# GENERAL

## General Requirements

### This Section covers the flushing, testing and disinfection of water retaining structures; in-plant potable water process piping; and the dechlorination and discharge of chlorinated water.

### The Contractor shall employ qualified specialists to flush, test and sterilize all installed structures and pipe work in such lengths or sections as approved by the Consultant and the Region, and provide all labour, water, chemicals and chemical metering equipment, pumps, gauges, caps, stoppers, air release cocks, backflow preventers, pipe work and any other apparatuses required in order to complete the tests.

### If bacteriological test results on samples taken from the water retaining structures or process piping show incomplete disinfection, the procedure will be repeated, as directed by the Consultant, at no additional cost to the Region.

### All disinfection and testing procedures on watermains shall be in accordance with Watermain Disinfection Procedure (November 2015) as defined by the Ministry of the Environment, Conservation and Parks (MECP). The Contractor is required to conduct watermain disinfections in direct collaboration with the Region’s Operations, Maintenance & Monitoring (OMM) branch.

## Related Sections

### Section 11700 – Elevated Water Storage Tank

### Section 15200 – Process Piping and Fittings

### Section 15200-08 – Stainless Steel Pipe and Fittings – General Service

### Section 15205 – Process Valves and Operators

### Section 15955 – Piping Testing

## Submittals

### The Contractor shall submit to the Consultant for review, a detailed description of the Work procedure for both hydrostatic testing and disinfection of all water retaining structures and process piping, a minimum of 14 Days prior to commencing any Work. Permission to proceed will be granted in writing by the Consultant.

### The Contractor shall advise the Consultant of the estimated quantity of water to be required. The Contractor shall pay particular attention to conservation of water.

## Acceptable Specialist Subcontractor

### The specialist Subcontractor shall be fully experienced in providing disinfection services for water retaining structures and potable water process piping and shall provide references for disinfection work completed in Ontario.

### The specialist Subcontractor shall use an approved MECP licensed water operator.

## Payment

### All costs associated with the work of this Section, including the cost for flushing, disinfection and hydrostatic testing of water retaining structures and process piping as described herein, shall be included in the price for Item No. A1.14 in the Bid Form.

### The Contractor shall be responsible for the cost of any additional samples required due to failed test results.

### The cost for discharging or flushing chlorinated water, including the supply of chemicals and temporary provisions as described hereing and as required to complete the Work, shall also be included in the price for Item No. A1.14 in the Bid Form.

# PRODUCTS

## General

### The Contractor is responsible for all disinfection required to complete the Work.

### The Contractor shall furnish all disinfecting chemicals, mixing equipment, temporary service connections, testing plugs or caps, pressure pumps, pipe connections, isolation valves, pressure gauges, thrust supports, valves for expelling air (automatic and/or manual), pumping to the required test pressure, dewatering the line or structure and flushing, all other required equipment and all labour required for hydrostatic testing, flushing, draining and disinfecting pipes and reservoirs.

### The Region will provide, free of charge, the quantity of water required for one hydrostatic test and disinfection. Any water required for further testing or re-testing will be at the Contractor's expense.

### The Contractor shall provide all disinfection chemicals required to complete the Work.

### The Contractor shall provide chemicals to neutralize chlorinated water prior to its disposal.

### The Contractor shall provide a flow meter on any water supply used for hydrostatic testing, disinfection, and flushing of water retaining structures and process piping. The Contractor shall coordinate with the Region and the Consultant to record the total volume of water used.

# EXECUTION

## Disinfection of Water Retaining Structures

### The Contractor shall notify the Consultant a minimum of five (5) Working Days before disinfection is carried out in order to allow for inspection by the Consultant.

### Disinfection shall not commence until all components have been cleaned and thoroughly flushed.

### Disinfection of water retaining structures shall be carried out in accordance with the requirements of AWWA C652 Standard for Disinfection of Water-Storage Facilities. There are three disinfection methods provided in the Standard, however only Method 1 or Method 2 is to be used by the Contractor.

### Prior to placing any water retaining structures into service, the Contractor shall disinfect all water retaining structures. All disinfection operations shall be supervised by the Consultant.

### After the disinfection procedure is completed and before the facilities are placed in service, water shall be sampled and tested for coliform organisms in accordance with the applicable AWWA standard and O. Reg 170/03.

### Where disinfection procedures are not provided in the AWWA Standard for a water treatment process, disinfection procedures shall be carried out in accordance with the manufacturer’s recommendations and as approved by the Consultant.

### The Contractor shall be responsible for the safe disposal of all water from disinfection procedures.

## Bacteriological Sampling and Testing

### Before a water storage facility or process piping is placed into service, bacteriological sampling and testing shall be performed in accordance with AWWA Standard C651-14 and O. Reg.170/03.

### The water samples for bacteriological testing shall be taken by qualified, licensed Region personnel only.

### The Region shall be responsible for sending the samples to a registered laboratory for testing.

## Piping Sterilizing Methods

### General Requirements:

#### All current MECP Standards and Regulations on Drinking Water including O. Reg. 170/03, must be met while completing the swabbing and disinfection and chlorine residual and bacteriological testing of the process piping.

#### All connection points between the existing process piping and new process piping shall be kept physically separated until the new process piping has successfully passed all pressure, leakage, chlorine residual and bacteriological tests.

#### Suggested Sequence:

##### Charge piping

##### Swab (minimum three swabs per section of pipe)

##### Hydrostatic pressure test

##### Hydrostatic leakage test

##### Disinfection (chlorination)

##### Flushing and dechlorination

#### The Contractor shall employ a qualified specialist experienced in swabbing and disinfection of process piping, and who is otherwise acceptable to the Consultant, to perform the swabbing, disinfection and flushing Work described in this Section.

#### Tests shall be performed in the presence of, and to the satisfaction of, the Consultant and the Region.

### Swabbing

#### The following shall be used as a guideline in swabbing newly installed piping:

|  |  |
| --- | --- |
| Type of Swab | Open cell polyurethane foam having a density of 24 kg/m3 (1.5 lb/ft3) |
| Length of Swab | 1.5 x swab diameter |
| Diameter of Swab | (diameter of pipe) + 50 mm |
| Flow Rate | 0.5 to 1.0 m/s using potable water |
| Minimum No. of Swabs for a New Piping | 3 new foam swabs (after 3rd swab, the water should be clear if not, additional swabbing is required at the Contractor’s expense) |

#### Only new swabs will be permitted for use and under no circumstances will used swabs be allowed.

#### All swabs must be inspected prior to their insertion and immediately after they exit the main to ensure that they have remained intact and to ensure that pieces of the foam do not stay in the pipe.

#### The Contractor shall discharge water to an approved outlet ensuring all required dechlorination measures, as detailed in this Section, are followed.

### Disinfection

#### After the successful completion of swabbing operations and pressure and leakage testing, disinfection of the new piping shall proceed using liquid sodium hypochlorite, “pitchlor”, “H.T.H.”, or any other approved chlorine compound in sufficient quantity to obtain a free chlorine residual of 50 mg/L, after a period of 24 hours from the time of its introduction into the pipe.

#### Flushing and disinfecting operations are to be conducted in the presence of the Consultant and the Region. Notify the Consultant a minimum of five (5) Working Days in advance of the proposed date when disinfection operations are to commence.

#### The Consultant may permit or require flushing to be carried out in stages as sections of the system are completed. Ensure that no unwanted matter is allowed to enter into any sections which have been flushed.

#### Leave the system charged with 50 ppm chlorine solution for 24 hours.

#### Operate all valves during this 24 hour period.

#### Test the chlorine residual in the section after 24 hours.

#### If tests indicate a chlorine residual of not less than 25 ppm, flush the section completely and recharge with potable water. If the test does not meet the requirements, repeat the chlorination procedure until satisfactory results are obtained.

#### After the system has been recharged, the Region will take samples for bacteriological tests. If there is contamination, the Contractor must repeat the disinfection procedure. The water samples will be tested in accordance with the requirements of AWWA C651-14 Standards for Disinfecting Water Mains and O.Reg.170/03.

#### Do not put piping into operation until clearance has been given by the Consultant and the Region.

### Flushing:

#### After successful disinfection, the piping shall be thoroughly flushed by the Contractor to the satisfaction of the Consultant. All wasted water used for flushing operations shall be dechlorinated prior to its disposal as detailed in this Section.

## Dechlorination and Discharge of Chlorinated Water

### Safely dispose of all chlorinated water from draining operations or used for testing, flushing or disinfecting waterworks.

### Do not discharge any untreated chlorinated water into any storm sewer, drainage ditch, watercourse or sanitary sewer.

### In all cases, the wasted water must be neutralized to provide a total chlorine residual of less than 0.002 mg/L at the outfall where detrimental effects may be suffered by plants and/or animals in the natural environment. The Contractor shall monitor the discharge of all wastewater in the presence of the Consultant. Should tests show a residual of greater than 0.002 mg/L, the discharge shall be ceased immediately and the procedure modified to meet the requirement of less than the 0.002 mg/L.

### Discharge sites that are within 100 metres of natural drainage, or with direct discharge to a body of water, should be considered high risk. In such instances, the Region may request a dechlorination plan along with contingency and mitigation plans in the event that the chlorine residuals exceed those specified in this Section.

### Where no other options are available, the Contractor may be permitted to discharge wastewater into an existing sanitary sewer only with the prior, written approval of the Region. The Region may direct the Contractor to dechlorinate to a specified chlorine residual prior to discharge or limit the discharge rate. The Contractor shall monitor the discharge of wastewater to ensure that the chlorine residual and discharge limits are not exceeded, in the presence of the Consultant.

### Approved dechlorinating agents are as follows:

#### Hydrogen Peroxide

#### Sulphur Dioxide

#### Sodium Bisulphite

#### Sodium Metabisulphite

### The Contractor shall notify the following authorities regarding the method to be used to discharge the flush water and obtain approval from the Consultant prior to discharging any chlorinated water:

#### For receiving waters, notify the TRCA and MECP.

#### For drainage ditches and storm sewers, notify the Region.

**END OF SECTION**