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WORK PROCEDURE

Task:	Water and Sewer Work Procedures	Date Revised:	March 2006

1.0 Introduction

1.1 During the construction season there are many projects underway throughout the city that involving work on, or tying into, existing water and sewer mains. As a city employee, it is your responsibility to ensure that public safety is protected and that the impact of the work on the public is minimized.

This work procedure details the steps that the City is responsible for in this process and the mechanisms that are in place to protect both the public and the City.

2.0 General Requirements of Contractors

2.1 The contractor shall submit an application form to the Engineering Services Department at least seven (7) business days prior to connecting to, or working on, an existing water or sewer main. These forms are available from the Engineering Services Department upon request. The application form shall include a work plan identifying any necessary valve closures or facility access requirements, and a contingency plan detailing the procedures to be observed in the event of problems during the connection process or other emergency. As well, the work plan should describe the precautions to be taken to ensure that there is no contamination of the water system during the connection process. Additional supporting documentation may be required by the City including traffic control plans, safety plans, sediment control, and public notification procedures. Written approval from the City must be received by the contractor prior to connecting to existing mains.

2.2 The contractor must arrange an On-Street Construction Permit for any work on existing roads. Sufficient traffic management must be provided.

2.3 Where performance of the work requires disruption to regular traffic patterns, property access, or utility service to the public, the contractor must provide sufficient notice to affected parties. Where a transit route is impacted, the Transit Department should be notified at least two (2) business days in advance. Major planned disruptions should be publicly advertised for public awareness and education.

2.4 Allowable working hours within City limits are from 7:00 AM to 10:00 PM, Monday through Friday, 9:00 AM to 11:00 PM Saturdays and 9:00 AM to 10:00 PM Sundays and Statutory Holidays. Special written permission may be considered to work after-hours, permission shall consist of written communication from the City Engineer.

2.5 Where performance of the work requires water supply, the contractor may obtain water from the City's fire hydrants. Refer to Section 01 52 00 – Construction Facilities of the City's construction specifications for additional information regarding the contractor's use of City water supplies. The contractor must obtain a permit and meter from the City of St. Albert Utilities Department.

2.6 The contractor should provide sufficient sanitation facilities for workers on the site. Any worker who commits a "nuisance" shall be removed from the site.

2.7 The contractor must have some form of phone service on the site. This phone must be accessible to the inspector for local and emergency calls.

2.8 The contractor must provide sufficient protective measures to prevent damage or injury to surrounding property, facilities, infrastructure, and the public.

2.9 The contractor is responsible for maintaining adequate noise control, dust control, traffic control, and sediment control, and is responsible for suitable disposal of waste material. As well, the contractor is responsible for maintaining adequate site security.

3.0 Notifying Affected Parties		
3.1	Where performance of the Work requires disruption to utility service to the public:	
	3.1.1	The contractor must provide at least five (5) business days notice to all affected parties. Such notice shall consist of an information pamphlet, subject to the review and approval of the City, which shall be hand-delivered to affected parties by the contractor.
	3.1.2	The contractor shall provide temporary facilities as required to provide water and sewer service for commercial building, apartment buildings, and multi-family developments affected by disruption of service longer than 8 hours in the performance of the work. Portable water facilities are not acceptable.
	3.1.3	The contractor shall provide residents of single-family houses or duplexes, affected by disruption of service longer than 8 hours in the performance of the work, with suitable temporary water and sewer facilities.
	3.1.4	Temporary water and sewer facilities shall be subject to the approval of the City.
	3.1.5	A copy of all applicable notices shall be provided to the City for review at least five (5) business days in advance of notices being issued.
4.0 Work Involving Existing Water Mains		
4.1	An Engineering Services representative will coordinate any necessary valve closures with a representative from the City of St. Albert Utilities Department. Coordination between Engineering Services and Utilities will be under the authority of appropriate supervisors in each department. Only Utilities staff is authorized to conduct valve operations on the City water system, unless in the event of an emergency (immediate risk to life or property) where insufficient time is available to wait for Utilities representatives to arrive on the site.	
4.2	The contractor shall use a tapping sleeve and valve where possible to make the connection without taking the existing water main out of service (hot-tap). Tapping of PVC/AC pipe shall be in accordance with AWWA-C605, AWWA-M23, and the manufacturer's instructions. The contractor shall observe all due care and diligence during tapping activities.	
4.3	Upon completion of installation, the *contractor* shall pressure test all new water mains as follows:	
	4.3.1	Test Preparation:
	a)	The contractor shall supply all testing equipment and personnel to perform hydrostatic pressure testing.
	b)	Personnel shall be qualified to operate testing equipment. Testing equipment shall be subject to the approval of the City. Test pumps shall be motor driven and shall be complete with pressure gauges. An approved pressure recorder shall be provided to continuously record line pressure over a 24-hour period.
	c)	The contractor shall advise the City two (2) business days in advance of filling the line for testing. Failure to notify the City may result in the tests being deemed unacceptable.
	d)	Testing shall not be done under winter conditions unless the line can be safely drained or immediately placed into operation.
	e)	Concrete thrust blocks must be cured prior to commencing testing activities.
	f)	Partially or completely backfill the excavation prior to commencing testing activities.
	g)	Ensure all corporation stops are open and all curb stops are closed.
	h)	Ensure the test section is isolated and open all main valves within the test section.
	i)	Ensure all hydrants are sufficiently inspected prior to pressure testing. Open all hydrant shutoff valves in the test section and ensure the hydrants are closed.
	j)	Maximum length of distribution water main test sections shall be 450 m, unless otherwise directed by the City.
	k)	Maximum length of transmission water main test sections shall be 800 m, unless otherwise

		directed by the City.
	l)	Take care when filling water mains to ensure any calcium hypochlorite tablets are not dislodged prematurely.
	m)	Ensure air is sufficiently expelled from the test section prior to initiating testing.
	4.3.2	Hydrostatic Pressure Test:
	a)	At the point of the test, apply hydrostatic pressure of 1.5 times the operating pressure or 690 kPa, whichever is the greater, and at no point in the test section shall the hydrostatic pressure be less than 1.25 times the operating pressure. Public Works to conduct any necessary valve operations.
	b)	When the test pressure is achieved, the test will begin.
	c)	Mark the gauge and level of water in the storage barrel at the beginning of the test. These will be used to calculate leakage at the end of the test.
	d)	Maintain the test pressure, within ± 20 kPa, for two hours.
	e)	During the test, inspect all exposed pipe, fittings, and appurtenance locations for signs of leakage or distress.
	f)	At the end of the test, pump the test section back to the test pressure.
	g)	The leakage allowance for PVC pipe will be determined by the City using the following formula: $L = \frac{ND\sqrt{P}}{128{,}300}$ Where: N = number of joints in the test section; D = nominal pipe diameter in mm; and P = average test pressure in kPa. • The number of joints is estimated from the total length of pipe installed plus 1 joint allowance for each water service connection. • An additional allowance is made when testing against closed metal-seated valves. This allowance is 0.0012 L per hour per mm of nominal valve size. • Contractor must provide test results for the City's review.
	h)	If the total volume of makeup water used to pump the test section back up to the test pressure exceeds the allowable leakage, inspect the test section for and repair leaks or defective pipes, or remove trapped air and repeat the test.
	i)	Repair and re-test until leakage is within the specified limits.
	j)	Upon successful completion of testing procedures, complete any remaining backfilling and surface restoration.
4.4		Upon completion of pressure testing, all mains affected by the work shall be flushed and disinfected by the contractor prior to being placed back into normal operation. Disinfection procedures shall be as follows:
	4.4.1	Work Plan:
	a)	The contractor shall submit a detailed work plan for disinfection procedures to the City for approval at least ten (10) business days prior to conducting such activities. The work plan must provide sufficient detail regarding the following: • Water supply source; • Disinfection procedures; • Flushing procedures; • Discharge location; • Discharge de-chlorination procedures; and

	• Testing locations for chlorine residual and bacteriological testing.
4.4.2	Disinfection:
a)	Disinfect the water main in accordance with AWWA-C651.
b)	The preferred method of disinfection is with calcium hypochlorite tablets, further described in the following. Alternatively, disinfection using continuously fed sodium or calcium hypochlorite solution or slug injection of chlorine solution may be acceptable provided that the contractor submits detailed disinfection procedures for approval at least ten (10) business days in advance of disinfection activities. For alternate disinfection methods, flushing activities shall be conducted prior to disinfection. The use of swimming pool tablets for disinfection is NOT permitted.
c)	Calcium hypochlorite tablets shall be placed in the water main during construction.
d)	Use 5-gram tablets and place one at each end of the water main, at 150 m intervals, at each hydrant lead, in each hydrant, and at other appurtenances to provide an average dose of 25 mg/L in the water main.
e)	Attach the tablets to the top inside of each piece of pipe during construction using a food grade adhesive waterproof glue.
f)	The number of tablets required can be calculated from: $N = 6.28x10^{-6}(D^2)(L)$ Where: N = number of tablets required; D = nominal pipe diameter in mm; and L = length of pipe being disinfected in m
g)	Slowly fill the water main, maintaining flow velocity below 0.3 m/s, to prevent premature dislodging of the tablets. Care should be taken to prevent the chlorine residual from backing into the supply line.
h)	Upon complete filling of the water main, allow minimum of 24 hours (maximum 48 hours) of contact time at water temperatures greater than 5°C.
i)	Disinfection may be carried out simultaneously with pressure and leakage testing, provided the provisions of AWWA-C651 are followed.
j)	If repairs are made on any section of pipe, disinfection shall be repeated.
4.4.3	Flushing:
a)	Flush water mains clean of all dirt, debris, and other deleterious material prior to placing the water mains into normal operation.
b)	The flushing flow rate shall be sufficient to achieve a minimum flow velocity of 0.8 m/s through the pipe.
c)	Flush water mains and safely discharge the water so that no downstream damage occurs.
d)	Discharge flushing water in a manner and to locations approved by the City. Sufficiently de-chlorinate flushing water in accordance with Article 4.4.4 prior to discharge.
e)	Where flushing is insufficient to remove material buildup in the water main, the contractor shall undertake foam swabbing of the water main.
f)	After 24 hours, the City will supervise testing of the chlorine residual and taking of bacteriological test samples. The free chlorine residual must be greater than 20 mg/L and the samples must successfully pass bacteriological testing prior to the water main being placed into normal operation. Should the test sample fail either of these testing procedures, the water main will be flushed and disinfected at the contractor's expense. This process shall be repeated until water samples pass these tests.

4.4.4 Dechlorination:

a) Flushing water must be sufficiently de-chlorinated prior to release. The maximum allowable free chlorine residuals that must be achieved prior to release are as follows:
   - 5.0 mg/L to sanitary sewers;
   - 0.20 mg/L to storm sewers; or
   - 0.20 mg/L to watercourses.

b) De-chlorination procedures are subject to the approval of the City. No disposal of flushing water shall be permitted until the contractor's proposed de-chlorination procedures have been reviewed and approved by the City.

c) The preferred de-chlorination method includes utilizing a continuously fed neutralizing chemical introduced to the chlorinated water as it is flushed from the water main and before the water enters the receiving environment. Alternatively, a de-chlorination tank system may be used.

d) Acceptable de-chlorination chemicals include sodium thiosulphate, sodium sulphite, and sodium bisulphate.

e) Follow the instructions of the de-chlorination chemical supplier for mix ratios required for chlorine neutralization, application methods, and safety procedures.

4.5 Water Main Breaks:

For repairs of water main breaks, all due care shall be taken to exclude dirt, debris and outdoor water from entering the pipe. The section shall be thoroughly flushed and shall remain filled with water having a free chlorine residual of 1 mg/L after one-hour before being placed back into service. A bacteriological test shall be taken as close as possible to the location of the repaired break. If the bacteriological test is failed, the line shall be immediately re-flushed and tested again. If the line fails the bacteriological test once more, the line shall be taken out of service and disinfected. All necessary public notifications shall be issued if this step is required and all supervisors must be notified and involved in this procedure.

4.6 Placing New or Repaired Water Mains Into Active Service:

- The contractor must notify the Engineering Services Department at least two (2) business days in advance when a new or repaired line is prepared to be placed into active service.
- Engineering Services will coordinate with Utilities to operate the boundary valves to commission the water main.
- Utilities will open one boundary valve slowly, releasing air from the new main through hydrants or air release valves until the pressure is equalized and stable, and then slowly open other boundary valves.
- The contractor shall maintain a watch for a break in the new water main within three (3) days of commissioning. In such an event, the City will isolate the water main so that service interruptions will be minimal. The contractor must promptly repair any leaks, which are detected.
- Public Works will turn on service connections.
- Should any water sample fail quality control testing, the City may request the may issue directions for remedial action.

5.0 Work Involving Existing Sewer Mains

5.1 Temporary Flow Control:

Where required for the performance of the work, the contractor will provide temporary flow control. The *contractor* shall follow the following procedures for temporary flow control:

5.1.1 The contractor shall submit a proposed temporary flow control plan to the City for approval at least five (5) business days prior to commencing work at the site. The plan shall detail the anticipated normal sewer flows, temporary flow control method (including pump and piping capacities for flow bypassing), upstream flood prevention measures, and monitoring

5.1.2 Plugging and Blocking Flow Control Methods:

	a)	Where normal flows are such that the sewer main can be isolated and blocked without causing adverse affects upstream related to sewer backups, plugging and blocking may be used.
	b)	For sanitary sewers, this method shall be used only during off-peak periods where sewer flows are at a minimum.
	c)	For storm sewers, this method shall be used only when the prevailing weather conditions are such that there is limited risk of wet weather flows through the storm sewer.
	d)	A sewer line plug shall be inserted into the line at an upstream manhole.
	e)	The plug shall be designed so that a portion or all of the sewer flows can be released.
	f)	Flows shall be suitably reduced or shut off completely to allow work to be completed.
	g)	The plug shall be installed with a suitable method for quick removal in the event of upstream flooding, a major wet weather event, emergency, or as directed by the City.
	h)	After work is completed, the plug shall be removed and flows shall be returned to normal.
	5.1.3	Flow Bypassing Flow Control Methods:
	a)	Where sewer flows are such that adequate flow control cannot be achieved by the plugging and blocking method, pumps or siphons shall be used to divert a portion or all of the sewer flows around the section to be isolated.
	b)	A sewer line plug shall be inserted into the line at an upstream manhole.
	c)	The plug shall be designed so that a portion or all of the sewer flows can be released.
	d)	Flows shall be suitably reduced or shut off completely to allow work to be completed.
	e)	The plug shall be installed with a suitable method for quick removal in the event of upstream flooding, a major wet weather event, emergency, or as directed by the City.
	f)	Excess sewer flows shall be pumped through a closed pipeline from the upstream manhole to a downstream manhole. The pipeline will be suitably located and protected from traffic. Sufficient pumping capacity shall be provided to accommodate anticipated peak flows.
	g)	Alternatively, vacuum trucks may be used to remove excess sewer flows from the upstream manhole. The contractor shall dispose of such sewer flows at sites to be located by the contractor and approved by the City.
	h)	After work is completed, the plug shall be removed and flows shall be returned to normal.
	5.1.4	Monitoring:
	a)	The contractor shall provide continuous monitoring of liquid levels in the upstream manhole.
	b)	Ensure that there is no contamination of basements, ditches, roadways, or sidewalks with raw sewage. In the event of such contamination, immediate action shall be taken to eliminate the source of the contamination. Proper cleanup of the affected areas shall be undertaken. Work shall not recommence until the temporary flow control plan has been reevaluated and revised as necessary, and approved by the City.
	c)	Where the Contractor uses temporary flow control to limit flows during an inspection, the Contractor shall note on the inspection report the depth of normal flow and the duration the flow control measure was in place.
5.2	Cleaning Sewers:	
	Prior to placing sewers into active operation, the contractor shall thoroughly clean the sewers as follows:	
	5.2.1	Clean the line of all obstructions including, but not limited to, debris, encrustation, roots, and protruding services.

5.2.2 Water for flushing is generally available from fire hydrants located near the site. The Contractor shall arrange for water supply from the City in accordance with Article 1.2 of Section 01 52 00 – Construction Facilities. The Contractor shall make suitable arrangements with the City for provision of a backflow prevention device, where required.

5.2.3 The Contractor shall remove all debris cleared from the lines. The Contractor shall dispose of such debris at sites to be located by the Contractor and approved by the City.

5.2.4 If cleaning methods fail to clear an obstruction in the sewer line; the City may direct a point repair excavation to clear the obstruction.

5.3 Inspection and Testing of Sewers:

The contractor shall be responsible for the inspection and testing of sewer mains as follows:

5.3.1 The contractor shall provide all materials, equipment, and labour necessary to inspect and test sewer pipes.

5.3.2 Any sewer mains that fail to pass inspection and testing, or having obstructions, breaks, or any other defects, shall be repaired, re-inspected, and re-tested to the satisfaction of the City, at the contractor's sole expense.

5.3.3 Visual Inspection:

a) All installed sewers shall be visually inspected by the contractor and the City to determine if there are any obstructions, breaks, or misalignments of the pipes.

b) Gravity sewers, which are designed to be straight, shall be tested by light testing from manhole to manhole. Variations in line, grade, and any other defects shall be recorded.

c) Where light tested cannot reveal the extent of an observed defect, the contractor shall arrange for television inspection of the sewer, at the Contractor's sole expense.

5.3.4 Testing:

a) Following successful inspection and cleaning, leakage tests shall be performed by the contractor, upon the direction of the City. The City will determine if the test shall be an infiltration or exfiltration test.

b) The contractor shall provide all water, materials, equipment, and labour required for the testing. Equipment shall include plugs, meters, and other measuring equipment that is acceptable to the City, to measure exfiltration or infiltration.

c) The City will direct which sections of the main shall be tested.

d) Infiltration testing shall be performed by plugging the upstream end of the test section and measuring flow at the downstream end.

e) Exfiltration testing shall be performed by plugging both ends of the test section and filling the test section to provide a hydrostatic head of 600 mm above the top of the highest point in the test section.

f) The test duration shall be 4 hours.

g) The allowable leakage shall be is follows:

Type of Pipe	Allowable Leakage
Concrete Pipe	60 L/mm dia./km/day
PVC Pipe	5 L/mm dia./km/day

h) No additional leakage allowance will be made for manholes.

6.0 Procedures for Water Main or Sewer Main Breaks:

In the event of a water main break or sewer main break:

- Contact your supervisor.

- During regular business hours, contact the Utilities Department and Sewer Superintendent. After regular business hours, contact Utilities standby number at 497-9763. Utilities will operate isolation valves on water and sewer infrastructure to complete any necessary shut-offs.
- For capital projects, Engineering Services is responsible coordinate any required repairs between the contractor and Utilities.
- If the contractor responsible for the break is not capable of completing a repair of the water or sewer main, contact the designated repair contractor for Utilities to conduct the repair.
- Wherever possible, provide homeowners affected by emergency water shut-off with at least 30-minutes notice prior to the shut-off. Where a water shut-off will be in effect for more than 3-hours, alternate water supplies should be provided to affected homes (bottled water, water truck, temporary hydrant feed, etc.). Notify Fire Services at 459-7021 of areas affected by a water shut-off.
- Assemble a detailed account of the break if you were present when it happened. Otherwise ensure that the contractor assembles such report and submits it to the City.
- Upon completion of the repair, instruct public works to re-open any isolated (shut-off) mains. For water mains, Utilities must flush the main, take a chlorine residual test (min. 1.0 mg/L free chlorine residual), and take a bacteria test (sent to Alberta Environment for testing). The main should be flushed for a minimum of five minutes before taking a chlorine residual test. If the water does not meet the minimum chlorine residual, continue flushing until it does. If the bacteria test comes back positive, conduct another bacteria test near the break location and if it fails a second time Utilities should disinfect the main.
- Notify Fire Services and your supervisor when the main is back in operation.

16) In the event of contact with a power, telephone, or gas utility line:

- Have the contractor contact the utility owner.
- Contact Utilities and Engineering Services directors.
- Assemble a detailed account of the contact if you were present when it happened. Otherwise ensure that the contractor assembles such report and submits it to the City.

14) The contractor must arrange an On-Street Construction Permit for any work on existing roads. Sufficient traffic management must be provided.

15) Where performance of the work requires disruption to regular traffic patterns, property access, or utility service to the public, the contractor must provide sufficient notice to affected parties. Where a transit route is impacted, the Transit Department should be notified at least two (2) business days in advance. Major planned disruptions should be publicly advertised for public awareness and education.

16) Allowable working hours within City limits are from 7:00 AM to 10:00 PM, Monday through Friday, 9:00 AM to 11:00 PM Saturdays and 9:00 AM to 10:00 PM Sundays and Statutory Holidays. Special written permission may be considered to work after-hours, permission shall consist of written communication from the City Engineer.

17) Where performance of the work requires water supply, the contractor may obtain water from the City's fire hydrants. Refer to Section 01 52 00 – Construction Facilities of the City's construction specifications for additional information regarding the contractor's use of City water supplies.

18) The contractor should provide sufficient sanitation facilities for workers on the site. Any worker who commits a "nuisance" shall be removed from the site.

19) The contractor must have some form of phone service on the site. This phone must be accessible to the inspector for local and emergency calls.

20) The contractor must provide sufficient protective measures to prevent damage or injury to surrounding property, facilities, infrastructure, and the public.

21)	The contractor is responsible for maintaining adequate noise control, dust control, traffic control, and sediment control, and is responsible for suitable disposal of waste material. As well, the contractor is responsible for maintaining adequate site security.

Signature (Supervisor)	Date