

Technical Memorandum



EPCOR Water Services and the Town of Chestermere

Flushing, Testing and Disinfection Manual for New Water and Sanitary Sewer Mains

March 2008

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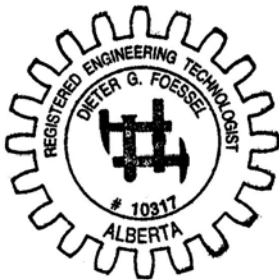
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Certification Page

**EPCOR Water Services
and the
Town of Chestermere**

Flushing, Testing and Disinfection Manual for New Water and Sanitary Sewer Mains



<p>PERMIT TO PRACTICE ASSOCIATED ENGINEERING ALBERTA LTD. Signature _____ Date _____ PERMIT NUMBER: P 3979 The Association of Professional Engineers, Geologists and Geophysicists of Alberta</p>

Prepared by: Associated Engineering Alberta Ltd.

TECHNICAL MEMORANDUM

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1 General

1.1 GENERAL

All Developers, Consultant(s) and Contractor(s) shall comply with the following procedures and methodologies for the flushing, testing and disinfection of any potable water distribution systems and sanitary sewers, or portions thereof, installed within the municipal boundaries of the Town of Chestermere. EPCOR Water Services shall be the Town's approving authority responsible for monitoring the Developers' work for compliance with the requirements outlined in this manual.

1.2 DEFINITIONS, ROLES AND RESPONSIBILITIES

"Town" means the Town of Chestermere who is the OWNER of the sanitary and water systems and the final authority as to the acceptability of the work performed, and product delivered by, EPCOR.

"EPCOR" means EPCOR Water Services and their designated consultants. EPCOR is the authority responsible for the delivery of sanitary and water system services and product to the Town in compliance with the terms and conditions of the Service Agreement between EPCOR and the Town. EPCOR is the final authority as to the acceptability of the services and products delivered by the "Developer" for all matters pertaining to the sanitary sewer and water systems in the Town of Chestermere; and the final interpreter of the intent of the flushing, testing and disinfecting requirements contained in this manual.

"Developer" means the firm/company/corporation signatory to the Development Agreement between the Town and the Developer. The Developer is the party in the first instance responsible for the execution, product delivery and compliance with the flushing, testing and disinfecting requirements contained in this manual.

"Consultant" means the Developer's engineering/design consultant and his representative(s). It is the responsibility of the Consultant to monitor, inspect, document and report the Contractor's compliance with the flushing, testing and disinfecting requirements contained in this manual.

"Contractor" means the construction firm engaged by the Developer to construct the sanitary and water system. It is the responsibility of the Contractor to comply with the flushing, testing and disinfecting requirements contained in this manual, and to ensure the acceptability of the infrastructure delivered to the Developer and EPCOR.

"Potable Water" means water meeting the quality standards outlined in the latest edition of the "Guidelines for Canadian Drinking Water Quality" published by the federal health ministry.

1.3 MINIMUM REQUIREMENTS FOR FLUSHING, TESTING AND DISINFECTION

1.3.1 Minimum Requirements for Flushing, Testing and Disinfection of New Water Mains and Forcemains and New Sewer Mains

Figure 1-1 summarizes the minimum requirements for the flushing, testing and disinfecting of new water mains and forcemains, and presents the chronological sequence in which the requirements must be executed.

**Figure 1-1
EPCOR/TOWN OF CHESTERMERE
MINIMUM REQUIREMENTS
FOR NEW WATER DISTRIBUTION MAINS AND SUPPLY MAINS**

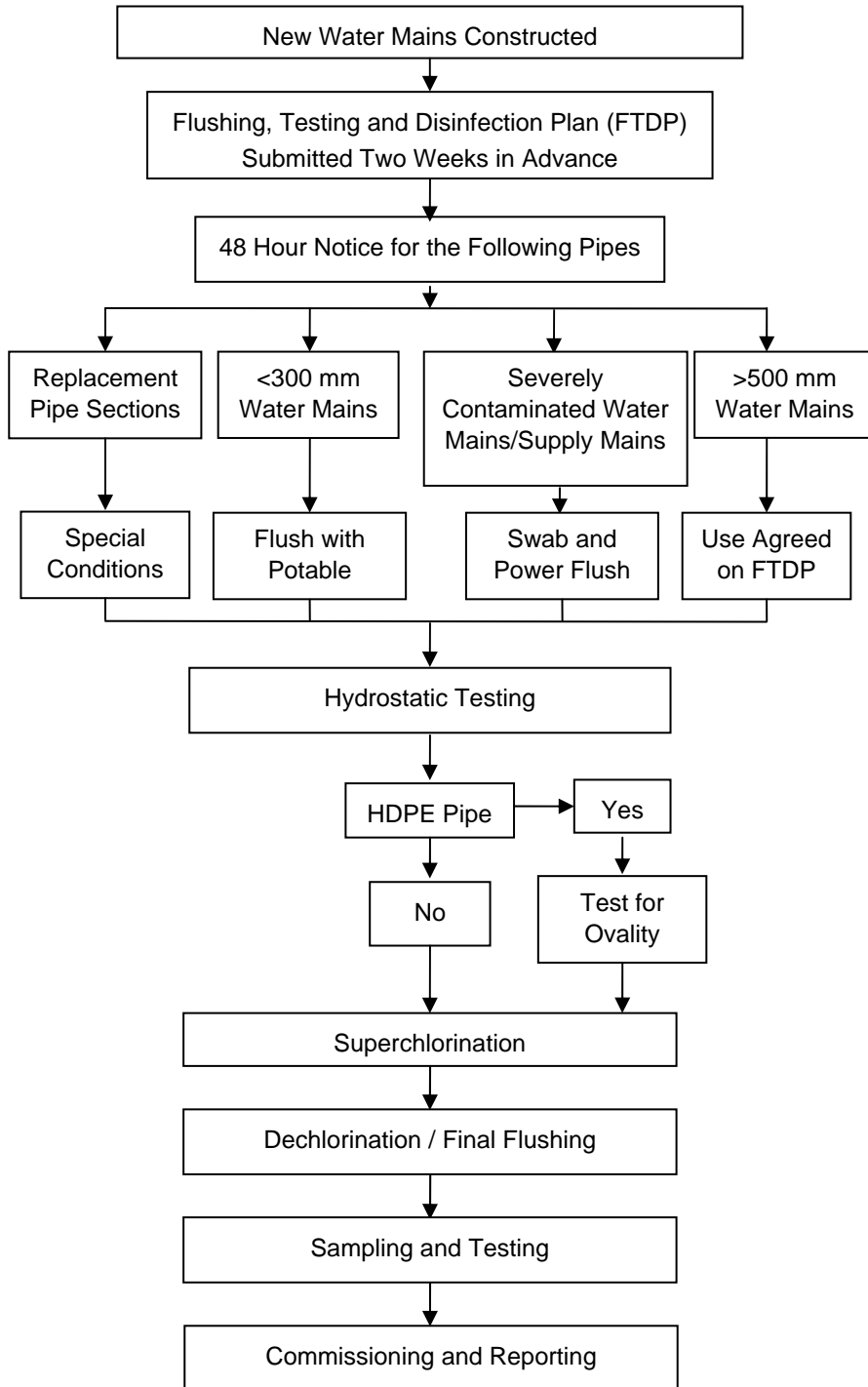
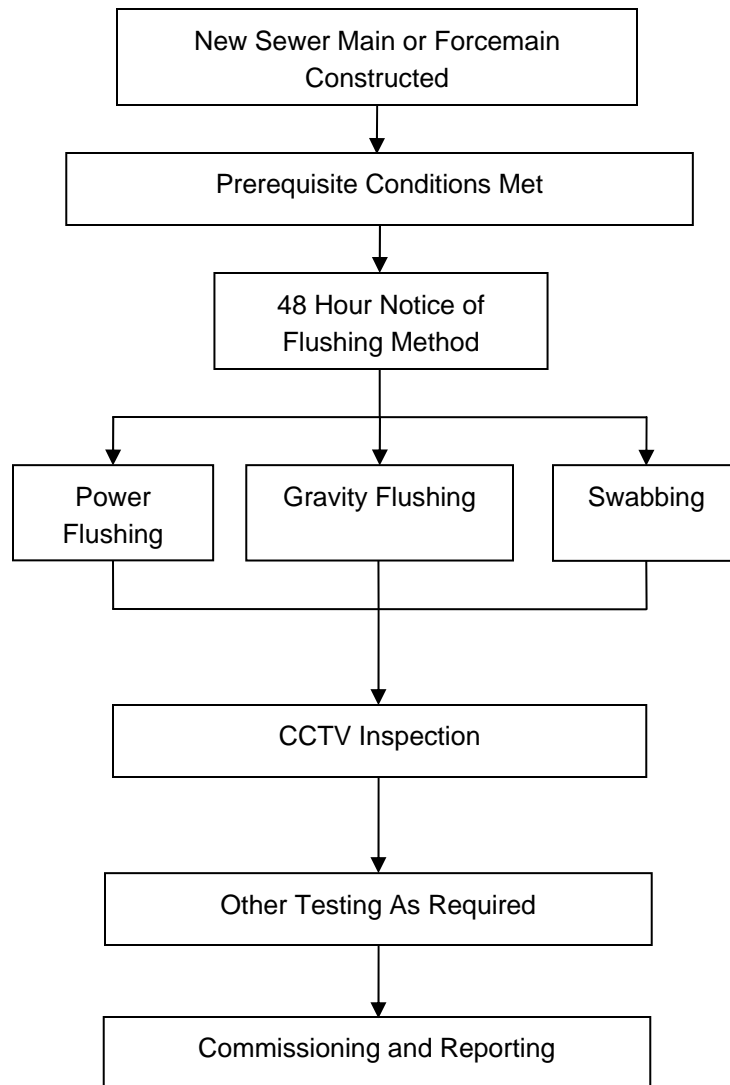


Figure 1-2 summarizes the minimum requirements for the flushing, testing and disinfecting of new sewer mains and forcemains, and presents the chronological sequence in which the requirements must be executed.

Figure 1-2
EPCOR/TOWN OF CHESTERMERE
MINIMUM REQUIREMENTS
FOR NEW SEWER MAINS AND SEWER FORCEMAINS



1.4 PREREQUISITE REQUIREMENTS

- .1 Prior to proceeding with the tapping of the sewer and water services, the Consultant shall review the Contractor's proposed tapping procedures with the Contractor's site superintendent/foreman to ensure compliance with the City of Calgary and the pipe manufacturer's tapping procedures.
- .2 The Consultant shall confirm and document that the methodology and equipment to be deployed by the Contractor complies with City of Calgary, AWWA and industry accepted standards and guidelines for this work.
- .3 No flushing, testing or disinfection of the water mains, or flushing of the sanitary sewer mains, shall commence until all the mains and services have been completely installed, including all water distribution system and water/sanitary sewer forcemain appurtenances. No installations of any sort shall be allowed after the mains have been flushed and/or tested.
- .4 A minimum of two (2) weeks prior to commencing with any flushing, testing and disinfecting of the water mains, and flushing of the sewer mains, the Contractor shall submit a Water and/or Sewer Main Flushing, Testing and Disinfecting Plan (FTDP) to the Consultant and EPCOR for review and documentation.
- .5 The Flushing, Testing and Disinfecting Plan shall provide a detailed, step-by-step outline of the methodology(s) that the Contractor proposes to use when conducting the flushing, testing and disinfecting of the water and sewer mains.
- .6 The Consultant shall provide EPCOR with forty eight (48) hours notice of intent to proceed with the flushing, testing and disinfecting of the completed water and sewer mains.
- .7 The Consultant shall review the flushing, testing and disinfecting procedures with EPCOR so that EPCOR can confirm compliance with the minimum requirements of this manual.
- .8 The Consultant shall be present during the entire flushing, testing and disinfecting operation(s) to monitor the Contractor's compliance with the requirements of the Flushing, Testing and Disinfecting Plan, and to document the results of the flushing, testing and disinfection process.
- .9 Flushing, testing and disinfection is to be conducted by competent and experienced personnel using equipment appropriate for the piping being flushed, tested and disinfected.
- .10 Fire hydrants shall be operated in a full-open or full-closed position only.

- .11 EPCOR and all EPCOR representatives shall have unrestricted access to the site at all times during the flushing, testing and disinfection operation.
- .12 All flushing shall be in compliance with Town of Chestermere By-laws for direct billing of water consumption.
- .13 Approved cross-connection control devices shall be implemented to prevent cross-contamination between the sanitary sewer system and the potable water system.

2 Water Main Flushing

2.1 PRELIMINARY CLEANING OF SMALL DISTRIBUTION MAINS (LESS THAN 300 MM) AND SERVICES

- .1 Upon completion of all water main installations and the prerequisite requirements, all distribution mains and services (up to the service valves) shall be thoroughly flushed with potable water to remove entrapped air and foreign matter.
- .2 Distribution mains greater than 300 mm in diameter shall be swabbed and power flushed as per the requirements for swabbing and flushing of water mains outlined in Section 2.2.
- .3 If, in the opinion of the Consultant and/or EPCOR, the water mains (regardless of size) were subjected to severe contamination and/or injected with debris during the installation of the water mains, the water mains shall be swabbed and power flushed in accordance with the requirements given in Section 2.2.
- .4 Notify the Consultant of the source of the potable water. If the potable water is to be withdrawn from the Town of Chestermere distribution system, notify EPCOR at least forty eight (48) hours in advance of withdrawing water from the Town's water system.
- .5 The preliminary flushing procedure shall be as follows:
 - a) Flushing shall be a Uni-Directional Flushing (UDF) methodology.
 - b) Flushing shall be conducted at a minimum velocity of 1.5 m/s for a minimum duration of fifteen (15) minutes over a maximum main length of 600 m for mains up to and including 250 mm of main diameter (AWWA Standard).
- .6 The Contractor shall provide and install a Pitot Gauge suitable for verifying the required flushing velocity.
- .7 The Contractor shall supply a stop watch to accurately time the duration of the flush at the required velocity.
- .8 Test the flush water using an approved turbidimeter (HACH) in the presence of the Consultant and/or EPCOR.
- .9 Flush and test each section of main until the turbidity is 1.0 NTU or less.

- .10 The flush water shall not be discharged to the sanitary or storm sewer systems. Flush water (and debris) shall be discharged to a suitable disposal area as reviewed and approved by the local authority(s) having jurisdiction.

2.2 PRELIMINARY CLEANING OF LARGE DIAMETER MAINS (300 MM AND GREATER) AND FORCEMAINS

- .1 Water distribution mains 300 mm diameter and larger and all sewer and water forcemains shall be swabbed and power flushed.
- .2 The swabbing and power flushing procedure shall be as follows:

If swabbing of the water mains is required, the Contractor shall include a Swabbing and Flushing section in the Water Main Flushing, Testing and Disinfecting Plan. The swabbing section shall detail the swabbing and preliminary flushing methodology. Details shall include, but not be limited to:

- a) A descriptive outline of the swabbing methodology
 - b) Type and size of swabs
 - c) Swab launch/retrieval locations
 - d) Main sections to be swabbed
 - e) Flushing velocities and durations
 - f) Monitoring and documentation procedures
 - g) Swab pumping pressures
 - h) Method for collection and disposing of swab debris and flush water
 - i) Schedule for flushing/swabbing
 - j) Source of water for flushing.
- .3 Swabs shall be urethane type and shall have a diameter of at least 50 mm larger than the largest pipe nominal diameter.
 - .4 Each main section shall be swabbed by passing a minimum of three (3) swabs through the main section being swabbed.
 - .5 Swabbing of the mains shall continue until the swab shows no further evidence of contaminants (dirt) in the pipes.
 - .6 All pipes are to be swabbed.
 - .7 The Contractor shall supply and install temporary launch/retriever ports to facilitate swabbing.
 - .8 Contractor to remove these items following the completion of the swabbing.

- .9 Flushing of the swabbed mains shall be performed using a power flusher.
- .10 Test the flush water using an approved turbidimeter (HACH) in the presence of the Consultant and EPCOR.
- .11 Flush and test each section of main until the turbidity is 1.0 NTU or less.
- .12 If, in the opinion of EPCOR, the required swabbing and flushing job exceeds the Contractor's capabilities or the degree of main contamination is too severe, EPCOR may require the Contractor to engage the services of a professional firm specializing in utility systems servicing and maintenance, at the Contractor's expense, to swab and flush the water mains.
- .13 For exceptionally large water distribution mains and forcemains (e.g. 500 mm diameter mains or larger), where it is impractical to clean and flush the mains using the methodologies outlined above, the Water Main Flushing, Testing and Disinfecting Plan shall specifically address and detail the methodology proposed for cleaning and flushing the large diameter mains.

2.3 FLUSHING OF WATER MAIN AND FORCEMAIN REPLACEMENT SECTIONS

- .1 Tap 50 mm main stops through saddles at the ends of the main section to be flushed and tested.
- .2 After completion of the flushing, testing and disinfection, remove the main stops and saddles:
 - a) PVC pipe: Install a PVC repair coupling over the tapping holes.
 - b) DI or Steel pipe: Install a mechanical repair coupling over the tapping holes.
 - c) HDPE pipe: Install a mechanical repair coupling over the tapping holes or leave the main stop and saddle in place.
- .3 The exact methodology proposed by the Contractor shall be reviewed with the Consultant and EPCOR prior to commencing the flushing, testing and disinfection of a water main or forcemain section replacement.

3 Hydrostatic Leakage and Pressure Testing

3.1 HYDROSTATIC LEAKAGE AND PRESSURE TESTING OF DISTRIBUTION MAINS AND FORCEMAINS

- .1 Do tests in accordance with AWWA C605 for PVC pipe and AWWA C906 for HDPE pipe.
- .2 Hydrostatic testing is to be conducted by competent and experienced personnel using equipment appropriate for the piping being tested and the test pressures applied.
- .3 Install temporary struts and bracing, as required, to guard against pipe movement when test pressures are applied.
- .4 The test pressure shall be monitored with a suitable pressure gauge.
- .5 Pressure gauge to be mounted directly on the pipes being tested.
- .6 Flow control shall be monitored by means of a throttling valve installed on the hydrant discharge line(s) on a temporary basis.
- .7 Install corporation stops complete with double strapped service saddles at high points in main where no air vacuum release valves are installed to allow for the expulsion of air. Cap and record location of the corporation stops after satisfactory completion of test.
- .8 Open all main valves within the test section.
- .9 Expel air from main by slowly filling main with potable water at a filling velocity of <0.5 m/s.
- .10 Cement mortar lined pipe shall be left to soak for a minimum of forty eight (48) hours at 100% of the test pressure prior to testing.
- .11 Test pressures shall not exceed the pipe manufacturer's recommended maximum test pressure.
- .12 Do not conduct tests when ambient air temperatures drop below -5°C during the test period. If the temperature(s) drop below -5°C at any time during the test, the test shall be considered invalid and a re-test will be required.
- .13 Test pressures to be 1.5 times the specified pressure rating of the pipe being tested or 1,035 kPa (150 psi), whichever is greater, based on the elevation of the lowest point of the main being tested and corrected to the elevation of the test gauge.

- .14 The test pressure shall be maintained continuously for a minimum of two (2) hours.
- .15 Maintain the specified test pressure by injecting additional water if test pressure deviates from the specified pressure by 13.8 kPa (2.0 psi) or more.
- .16 Thoroughly examine exposed parts and correct for leakage as necessary.
- .17 Remove pipes, joints, fittings and appurtenances found defective and replace with new sound material and make watertight.
- .18 Repeat hydrostatic test until all defects have been corrected.
- .19 Define leakage as amount of water supplied from water storage tank or meter in order to maintain test pressure for two (2) hours.
- .20 Locate and repair defects if leakage is greater than amount specified.
- .21 Repeat test until leakage is within specified allowance for full length of water main.

3.1.1 Allowable Leakage

- .1 Allowable leakage is defined as the quantity of make-up water that must be pumped into the main being tested in order to maintain the test pressure within 13.8 kPa (2.0 psi).
- .2 HDPE pipe sections shall be considered as jointless.
- .3 Allowable leakage for PVC, HDPE and Welded Steel pipe is 0.0 L/h regardless of the number of joints being tested.
- .4 For mechanically jointed pipe metal pipes, no installation shall be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{ND(P^{0.5})}{32,046}$$

Where: L = allowable leakage (litres per hour)

N = Number of joints in the pipeline's test section

D = Nominal diameter of the pipe (mm)

P = Average test pressure (kPa)

3.2 AIR TESTING OF WATER DISTRIBUTION MAINS AND FORCEMAINS

- .1 The use of compressed air for pressure testing water distribution mains and forcemains shall not be allowed under any circumstances.
- .2 Any attempt(s) to use compressed air for testing purposes shall result in the test results being rejected by EPCOR.

3.3 OVALITY TESTING OF HDPE WATER DISTRIBUTION MAINS AND FORCEMAINS

- .1 All HDPE water distribution mains and forcemains, or portions thereof, shall be tested for ovality (pig tested).
 - a) The Contractor shall submit an Ovality Test Plan, outlining the methodology for conducting the test, for review by the Consultant and EPCOR.
 - b) The test shall be conducted using a hard, non-compressible test pig with a minimum diameter equal to 90% of the nominal inside diameter of the pipes being tested.
 - c) The pig shall be pulled through the main section by one man pulling on a rope without the aid of any power assist or mechanical advantage.
 - d) Alternatively, the Contractor may propel the test pig through the HDPE main hydrostatically, provided that the test pig can be retrieved in the event that the pig fails to transit smoothly through the pipe.

4 Water Main Disinfecting and Final Flush

4.1 DISINFECTING AND FINAL FLUSHING OF WATER MAINS AND SERVICES

4.1.1 Chlorination of Mains

- .1 Upon the completion of the preliminary flushing, pressure and leakage testing, to the satisfaction of the Consultant and EPCOR, all distribution mains, services and supply mains tested shall be disinfected in accordance with the Contractor's Water Main Flushing, Testing and Disinfecting Plan and the following requirements.
- .2 The Contractor shall provide the Consultant and EPCOR with the MSDS sheets for the type of chlorination and dechlorination agents to be used for the disinfection and dechlorination process.
- .3 Disinfect and flush the mains in accordance with the latest edition of AWWA Standard C651 for Disinfecting Water Mains.
- .4 An aqueous chlorine solution of calcium hypochlorite (HTH) shall be injected into the main being disinfected while sufficient water is being discharged through the main to bring the chlorine concentration throughout the main to a minimum concentration of 50 mg/L (50 ppm).
- .5 The use of chlorine tablets will not be allowed.
- .6 The disinfecting, testing and final flushing procedure must be witnessed by the Consultant.
- .7 Calcium hypochlorite shall conform to AWWA B300-99. Sodium hypochlorite shall conform to AWWA B301-99.
- .8 The chlorine solution shall be injected at the start of the water main test section with the discharge at the extreme end of the test section.
- .9 Take samples from various sampling points along the main and test, using an approved test kit (HACH), to confirm that the entire test section is at the specified chlorine concentration.
- .10 Once the Contractor has confirmed that the entire test section is at the specified chlorine concentration, the intake and discharge valves shall be closed and the test section left to stand a minimum of twenty four (24) hours.

- .11 At the beginning of the contact period, all valves (including hydrant valves) and hydrants shall be operated to ensure that all parts have been in contact with the chlorine solution.

4.1.2 Dechlorination of Super Chlorinated Water

- .1 Super chlorinated water must be dechlorinated before being discharged to the environment.
- .2 Dechlorination of the super chlorinated water shall be done by injecting an aqueous solution of sodium thiosulphate into the discharge stream of the flush water at the end of the test main.
- .3 The dechlorinated water must be continually field tested to confirm the effectiveness of the dechlorination process. Dechlorinated water exceeding a total chlorine concentration >0.5 mg/L shall not be discharged to the environment.
- .4 If the dechlorinated water exceeds a chlorine concentration of 0.5 mg/L, discontinue the flushing and dechlorination procedure and increase the strength of the sodium thiosulphate solution until the dechlorinated water's chlorine concentration is confirmed to be <0.5 mg/L.
- .5 Continue flushing and dechlorinating until testing of the flush water confirms a chlorine residual in the range of 0.2 mg/L to 0.5 mg/L, with a turbidity level of <0.5 NTU.
- .6 Dechlorinated flush water shall be discharged to a disposal area(s) approved by the Consultant and any local and/or provincial authorities having jurisdiction.
- .7 Upon satisfactory completion of the chlorinating and final flushing, the tested section of water main shall be isolated from all other water mains pending the results of the bacteriological testing.

4.1.3 Final Flushing of Water Mains

- .1 After twenty four (24) hours (minimum), the test section shall be flushed with potable water to expel all super chlorinated water.
- .2 Final flushing through the mains shall be conducted so that the flushing velocity ranges between 0.5 m/s and 0.75 m/s for a minimum duration of fifteen (15) minutes for a maximum main length of 600 m.

- .3 Continue flushing until testing of the discharging water confirms a chlorine residual in the range of 0.2 mg/L to 0.5 mg/L with a turbidity level of <0.5 NTU.
- .4 For water mains that will be placed into immediate service or replacement portions of existing water mains, flush the mains until the chlorine residual is >0.2 mg/L.
 - a) Chlorinated water must not be released into a storm sewer, Lake Chestermere, the Western Irrigation District (WID) canal, or ditches and water courses flowing into Lake Chestermere, the WID. canal or wetlands.

5 Sampling and Bacteriological Testing

- .1 Immediately after the specified final flushing results have been achieved and verified by the Consultant and/or EPCOR, the Contractor shall obtain a minimum of three (3) water samples. One each at the start, middle and end of the water main section being tested.
- .2 Samples shall be obtained from sampling points at the main, hydrants, service(s) or temporary sampling points provided by the Contractor.
- .3 Samples taken from temporary flushing hoses and devices are not acceptable.
- .4 Water samples shall be submitted to an approved and certified testing laboratory (City of Calgary Water Resources lab, Provincial Health lab, private testing firm) within twelve (12) hours of the sample being taken.
- .5 The samples shall be tested for turbidity, chlorine residual and microbiological parameters.
- .6 Copies of the laboratory report shall be submitted to the Consultant and EPCOR prior to commissioning the water main.
- .7 Should any of the tests indicate that the water failed to meet the requirements and definitions for potable water as defined in the latest edition of the "Guidelines for Canadian Drinking Water Quality" and Alberta Environment's standards and guidelines for potable water, the Contractor shall repeat the disinfecting and final flushing procedure until the water quality tests indicate that the water in the main complies with the potable water requirements and definitions.
- .8 When the water quality is acceptable to the Consultant and EPCOR, the water main may be commissioned for immediate use.
- .9 If immediate commissioning of the water main is not required, the main shall be left fully charged and isolated.
- .10 If the tested and disinfected water mains (or portions thereof) lie dormant for a period of greater than 30 days, the stagnant water in the dormant mains shall be flushed out with potable water until test results indicate that the chlorine residual in these mains is >0.2 mg/L.

6 Sanitary Sewer Mains

6.1 FLUSHING AND INSPECTION OF SEWER MAINS AND SERVICES

- .1 Upon completion of all sanitary sewer system installations and the prerequisite requirements, all sewer collection mains and services (up to the plugged Inspection Chambers) shall be thoroughly flushed with potable water to remove sediments and solids.
- .2 Notify the Consultant of the source of the potable water. If the potable water is to be withdrawn from the Town of Chestermere distribution system, notify EPCOR at least forty eight (48) hours in advance of withdrawing water from the Town's water system.
- .3 The sewer flushing procedure shall be one of the following methods:
 - a) Gravity Flushing:
 - i) Flush using the Gravity methodology.
 - ii) Flushing shall be conducted at a minimum velocity of 1.5 m/sec. for a minimum duration of fifteen (15) minutes over a maximum main length of 600 m for mains up to and including 250 mm of main diameter.
 - iii) The Contractor shall provide and install a certified flow meter suitable for verifying the required flushing velocity.
 - iv) The flush water shall not be discharged to the storm sewer system. Flush water (and debris) shall be discharged to a suitable disposal are satisfactory to EPCOR.
 - b) Power Flushing
 - i) If in EPCOR's opinion, the sediments/debris in the sewer mains is too severe, EPCOR may require the Contractor to engage the services of a professional utility systems servicing and maintenance firm, at the Contractor's expense, to power flush the water mains.
 - c) Swabbing
 - i) If swabbing of the sewer mains is required, the methodology shall be the same as for that for swabbing water mains.
- .4 A Closed Circuit Television (CCTV) inspection shall be conducted of all sewer mains immediately after the completion of the gravity flushing, or in conjunction with the power flushing.
 - a) If the CCTV inspection indicates that the main flushing did not clean the sewer mains to the satisfaction of the Consultant or EPCOR; or that deficiencies exist that require repairs to the main, such repairs shall be made by the Contractor and the flushing and CCTV inspection repeated, at the Contractor's expense, until the sewer mains are found to be in a state acceptable to the Consultant and EPCOR.

- b) After the successful completion of the sewer main flushing and CCTV inspection, the mains shall remain isolated until EPCOR activates the sanitary service I/C chambers.
- c) Show homes or other temporary wastewater facilities may not discharge to the sewer mains without the consent of EPCOR.

7 Monitoring, Documentation and Reporting

7.1 MONITORING OF THE WORK

- .1 The Consultant shall be the primary authority responsible for monitoring and inspecting the Works for compliance with these and other applicable requirements and quality control standards.
- .2 EPCOR shall have full and unrestricted access to inspect the Work at all times.
- .3 EPCOR shall conduct inspections at their discretion and report any noted deficiencies and/or quality and workmanship concerns and issues to the Consultant.
- .4 All noted deficiencies, quality control concerns and workmanship issues must be addressed and resolved to the satisfaction of the Consultant and EPCOR prior to the issuance of the Construction Completion Certificate (CCC).

7.2 DOCUMENTATION

- .1 The Consultant shall document the detailed methodologies and results of all aspects of the water and sewer main flushing, testing and disinfecting procedures.
- .2 The documentation shall include a brief description of any 'unusual' events that may have occurred during the construction of the mains that led to the selection of a particular methodology for flushing the mains.
- .3 Documentation shall be provided for all sections of sewer and water mains flushed, tested and disinfected, including failed attempts/tests and retests (not just the final successful tests).
- .4 EPCOR reserves the right to monitor the Consultant's documentation of the flushing, testing and disinfecting procedures.
- .5 EPCOR comments and concerns, brought to the Consultant's attention, shall be addressed by the Consultant to EPCOR's satisfaction.

7.3 FINAL REPORT

- .1 The Consultant shall prepare a Final Report of the flushing, testing and disinfecting of the sewer and water mains, based on the documented information compiled during the execution of these procedures.

- .2 A draft copy of the Final Report shall be submitted to EPCOR for review and comment prior to the Consultant finalizing the Report, based on EPCOR'S review comments, for submission to EPCOR.
- .3 The Final Report shall include:
 - a) The Flushing, Testing and Disinfecting Plan
 - b) The documentation of the flushing, testing and disinfecting procedures
 - c) A CD of the CCTV inspection/report
 - d) Any photographs taken to record the flushing, testing and disinfecting of the sewer and/or water mains.
- .4 The format of the hard copy of the Final Report shall include:
 - a) A covered and bound (Cerlox) report
 - b) The front cover of the report shall include:
 - i) The Developer's corporate name
 - ii) The Development's name, stage and phase number
 - iii) The Consultant's corporate name
 - iv) The report's title (e.g. "Final Flushing, Testing and Disinfecting Report for 'Development', Phase 1" by 'Consultant')
 - v) Date (Month/Year).
 - c) A table of contents
 - d) A certification page containing the Consulting firm's Permit to Practice stamp and the signed Engineer's stamp of the engineer or technologist of record
 - e) Appendices, as required.
- .5 The deliverables submitted to EPCOR shall include:
 - a) Five (5) hard copies of the Final Report with a CD of the CCTV inspection
 - b) Three (3) CDs of the Final Report
 - c) A PDF of the Final Report sent to the attention of EPCOR's Chestermere manager.
- .6 The Final Report must be received by EPCOR, to EPCOR'S satisfaction, prior to the issuance of the Construction Completion Certificate (CCC) to the Consultant/Developer.

