APPENDIX H:
WATERMAIN CONNECTION AND COMMISSIONING MANUAL

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DEFINITIONS

Commissioned watermain: in service for distribution of safe drinking water

Operator: MECP Certified InnServices Operator (Town of Innisfil's water operating authority)

Licenced Third Party: A Company that specializes in water distribution and has licenced Class one Distribution System Operators on staff.

REFERENCES

Ontario New Watermain Disinfection Procedure

American Waterworks Association (AWWA)

- AWWA Standard C651-14 - [Disinfecting Watermains]
- AWWA C655-09 - [Field De-chlorination]
- AWWA C605-13 - [Underground Installation of PVC and PVCO Pressure Pipe and Fittings]

Ontario Provincial Standard Specifications (OPSS)

Ontario Safe Drinking Water Act (SDWA)

Ontario Regulations

- O. Reg. 128/04 - [Certification of Drinking Water System Operators and Water Quality Analysts]
- O. Reg. 108/18 - [Fire Code]

NFPA Standard 291

1.0 General Information

- This procedure is required for addition, modification, replacement and extension of any watermain.
- This procedure is for all public and private watermain works.
- Service pipes with a diameter of 100mm or greater are to be considered watermains.
- The following procedure must also be followed for temporary watermains.
- Watermain commissioning is to be completed by a licenced third party.
- Scheduling is to be coordinated with InnServices Administrative Coordinator by email iuiwaterappt@innservices.co

1.1 Requirements

All procedures are to be followed in accordance to MECP and the latest AWWA Standard C651-14.

The MECP Procedure for Disinfection of Drinking Water in Ontario regulation shall take precedence if there are any discrepancies between MECP and the AWWA C651-14.

The watermain must meet design criteria set by the MECP.

Watermain live taps, commissioning and connections are to be witnessed by InnServices, and a senior staff member from the Owner's Consulting Engineer.

Mainline valves on a connected water distribution system may only be operated by an InnServices Operator. Valves on an unconnected system may be operated by a licenced third party.

If an Operator is required on site, the arrangements must be made with the Administrative Coordinator three (3) working days in advance.

Refer to Appendix B5 in the Town of Innisfil Engineering Design Standards and Specifications Manual for a list of approved materials. Materials not specified must be approved by InnServices prior to installation.

1.2 Watermain Commissioning Plan

A commissioning plan outlining the procedure that will take place along with specifications is to be **submitted to InnServices two (2) weeks prior** to the commissioning for review and approval.

The following should be included as part of the plan:

- Commissioning Procedure
- Specifications such as length of watermain to be commissioned, schedule of procedure, etc.;
- Outline steps to be taken if any testing has failed (ex. If turbidity of 1 NTU is not achieved within 10 minutes, the watermain will be re-swabbed);
- Outline all requirements that are to be met;
- Swabbing Procedure;
- Specify number of swabs to be launched, size, swab velocity, etc;
- Hydrostatic Testing Procedure;
- Disinfection Proposal Plan (criteria, mapping, calculations);
- Include disinfectant to be used, initial concentration, details of continuous feed method, duration of exposure, etc.;
- Disinfectant used for the procedure must be NSF certified;
- Disinfection Site Map; and

- Procedure for Microbiological sampling with proposed sampling locations

1.3 Other Submissions

- Turbidity and Chlorine Residual Report
- MECP Form 1 to be submitted once final connection has been completed
- Backflow Certification

2.0 New Watermain – Physically Isolated From Existing Watermain

The following testing requirements apply to all new sections of watermain. Any sections which fail to meet the requirements shall be retested, repaired or replaced at the direction of InnServices.

2.1 Live Tap Procedure

Live Taps must be completed by a third party approved by InnServices

1. Watermain is safely exposed and cleaned.
2. Tapping saddle and mainstop/gate valve are installed on the watermain.
3. A five (5) minute pressure test on the saddle must be completed before the main is cut. Pressure must be held at 150 psi.
4. Tapping saddle, tapping machine, cutter and gate valve are to be disinfected.
5. Tapping machine is fastened onto the mainstop/gate vale and live tap begins.
6. Once live tap is completed, the watermain coupon must be given to the InnServices Operator on site and the mainstop/gate valve is to be closed.

Live taps are to be witnessed by an InnServices Operator and are to be scheduled 3 days in advance.

2.2 Installation of bypass and backflow preventer

- A temporary by-pass connection complete with a water meter is to be installed to permit testing of the system. Water meters up to 50 mm in size are available for rent by InnServices. Please contact the Administrative Coordinator for rental forms.
- A backflow preventer is required on all by-passes. It is the Owner’s responsibility to hire a plumber for the installation and certification of a backflow preventer. Backflow preventers up to 50 mm in size are available to rent by InnServices.
- Manufacturer specifications and guidelines for installation must be followed.
- Removal of the backflow preventer shall not take place until the commissioning of the watermain has been completed.

2.3 Swabbing

- All watermains 600 mm diameter and less shall be swabbed. For diameters larger than 600mm, swabbing is to be discussed and approved by InnServices.
- All swabs are to be new and a minimum of 50 mm larger than the watermain diameter.
- Swabs are to be numbered in the order they are launched and collected thereafter.
- The watermain is to be loaded prior to swabbing.
- A turbidity reading must be taken within ten (10) minutes after the last swab has been launched and must be lower than 1.0 NTU. If a turbidity reading lower than 1.0 NTU is not achieved within ten (10) minutes the watermain must be re-swabbed.

2.4 Flushing and Turbidity Testing

- Flushing of the watermain (including all hydrant leads, services and sample point locations) is required to ensure removal of air pockets and particulates.
- **All hydrants must be flushed with high velocity.**
- Turbidity results must be obtained at each sample location and are to be documented in the Turbidity and Chlorine Residual Report.
- The flushing velocity is to be 3.0 ft/sec (0.91 m/s) or greater.

2.5 Hydrostatic Pressure Testing

Hydrostatic testing shall be performed, prior to disinfection of the watermain.

All main line and secondary valves must be open during testing except for valves being used to divide the system into sections for the purpose of testing.

Watermains must hold at **150 psi (1034 kPa)** for two (2) consecutive hours, with **no leaks** and **no additional water** added once pressurized and official pressure test has commenced.

Note: Only HDPE (High Density Polyethylene) watermains will have allowable leakage with respect to the manufacturer's recommendations.

If the watermain requires a repair, the swabbing and hydrostatic pressure testing procedures will be completed again.

2.5.1 Hydrostatic Pressure Testing of Fire Mains

Fire mains must hold at **200 psi (1379 kPa)** for two (2) consecutive hours, with **no leaks** and **no additional water** added once pressurized and official pressure test has commenced.

If the fire line requires a repair, the swabbing and hydrostatic pressure testing procedures will be completed again.

2.6 Disinfection/Chlorination

The system (including all hydrants) shall be disinfected using the continuous-feed method in accordance with AWWA C651-14.

- The chlorinated water is to remain in the watermain for a minimum contact time of twenty-four (24) hours.
- Initial chlorine concentration must be a minimum of 25 mg/L of free chlorine and a maximum of 125 mg/L.
- A chlorine residual is to be taken once the twenty-four (24) hour period has passed.
- The maximum allowable decrease in chlorine concentration after 24 hours is 40% of the initial concentration to a maximum decrease of 50 mg/L.
- The initial dosage and the concentration at the end of the twenty-four (24) hour contact time must be recorded in the Turbidity and Chlorine Residual Report for **all sample points and all hydrants** prior to flushing of the watermain.

2.6 De-chlorination

Following the required twenty-four (24) hour contact time, the system is to be flushed to remove super chlorinated water from of the watermain. The chlorinated water must be neutralized, prior to discharge, using an appropriate chemical such as sodium thiosulphate. Refer to the AWWA 651-14 for disposal of the treated water.

2.7 Chlorine Residual

Chlorine residuals are to be taken during initial chlorination, following the twenty-four (24) hour period and after de-chlorination at all sampling locations and recorded in the Turbidity and Chlorine Residual Report.

The chlorine residual after de-chlorination must be equal to the chlorine level of the water supply.

2.8 Microbiological Testing

Samples for bacteriological testing shall be collected by InnServices, a minimum of Sixteen (16) hours after flushing is completed, in accordance with AWWA C651.

Following the receipt of two consecutive sets of acceptable test results, InnServices will provide written notification that a final connection can be made to the existing distribution system.

For a test result to be deemed acceptable, the bacterial analysis of sampled water must indicate the following:

Total Coliform: 0 CFU/100ml

E.coli: 0 CFU/100ml

Background: <200 CFU/100ml

HPC: <200 CFU/mL

Should the results of the sampling be deemed unacceptable, additional swabbing, disinfection, flushing and sampling may be required at the discretion of InnServices.

A **minimum of sixteen (16) hours** after the de-chlorination of the main, **two (2) rounds of samples** are to be taken, **at least 15 minutes apart**, as stated in Section 5.1 of the AWWA C651. Each sampling point must remain open with water continuously flowing until both sets of samples have been collected. If a sample point gets shut off during sampling, the sampling process must start over and all samples previously collected will no longer be valid.

If water cannot be continuously flowing for the entire duration of testing for all sample points, the initial sample will be taken after de-chlorination and the second sample will be taken a minimum of 16 hours thereafter.

A set of samples is to be collected for every 370 meters and at the end of each branch and at the end of each line.

A set of samples is also to be collected at the water source.

Water samples are required every 61 meters wherever ground water has entered new watermain during construction.

All sampling is to be conducted by an InnServices Operator. Samples will be delivered to the lab for testing by InnServices.

2.9 Mandatory Submission

Prior to final connections, all documentation as part of new watermain commissioning shall be submitted to InnServices by email to iuiwaterappt@innservices.co and the InnServices Project Manager involved with the watermain commissioning.

- Turbidity and Chlorine Residual Report
- Backflow Prevention Test Inspection Report
- Watermain Hydrostatic Pressure Test Results

2.10 Final Connection

The final connection shall not be made until all the required testing and disinfection has been completed and InnServices has provided written notification to proceed.

Final connection must be witnessed by an InnServices Operator and the Owner's Consulting Engineer.

If the connection requires a shut-down a resident notice including a map of the area affected by the shutdown is to be submitted at the time of scheduling. Once approved, the Owner's

Consulting Engineer is required to hand deliver the resident notices a minimum of forty-eight (48) hours before the works take place.

During the connection all piping is to be cleaned and disinfected thoroughly by use of 12% sodium hypochlorite or equivalent solution.

The excavated area must be dewatered at all times to ensure water does not enter the watermain.

In the case of contamination, the watermain commissioning procedure is to be repeated.

If the final connection is not made **within ten (10) days** of InnServices providing the sample approval, InnServices will take a residual chlorine reading. If the residual free chlorine has fallen below 0.05 mg/L InnServices will require additional flushing, chlorination, and sampling of the system prior to final connection.

2.10 Return to Service of Watermains Isolated from the Distribution System

As per the Ontario Watermain Disinfection Procedure, Section 1.7., where a section of watermain has been isolated from the distribution system and a concentration of 0.05mg/L of free chlorine residual in a chlorinated system was not maintained within the isolated section (e.g., valve connection to existing live watermain), the isolated section must be re-chlorinated and sampled prior to the system being livened.

An updated commissioning plan must be submitted which shall include a re-chlorination, dichlorination, flushing and sampling procedure.