Overview

• Water Main - Materials

• Specifications

• Installation

• Future?
Water Main Materials

Material Types

There are various material types used for water mains, these include:

- Ductile Iron Pipe
- Polyvinyl Chloride (PVC)
- Concrete Steel Cylinder
- Polyethylene
Water Main Specifications

Specifications

Provide information on approved materials, installation methods and typical drawings.

• Department of Municipal and Intergovernmental Affairs – Municipal Water, Sewer and Roads Master Construction Specification Book, Section 02713

• City of St. John’s – Specification Book, Section 230
Water Main Specifications

Specifications - Examples

• Approved Pipe Materials
  o Ductile Iron, PVC, Conc. Steel Cylinder

• Pressure Classes of Pipe
  o DI Pipe Class = 350, 250, 200
  o PVC Pipe = DR 14, 18, 21

• Valves
  o Opening Direction, Operating Nut

• Service Pipe
  o Approved Materials and Diameter
Water Main Installation

Pipe Trench

• Excavated to depth specified on drawings, minimum 2 m cover.
• Pipe Bedding
  o Class “B” Material
  o 150 mm Below
  o 300 mm Above
• Marker Tape
Water Main Installation

[Diagram of water main installation with dimensions]

[Photograph of a construction site with a utility worker]

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Water Main Installation

Pipe Protection

- Debris caps are required on all pipes supplied to CSJ.
- Caps keep debris out of pipes during transportation and installation resulting in lower chance of contamination.
- Required on both bell and spigot ends of pipe
Water Main Installation

Pipe Assembly

- Pipe laid in trench at design grade and assembled using come-along or pry bar
- However typically pushed together with excavator, there is a risk pushing the pipe into the bell to far and damaging the bell
- On PVC pipe there is a line indicating required insertion depth of pipe.
Water Main Installation

Thrust Blocks

• Required at specified locations such as bends, tees, valves, reducers, end caps.
• Required to be constructed as per Standards Drawings in Specification
Water Main Installation
Water Main Installation

Thrust Blocks

- An alternate to thrust blocks is the use of mechanical joint restraints.
- Prior to installation location of joint restraints must be determined by design Engineer. Typically the fitting is restrained plus several lengths of pipe on either side of fitting.
- Two types of restraints:
  - Restraining Gland Ring – Megalug or Megaholder
  - Restraining Joint Restraint
Water Main Installation
Water Main Installation
Water Main Installation

Air and Vacuum Release

• The design of a water distribution system must recognize the importance of alleviating air from the system and breaking a vacuum should it form.

• These conditions typically form when a water main is being filled or drained for planned maintenance or during emergencies.

• Air Release can be accomplished by either:
  o Installing a fire hydrant at the high point;
  o Placing a water service at the high point;
  o Installing an Air Release valve at the high point.
Water Main Installation

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Water Main Installation

Corrosion Control

- Metallic components of a water distribution system can experience corrosion.
- Corrosion could be caused by:
  - Soil conditions;
  - Dissimilar materials;
  - Stray current.
- Corrosion control can be accomplished by either:
  - Using non-metallic components;
  - Installing zinc anodes;
  - Wrapping metallic pipe in polyethylene.
Water Main Installation
Water Main Installation
Water Main Installation

Service Connections – Ductile Iron

- Direct tapping is permitted up to 25 mm diameter.
- Service greater than 25 mm diameter require service saddle.
- Service connections should be a minimum of 1 m from adjacent service, pipe bell or fitting.
- Direct tap completed using drill and tap bit.
- Tap connection through service saddle completed using shell cutter bit.
Water Main Installation

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Service Connections – PVC

• Direct tapping can but done but not recommended.
• New Construction – use tap tee.
• Tapping to be completed with service saddle.
• Service connections should be a minimum of 1 m from adjacent service, pipe bell or fitting.
• Tap connection through service saddle completed using shell cutter bit.
Water Main Installation
Water Main Installation
Water Main Installation

Testing

• Swabbing or Pigging
• Pressure Test
• Leakage Test
• Chlorination
Water Main Installation

Swabbing / Pigging

• To remove material and debris from lines.
Water Main Installation

Pressure Test
• New water main tested at 150% of normal operating pressure.
• Each section of pipe slowly filled with water and air expelled and tested

Leakage Test
• Conducted concurrently with pressure test.
• Measure quantity of water required to maintain pressure, must not exceed calculated value
Water Main Installation

Chlorination

- Chlorine solution added and left for 24 hours.
- Water flushed from line and sample taken.
- Two consecutive samples required to be collected.
Water Main Installation

Tracing / Locating

• Water main material determines type of tracing.
• Metallic material can use be used as a conductor for locating buried infrastructure
• PVC material requires separate method for locating buried infrastructure.
Water Main Installation
Water Main Installation
Water Main Installation
Future Water Main Installation

Internal Joint Restraint

• Current joint restraint system for PVC pipe using external components
• Bulldog joint is an internal joint restraint system.
• No external components therefore no corrosion issues.
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New PVC Material

• Molecularly enhanced PVC – biaxially oriented
• Features:
  – Pipe is lighter therefore it is easier to handle and install.
  – Greater tensile strength
  – Greater impact strength
  – Crack resistance, prevents crack propagation
  – Thinner pipe wall = larger inside pipe diameter resulting in improved flows.
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Future Water Main Installation

PVC Pipe Assembly

- PVC pipe is supposed to be assembled with pry bars or come-along.
- However typically assembled using excavator bucket – increased risk of damage to pipe.
- Eagle – Claw is a pipe assembly tool
Future Water Main Installation
Future Water Main Installation
Thank You