 *E.coli* / 100ml <200 Background Colonies

Hydrant or Temporary Use Permit required – A contractor, developer, or other group or corporation (collectively the “Applicant”), who requires temporary water service for the purposes of construction or expansion of a development, or for another reason approved by the City may acquire water from a standpipe or hydrant must first apply for a Hydrant or Temporary Use Permit, pursuant to all conditions in the CWK Water Regulation Bylaw.

- *In order to lessen the possibility of unnecessary water quality disturbances, contact City of West Kelowna Utilities Department (CWKUD) prior to operating any hydrants, blow-offs, and/or valves connected to CWK water system.*



City of West Kelowna

WATER MAIN DISINFECTION AND TESTING PROCEDURE

Based on AWWA C651-14

DISINFECTION AND TESTING PROCESS DESCRIPTIONS

1. **“Removing, by flushing or other means, those materials that may have entered the water main or appurtenances.”** (AWWA C651-14, p.11, Sec. 4.7)
 - Flush water main, ensuring the “flushing velocity in the main shall not be less than 3.0ft/sec (0.91 m/sec) [and] where such flow rates are not possible, flushing at the maximum expected flow rate for the line for 2–3 volumes may be acceptable.” (C651-14, p.6-8, Sec 4.4.2)
 - Ensure all hydrants and services are flushed during process

2. **“Pressure testing the water main to ensure the main meets the [MMCD 33 11 01 8.3.19.2] allowable leakage rate. Hydrostatic pressure tests [are to] be conducted with potable water.”** (C651-14, p.11, Sec. 4.7)
 - “The main should undergo hydrostatic testing *prior* to disinfection. ”(C651-14, p.8, Sec 4.4.3)
 - *Upon successful completion of Water Main Pressure Testing, proceed with Water Main Disinfection Continuous Feed Method or by using pre-filled potable water tanker in cases where flow-paced chemical feed pump dosing is not feasible.*

3. **“Chlorinating and adequately documenting the process used for disinfection.”** (C651-14, p.11, Sec. 4.7)
 - CWK preferred method of disinfection – **Continuous-Feed Method of Chlorination** (C651-14, p.6, Sec. 4.4)
 - Test carrier water quality (hydrant use permit required if CWK system water used) to ensure field WQO are met prior to dosing.
 - Using chemical dosing system, inject calculated dose of Sodium Hypochlorite into metered flow of potable water to achieve a consistent **Free Chlorine Residual (FCR) concentration in the pipe between 25 & 35 mg/L**
 - Note:**
 - Pre-mixed water truck or temporary tank use may be acceptable upon approval.
 - Ensure water tank and hoses are for potable use only, and have been flushed and pre-disinfected. Note: Bacteriological testing of tank in advance recommended.
 - Prior to, during, and after filling tank with potable water, test to ensure CWK WQO are met.
 - Slug-Method (as per C651-14, p.10, Sec. 4.5.1) may be acceptable in some applications upon approval.
 - Fill water main with solution from lowest point and continue until water main full, purging air from watermain and ensuring all services and hydrants are charged with disinfection solution.
 - Confirm Disinfection FCR concentration at approved sample sites.
 - Record date/time, location name and results as the **“zero-hour disinfection”**.
 - **Zero-hour concentration must be no less than 25mg/L FCR at any sample site.**
 - **CWK allows a MAXIMUM of 35mg/L with a MINIMUM of 40% of initial recorded FCR remaining required to PASS after 24 hours.**
 - After a minimum of 24 hours, sample and measure FCR concentration using approved analyzers and methods at the approved locations noted above.
 - **Record date/time, location name and results as the “24-hour disinfection.”**
 - Chlorine solution must be flushed within 48 hours of zero-hour disinfection.



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WATER MAIN DISINFECTION AND TESTING PROCEDURE

Based on AWWA C651-14

DISINFECTION AND TESTING PROCESS DESCRIPTIONS cont.

4. **“Flushing the chlorinated water from the main.”** (C651-14, p.11, Sec. 4.7)
 - **Flush main**, as per Step 1, **using CWKUD approved temporary water supply, de-chlorination method & disposal location** until CWK WQO met.
 - “Water released into the environment shall meet the applicable provincial, or local regulatory agency’s residual chlorine limit before the point at which the supplier loses control of the water.” (AWWA C655-18, p.11, Sec. 5.1)
 - Must meet regulatory disposal guidelines of less than or equal to 0.1 Total Residual Chlorine (TCR) as per Government of BC Ambient Water Quality for Chlorine
 - **“Refer to ANSI/AWWA C655-18 Field De-chlorination for de-chlorination procedures”.** (C651-14, p.11, Sec. 4.7.7)

5. **“Determining the bacteriological quality of water samples collected from the pipe by laboratory test after disinfection.”** (C651-14, p.12, Sec. 4.7)
 - Once CWK WQO in the new water main have been confirmed to have been met, project engineer to perform or oversee the collection of bacteriological water samples, using best lab practices, from the CWK approved locations. **Record date/time, location name and label as “zero-hour bacteriological”**, and deliver to third-party accredited lab for analysis.
 - Collection of bacteriological water samples, using best lab practices, from the same approved sample locations noted above, a minimum of 16 hours after the zero-hour bacteriological sampling. **Record date/time, location name and label as “Minimum 16-hour bacteriological”**, and deliver to CWKUD approved lab for analysis.
 - **2 consecutive sample must meet CWK bacteriological WQO**
 - If the initial disinfection fails to produce satisfactory bacteriological results, or if other results indicate unacceptable water quality, the main may be re-flushed and shall be resampled. (C651-14, p.21, Sec 5.1.6)
 - Consecutive failed samples may require repeat disinfection with plan as per Part A with CWK approval.

6. Upon approval of **Request for Tie-in Application**, and under the supervision of CWK staff, **“connecting the newly disinfected water main to the active distribution system without sacrificing sanitary practices and conditions.”** (C651-14, p.12, Sec. 4.7)
 - The new main shall be put into service within 7 calendar days of successful 16-hour bacteriological results. If the main is not in service within seven calendar days, it must be flushed to maintain adequate water quality.
 - If tie-in is not completed and the main is not flushed within 7 days, flushing and bacteriological testing may be required.
 - All costs associated with re-testing are the responsibility of the developer/contractor.
 - CWK requires minimum 2 business day notice of tie-in, and all affected customers must receive minimum 48-hour notice of any service interruption.



City of West Kelowna

WATER MAIN DISINFECTION AND TESTING PROCEDURE

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TESTING and TIE-IN PROCESS

STEP A:

Submit a detailed ***Water Main Disinfection and Testing Plan*** and separate ***Water Main Tie-In Plan*** to the CWK for approval, **allowing 5 business days for review.**

Water Main Disinfection and Testing Plan to include:

a) Sketch of Water Main

- Clearly identify limits of water main under testing, all hydrants and services.
- Indicate test/sample points. (Recommend labeling points for use on *Disinfection & Bacteriological Testing Results* form.)

b) Flushing plan

- Indicate (approved) flushing water source. (**Hydrant or Temporary Use Permit may be required**)
- Identify disposal method.

c) Leakage and Pressure Testing plan

- Indicate test pressure.

d) Disinfection and Testing plan

- Specify the AWWA method of chlorination that will be used.
- Provide site specific methodology, referencing the proposed representative sample sites.
- Provide description of residual confirmation sampling method.
- Indicate the type of analyzer equipment to be used.

e) De-chlorination, Flushing of Disinfection Solution and Disposal plan

- Indicate method for de-chlorination (Must meet regulatory disposal guidelines of less than or equal to 0.1 Total Residual Chlorine (TCR) as per Government of BC Ambient Water Quality for Chlorine).
- Include description of proposed disposal site.
- Include method for confirming normal system water quality (CWK WQO).

f) Zero and 16-Hour Bacteriological Testing plan

- Describe method of testing, using best lab practices.
- Water to be tested at zero-hour must be confirmed to meet CWK WQO at time of testing.



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WATER MAIN DISINFECTION AND TESTING PROCEDURE

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TESTING and TIE-IN PROCESS cont.

Water Main Tie-In Plan to include:

- a) **Sketch showing tie-in locations.**
 - All tie-ins must be <6m or disinfection and pressure testing required.

- b) **Indicate tie-in method (Hot Tap or Shut-Down).**
 - If shut-down required;
 - i. Provide sketch indicating the City valves that will require shut-off (CWK staff only to operate City valves).
 - ii. Developer responsible for minimum 48-hour notification of all customers affected. *Provide CWK with draft of letter to affected customers for approval/editing prior to notification.*
 - iii. CWK will assist with identifying servicing area affected by shut-down.

- c) **Schedule (advisory).**
 - Scheduling to consider CWK normal operational hours.

- d) **Provide detailed Tie-In plan including:**
 - Proposed Date & Time.
 - Indicate all tie-in connections are <6m.
 - Describe disinfection of parts to be installed & sanitary construction processes
 - Hot-tap service provider (if applicable)
 - Engineer of Record or alternate to witness tie-in
 - After-hours Standby CWK phone number 250-862-7577 (if required)

STEP B:

Request for Water Main Tie-In submittal to include:

1. Completed *Flushing & Leakage / Pressure Testing Results* form
2. Completed *Disinfection & Bacteriological Testing Results* form
3. Laboratory bacteriological analyses reports
4. Completed *Request for Water Main Tie-In* form
5. Detailed Tie-In Plan

Forms attached at end



City of West Kelowna

WATER MAIN DISINFECTION AND TESTING PROCEDURE

Based on AWWA C651-14

FLUSHING & LEAKAGE / PRESSURE TESTING RESULTS

Date: _____ City File#: _____

Engineer or Representative : _____

Contractor : _____

Location : _____

FLUSHING

Pipe Length:	m	Pipe Size:	mm
Flow Rate:	L/sec	Velocity:	m/sec
Duration:	mins	Volume:	m ³

**If minimum flushing velocities not achievable (3.0ft/sec [0.91 m/sec]), flushing at the maximum flow rate for 2–3 volumes may be acceptable, pending prior CWK approval on Water Main Disinfection and Testing Plan*

ALL TESTING MUST BE IN ACCORDANCE WITH MMCD, AWWA & CWK REQUIREMENTS

LEAKAGE & PRESSURE TESTING

Pipe Length:	m	Pipe Size:	mm
Pressure:	kPa/PSI	Duration:	Hours
Allowable Leakage:	Litres	Measured Leakage:	Litres
PASS		FAIL	

ALL TESTING MUST BE IN ACCORDANCE WITH MMCD, AWWA & CWK REQUIREMENTS

I hereby certify that this test has been performed in accordance with the approved design, AWWA, MMCD & CWK standards, including all associated tests and procedures, and satisfactory results were obtained.

Passed

Failed

Engineer or Representative

Date



City of West Kelowna

WATER MAIN DISINFECTION AND TESTING PROCEDURE

Based on AWWA C651-14

DISINFECTION & BACTERIOLOGICAL TESTING RESULTS

Date: _____ City File# _____

Engineer or Representative : _____

Contractor : _____

Location : _____

DISINFECTION RESULTS

Zero-Hour Test: Date: _____ Time: _____ Sampler: _____

Sample Site:	FCR:
Sample Site:	FCR:
Sample Site:	FCR:
Sample Site:	FCR:

24-Hour Test: Date: _____ Time: _____ Sampler: _____

Sample Site:	FCR:
Sample Site:	FCR:
Sample Site:	FCR:
Sample Site:	FCR:

	PASS	FAIL
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BACTERIOLOGICAL RESULTS

Zero-Hour Test: Date: _____ Time: _____ Sampler: _____

Sample Site:	FCR:
Sample Site:	FCR:
Sample Site:	FCR:
Sample Site:	FCR:

16-Hour Test: Date: _____ Time: _____ Sampler: _____

Sample Site:	FCR:
Sample Site:	FCR:
Sample Site:	FCR:
Sample Site:	FCR:

	PASS	FAIL
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I hereby certify that this test has been performed in accordance with the approved design, AWWA, MMCD & CWK standards, including all associated tests and procedures, and satisfactory results were obtained.

Passed Failed

Engineer or Representative Date



City of West Kelowna

WATER MAIN DISINFECTION AND TESTING PROCEDURE

Based on AWWA C651-14

REQUEST FOR WATER MAIN TIE-IN

Date: _____ City File#: _____

Engineer or Representative : _____

Contractor : _____

Contact / Number : _____

DONE	ACTION
	Completed <i>Flushing & Leakage/Pressure Testing Results</i> Form attached
	Completed <i>Disinfection & Bacteriological Testing Results</i> Form attached
	De-chlorination; flushing of disinfection solution and disposal completed as approved by CWK in <i>Water Main Disinfection and Testing Plan</i>
	Bacteriological Testing Zero and 24-Hour lab results attached

By signing, the Engineer of Record acknowledges that all water main construction has been completed in accordance with the approved design, AWWA, MMCD & City standards, including all associated tests and procedures, and satisfactory results were obtained. The new water main may now be connected to the City Water System.

Engineering Firm	Engineer of Record	Signature
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For City Use Only

Authorized by City representative for contractor to proceed with Tie-in:

Name (Printed): _____ Position: _____

Signature: _____ Date: _____

Proposed Tie-In Date: _____

Special Notes and Conditions

1. Tie-In to system must be completed within 7 days of Bacteriological testing, otherwise further flushing and testing may be required by CWK.
2. Once City staff has received ALL required information, test results and applicable forms, a minimum of 48 hours is required for review. Incomplete packages will be rejected and the Engineer of Record will be required to resubmit a complete package.
3. After test results have been reviewed by City Staff and are acceptable, a minimum of 48 hours is required for City Crews to schedule any tie-in(s) that are associated with this request.

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