



## CONSTRUCTION SPECIFICATION FOR TRACER WIRE INSTALLATION IN THE CITY OF WATERLOO



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# CONSTRUCTION SPECIFICATION FOR TRACER WIRE INSTALLATION

## 100.01 SCOPE

To define materials, installation, submissions and quality assurance processes for tracer wire installation on watermains, hydrants, and water services. The standard will ensure that wire shall be installed in such a manner as to be able to properly trace all watermains without loss or deterioration of signal or without the signal migrating off the tracer wire.

## 100.02 REFERENCES

This specification shall be read in conjunction with the following specifications:

OPSS 441	Watermain Installation in Open Cut
OPSS 442	Corrosion Protection of New and Existing Watermains
DGSSMS	B.2.14 Corrosion Protection
DGSSMS	D.2.5.10 Wrapping

## 100.03 DEFINITIONS

For the purpose of this specification, the following definitions apply:

**Anode** means the electrode of an electrochemical cell where corrosion occurs and metal ions enter solution. An anode refers to a packaged anode consisting of the casting, chemical packing material, lead wire, tube, and label.

**Backfill** means material placed in a hole or excavation to fill the space around the anodes, test boxes, and other portions of the project.

**DGSSMS** means the latest version of the Region of Waterloo Design Guidelines and Supplemental Specifications for Municipal Services.

**Metallic Watermain** means a ductile iron, cast iron, or steel watermain pipe.

**OPSS** means the latest version of the Ontario Provincial Standards and Specifications for Roads and Public Works.

**Service Box** means the cylindrical valve box & stem located at property line that provides both protection and access to a curb stop valve.

**Test Box** means a flush mounted terminal that is used to conveniently access the tracer wire for locate and continuity testing.

**Watermains** means as defined in OPSS 441.

## **100.04 MATERIALS**

### **100.04.01 WIRE**

Tracer wire for open trench construction shall be blue in colour (B), High Strength (HS) 12 gauge (AWG) Copper Clad Steel (CCS) wire. Wire shall have a minimal break load of 452 lbs, a 30 mil HDPE jacket and rated for direct bury application. Wire shall be Copperhead 1230-BHS or approved equivalent.

Tracer wire for trenchless construction shall be blue in colour (B), Extra High Strength (EHS) 12 gauge (AWG) Copper Clad Steel (CCS) wire. Wire shall have a minimal break load of 1150 lbs, a 45 mil HDPE jacket and shall be rated for directional drill application. Wire shall be Copperhead 1245-BEHS or approved equivalent.

### **100.04.02 WIRE TO WIRE CONNECTORS**

All connectors shall be filled with a waterproof dielectric silicone and rated for direct bury application.

New connections (12 gauge AWG CCS wire) or connection to existing tracer wire (8-14 gauge AWG wire) shall use DryConn 3-way direct bury lug style connectors (Copperhead Model 3WB-01) or approved equivalent.

Connections for 1245-BEHS wire shall use the appropriate pipe burst connector:

In-line splice connections to be made with Copperhead Model SC-PB-01 or approved equivalent.

Three-way connections to be made with Copperhead Model SC-3WPB or approved equivalent.

### **100.04.03 TEST BOXES**

Test boxes in a landscaped area shall be Copperhead SnakePit Model LD14-TP, 350 mm in length with a cast iron blue locking lid with “water” cast into the cap or approved equivalent.

Test boxes in a hardscaped area shall be Copperhead SnakePit Model CD14-TP, 350 mm in length with a cast iron blue locking lid with “water” cast into the cap or approved equivalent.

### **100.04.04 SERVICE BOXES**

See DGSSMS C.2.9.7



## 100.05 INSTALLATION

### 100.05.01 TRACER WIRE

Tracer wire shall be installed in a continuous run for the full length of the installation and must not be connected to any metallic fittings along the route of the new watermain. The tracer wire shall be taped to the top center of the pipe at 6.0 m intervals and before and after any valve or fitting. All wire dead end locations will require termination with a 6 lbs anode.

### 100.05.02 CONNECTIONS

Connections shall be completed as per the following specifications:

Wire-to-wire connections shall be done by following the connector manufacturer's installation instructions. The appropriate wire stripping tool shall be used to strip any insulation from the tracer wire and the exposed copper wire shall be free of nicks or scores.

The main tracer wire is to remain a continuous run for the full length of the installation; therefore, when making a connection, the main line tracer wire must not be cut. The insulation shall be stripped the length required for the electrical connector, and the bare wire laid into the open mouth of the DryConn lug style connector.

The end of the tap (branch) wire shall be stripped of insulation as per the manufacturer's instructions and the bare end slid into the closed mouth of the DryConn lug style connector. Connections shall be snug and free of exposed copper. With all wires in place and in contact, secure using the set screws and seal as per the manufacturer's instructions. DryConn lug style connectors are for single-use only.

Tracer wire shall only have tap (branch) wire connections, using approved wire connectors, at the following locations:

- hydrant tees,
- watermain tees or crosses,
- large diameter water service tees or tapping sleeves  $\geq 100$  mm diameter,
- residential water services  $\leq 50$  mm diameter, and
- extensions to existing tracer wires (as approved).

When a new non-metallic pipe is being connected to an existing metallic pipe, the tracer wire shall be terminated with a 6 lbs anode using an approved wire connector (and shall not be connected to the existing metallic pipe). When a new non-metallic pipe is being connected to an existing non-metallic pipe, the new tracer wire shall be connected to the existing tracer wire using approved wire connectors. Refer to **City of Waterloo Standard Drawing No. 104** for further information.

Tracer wire must only come to surface at approved test box locations and/or approved service box locations.

### **100.05.03 HYDRANT LEADS**

Tracer wire shall be installed at hydrant leads as per the following specifications:

For a connection between a non-metallic hydrant lead and non-metallic watermain, the new tracer wire shall be connected to the mainline tracer wire at the hydrant tee/tapping sleeve using an approved wire connector. The tracer wire shall then be installed along the lead, taped to the top centre of the pipe every 6.0 m (where applicable) as well as taped to the hydrant barrel and directed to the test box behind the hydrant for connection. See Section **100.05.06**.

Refer to *City of Waterloo Standard Drawing No. 101* for further information.

### **100.05.04 LARGE DIAMETER WATER SERVICES (≥100 mm DIAMETER)**

Tracer wire shall be installed at large diameter water services (≥100 mm diameter) as per the following specifications:

For service connections between non-metallic watermain and non-metallic water services, tracer wire shall be connected to the mainline tracer wire at the tee/tapping sleeve using an approved wire connector. The wire shall then be installed along the service, taped to the top centre of the pipe every 6.0 m (where applicable) and directed to the test box for connection at the property line. If the private side non-metallic water service has an existing tracer wire, it shall be extended using a piece of new 12 gauge AWG tracer wire and approved connectors, then directed to the test box for connection. See Section **100.05.06**.

For service connections between metallic watermain and non-metallic water services, the tracer wire shall be terminated with a 6 lbs anode using an approved wire connector (and shall not be connected to the existing metallic pipe). The tracer wire shall then be installed along length of the service, taped to the top centre of the pipe every 6.0 m (where applicable), and directed to the test box for connection. See Section **100.05.06**.

For site servicing projects (i.e. infill or new site services), the new service tracer wire is to be installed as per the above situations based on the existing watermain material, but instead of installing a test box for access to the tracer wire, a separate piece of tracer wire (i.e. a branch wire) shall be connected to the service tracer wire with an approved connector and then directed up the outside of the valve box (whether tapping valve or property line valve is used) and inside the grommet hole for access from the surface. This is to avoid the test box being damaged by subsequent building construction and/or landscaping along the frontage of the site.

Refer to *City of Waterloo Standard Drawing No. 102* for further information.

## 100.05.05 RESIDENTIAL WATER SERVICES (≤50 mm DIAMETER)

Tracer wire shall be installed at residential water services (≤50 mm diameter) as per the following specifications:

When a non-metallic service tap is installed on a non-metallic watermain, the service tracer wire shall be connected to the mainline tracer wire with an approved wire connector. The tracer wire shall be installed along the service pipe between the service saddle and the curb stop, taped to the service pipe at an appropriate interval so as not to allow the tracer wire to deviate from the alignment of the service pipe. The tracer wire shall then be connected to the tail nut on the curb stop. If the private side non-metallic water service has an existing tracer wire, it shall be extended (if required) using a piece of new 12 gauge AWG tracer wire and approved connectors, and also connected to the tail nut on the curb stop.

When a non-metallic service tap is on a metallic watermain, the tracer wire shall be terminated with a 6 lbs anode using an approved wire connector (and shall not be connected to the existing metallic pipe). The tracer wire shall then be installed along the service pipe between the service saddle and the curb stop, taped to the service pipe at an appropriate interval so as not to allow the tracer wire to deviate from the alignment of the service pipe. The tracer wire shall then be connected to the tail nut on the curb stop. If the private side non-metallic water service has an existing tracer wire, it shall be extended (if required) using a piece of new 12 gauge AWG tracer wire and approved connectors, and also connected to the tail nut on the curb stop.

Where the existing private side service material is found to be metallic, the Contractor shall connect to the new curb stop with a short piece of 25mm copper and then connect to the existing service lateral with the appropriate sized reducer compression fitting(s). In this circumstance, a 12lbs anode must also be affixed to the tail nut on the curb stop. **Poly “whips” will no longer be accepted to connect to the existing service lateral.**

Refer to *City of Waterloo Standard Drawing No. 103* for further information.

## 100.05.06 TEST BOXES

Test boxes shall be installed vertically to finished grade at the following locations:

- Just behind permanent and/or temporary hydrants at the 12 o'clock position (See *City of Waterloo Standard Drawing No.101*),

- Just behind property line valve box (for services  $\geq 100$  mm diameter) directly at the 12 o'clock position (when service valve is in right-of-way landscape), or
- At property line above any service pipe  $\geq 100$  mm diameter directly at the 12 o'clock position (when service valve is in the right-of-way hardscape). See ***City of Waterloo Standard Drawing No.102***.

The tracer wire shall enter the bottom of the test box and be connected to the provided terminal. The included wax pack should then be applied to the connection point. A minimum 600 mm of extra tracer wire length/slack must be provided for the tracer wire inside the test box.

Approval from the Contract Administrator must be obtained if a test box is proposed to be located in a hardscape area. If a test box is required to be installed in a hardscape area, a Copperhead SnakePit Model CD14-TP or approved equivalent shall be used and the test box shall not be installed in the travelled portion of the roadway. At no time should the ABS body of the test box be allowed to contact hot asphalt.

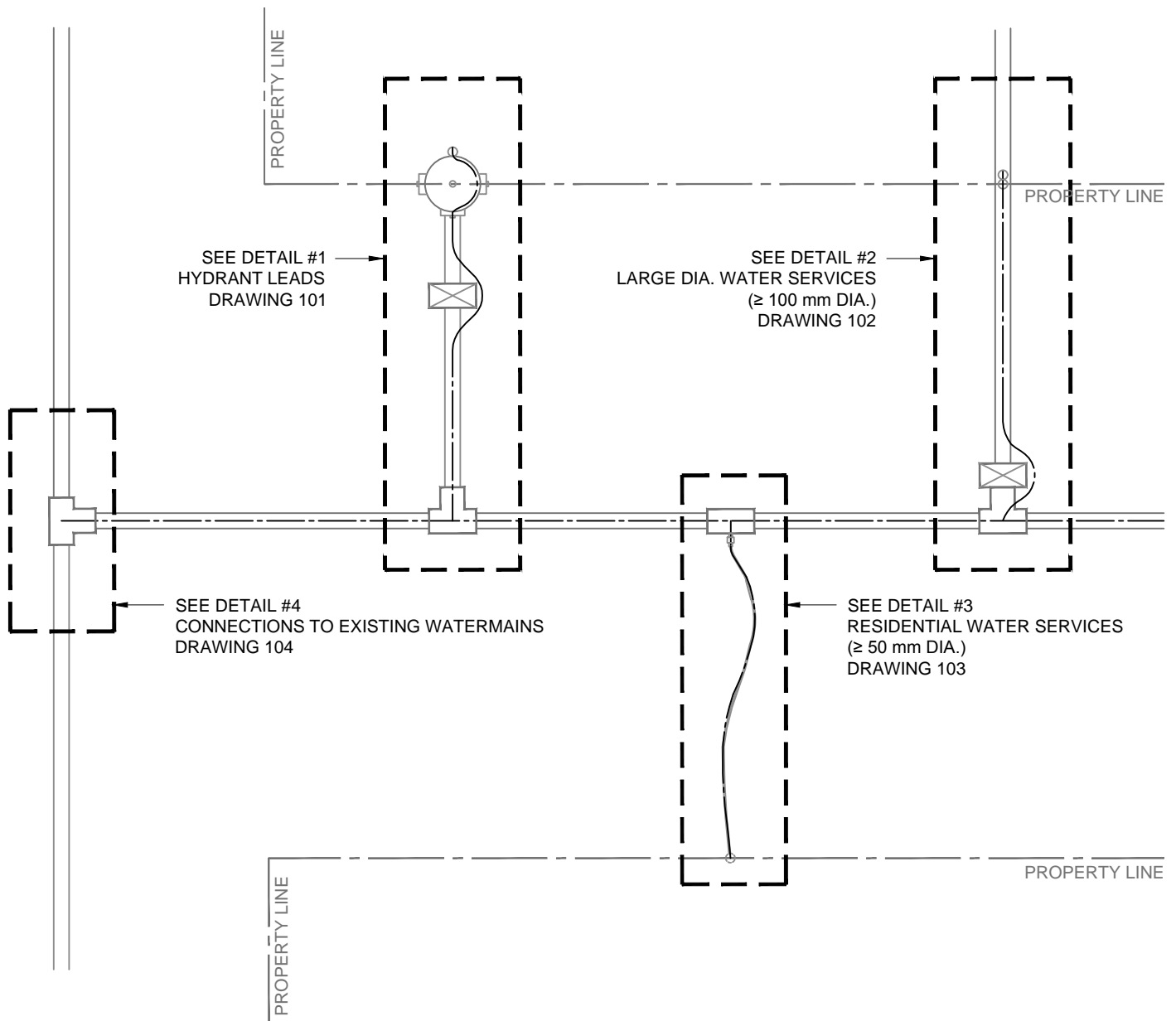
The Contract Administrator shall ensure that the location of the new test boxes are illustrated properly on the As Recorded drawings.

## 100.06 QUALITY ASSURANCE

A tracer wire conductivity test will be required **after the watermain final connection(s) but prior to the installation of the granular road subbase**. The test is expected to demonstrate the integrity of the underground tracer wire by applying a signal and confirming the proper conductance of the signal on all watermains, services, hydrant leads, and chambers. City of Waterloo Utilities reserves first right of refusal to complete the conductivity test on the new watermain. A minimum of 48 hours notice will be required to schedule the test. In the event that City Utilities is unavailable to complete the conductivity test, the Contractor may seek third party assistance or complete it themselves with oversight from the Contract Administrator. The Contract Administrator shall witness the conductivity test(s) and provide written confirmation with the ***Design Sheet E-DS2 Tracer Wire Conductivity Test Template***, as can be found in the latest version of the DGSSMS.

The tracer wire conductivity test shall be performed by applying a direct-connect electromagnetic locate signal on the tracer wire system from all connections points. Tracing must be completed at 512 Hz to pass. The signal shall be detectable for a minimum distance of 300 m from either side of the signal connection point. If failure or defects are found, higher frequencies can be used for troubleshooting purposes only. If any failures or defects are found, the same grounding points will be used for reassessment and to confirm repairs have been completed properly.





ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN.

**STANDARD DRAWING**

REV 3

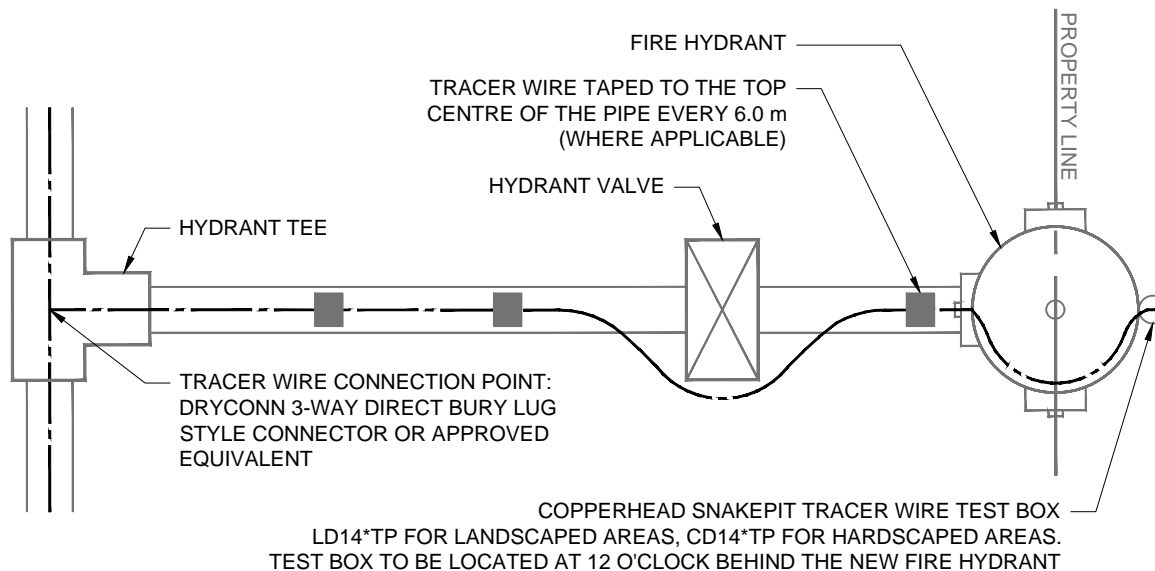
DEC 2019

# **TRACER WIRE GENERAL LAYOUT**

THE CITY OF   
**Waterloo**

DWG NO.

**100**



#### CONNECTION TO NEW NON-METALLIC WATERMAIN

#### NOTES:

1. REFER TO STANDARD DRAWING 100 FOR GENERAL OVERVIEW OF TRACER WIRE DETAIL.
2. REFER TO CONSTRUCTION SPECIFICATION FOR TRACER WIRE INSTALLATION IN THE CITY OF WATERLOO.

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN.

**STANDARD DRAWING**

REV 3

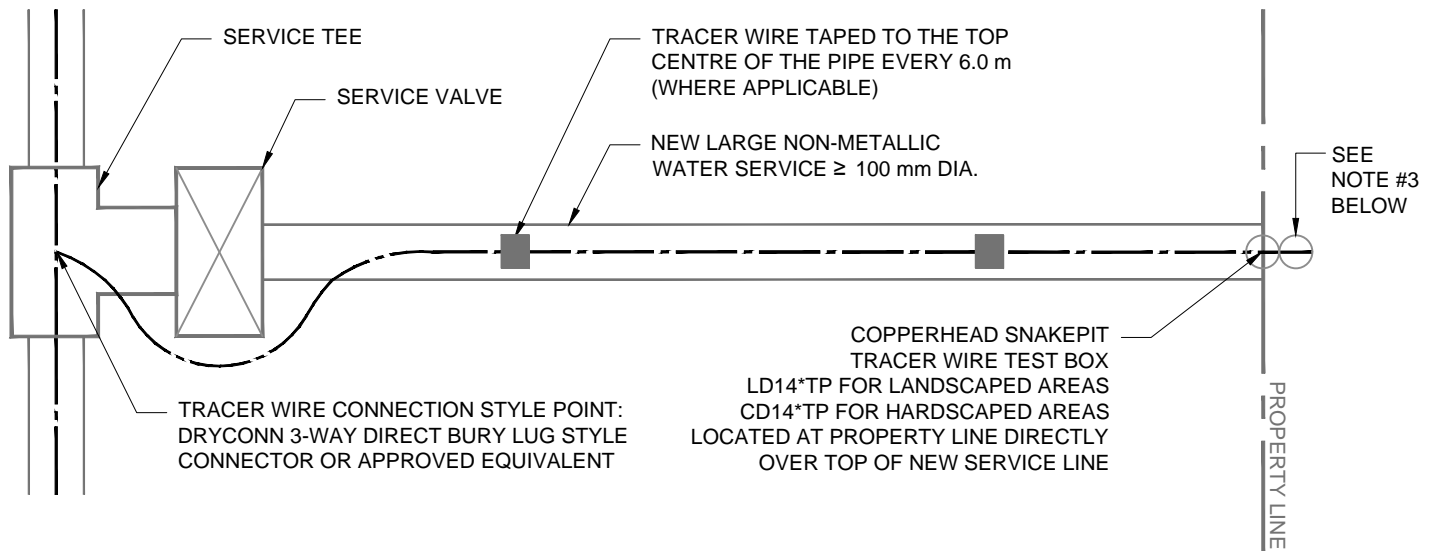
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## **TRACER WIRE - DETAIL #1 HYDRANT LEADS**

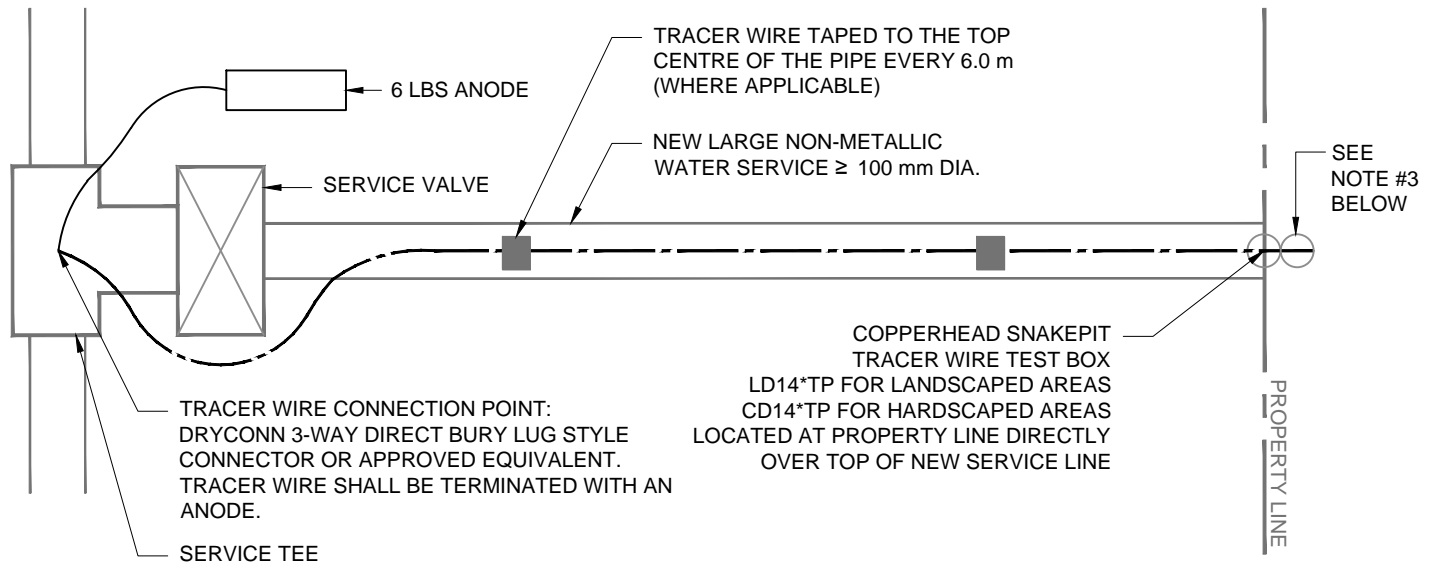
THE CITY OF  
**Waterloo**

DWG NO.

**101**



#### CONNECTION TO NEW NON-METALLIC WATERMAIN



#### CONNECTION TO EXISTING METALLIC WATERMAIN

##### NOTES:

1. REFER TO STANDARD DRAWING 100 FOR GENERAL OVERVIEW OF TRACER WIRE DETAIL.
2. REFER TO CONSTRUCTION SPECIFICATION FOR TRACER WIRE INSTALLATION IN THE CITY OF WATERLOO.
3. IF SERVICE VALVE IS LOCATED AT PROPERTY LINE, TEST BOX SHALL BE INSTALLED BEHIND PROPERTY LINE VALVE BOX.
4. FOR SITE SERVICING PROJECTS (I.E. INFILL OR NEW SITE SERVICES), THE NEW SERVICE TRACER WIRE IS TO BE INSTALLED AS PER THE ABOVE SITUATIONS BASED ON THE EXISTING WATERMAIN MATERIAL, BUT INSTEAD OF INSTALLING A TEST BOX FOR ACCESS TO THE TRACER WIRE, A SEPARATE PIECE OF TRACER WIRE (I.E. A BRANCH WIRE) SHALL BE CONNECTED TO THE SERVICE TRACER WIRE WITH AN APPROVED CONNECTOR AND THEN DIRECTED UP THE OUTSIDE OF THE VALVE BOX (WHETHER TAPPING VALVE OR PROPERTY LINE VALVE IS USED) AND INSIDE THE GROMMET HOLE FOR ACCESS FROM THE SURFACE

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN.

#### STANDARD DRAWING

REV 3

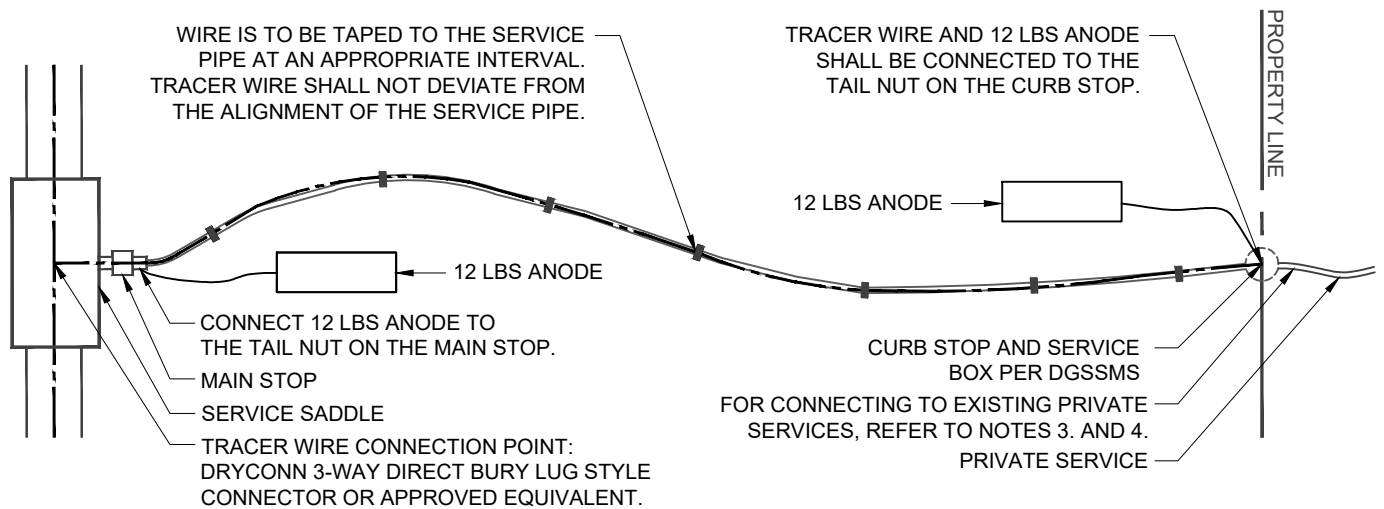
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## TRACER WIRE - DETAIL #2 LARGE DIA. WATER SERVICES ( $\geq 100$ mm)

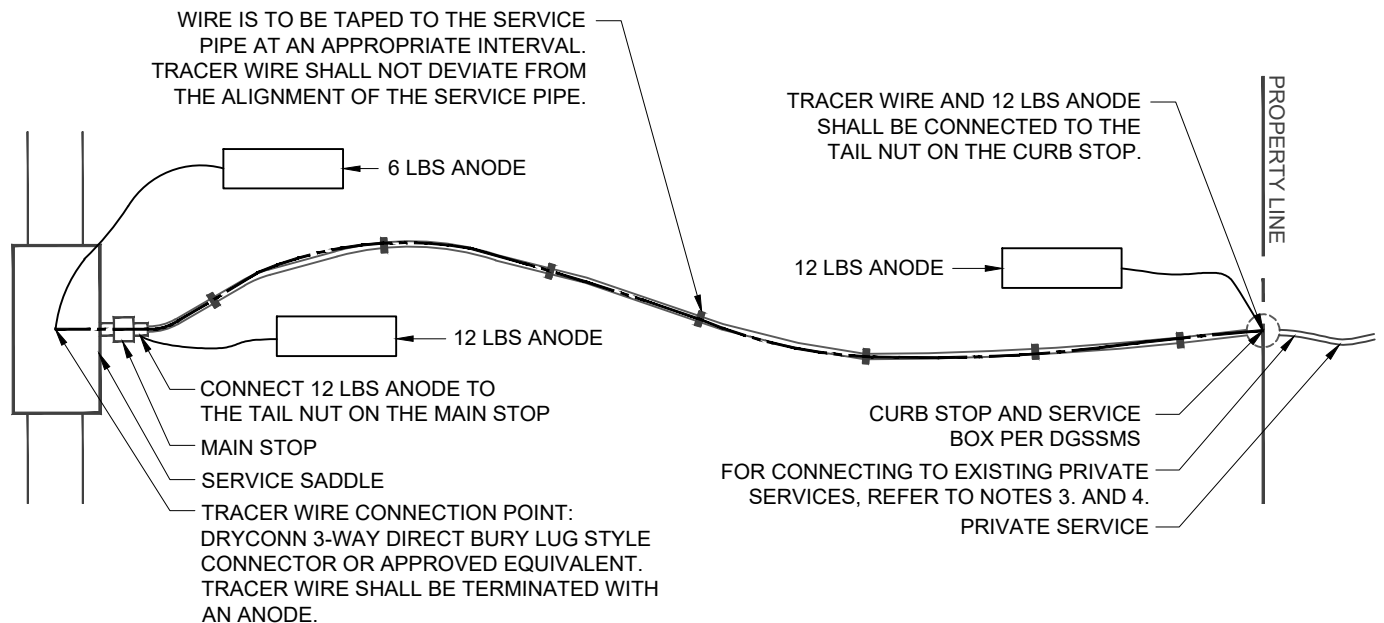
THE CITY OF  
**Waterloo**

DWG NO.

102



#### CONNECTION TO NEW NON-METALLIC WATERMAIN



#### CONNECTION TO EXISTING METALLIC WATERMAIN

#### NOTES:

1. REFER TO STANDARD DRAWING 100 FOR GENERAL OVERVIEW OF TRACER WIRE DETAIL.
2. REFER TO CONSTRUCTION SPECIFICATION FOR TRACER WIRE INSTALLATION IN THE CITY OF WATERLOO.
3. WHEN A REDUCER IS REQUIRED TO CONNECT TO AN EXISTING METALLIC SERVICE, THE SERVICE WILL BE EXTENDED FROM THE CURB STOP TO THE REDUCER USING COPPER PIPING.
4. IF THE EXISTING SERVICE IS NON-METALLIC AND A TRACER WIRE IS FOUND, IT SHALL BE EXTENDED (IF REQUIRED) USING A PIECE OF NEW 12 GAUGE AWG TRACER WIRE AND APPROVED CONNECTORS, AND ALSO CONNECTED TO THE TAIL NUT ON THE CURB STOP.

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN.

### STANDARD DRAWING

REV 3

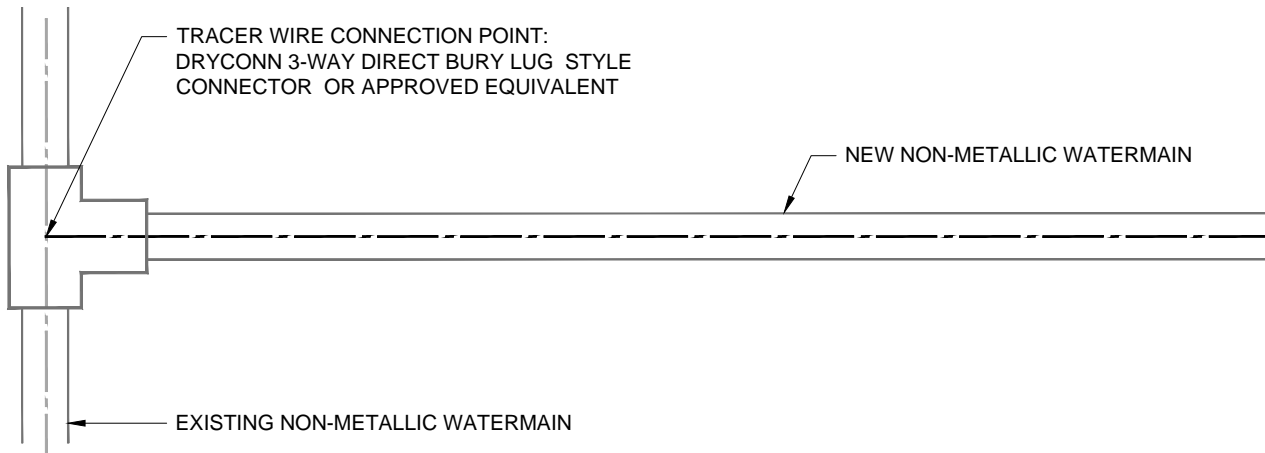
MAR 2022

## TRACER WIRE - DETAIL #3 RESIDENTIAL WATER SERVICES (≤50 mm)

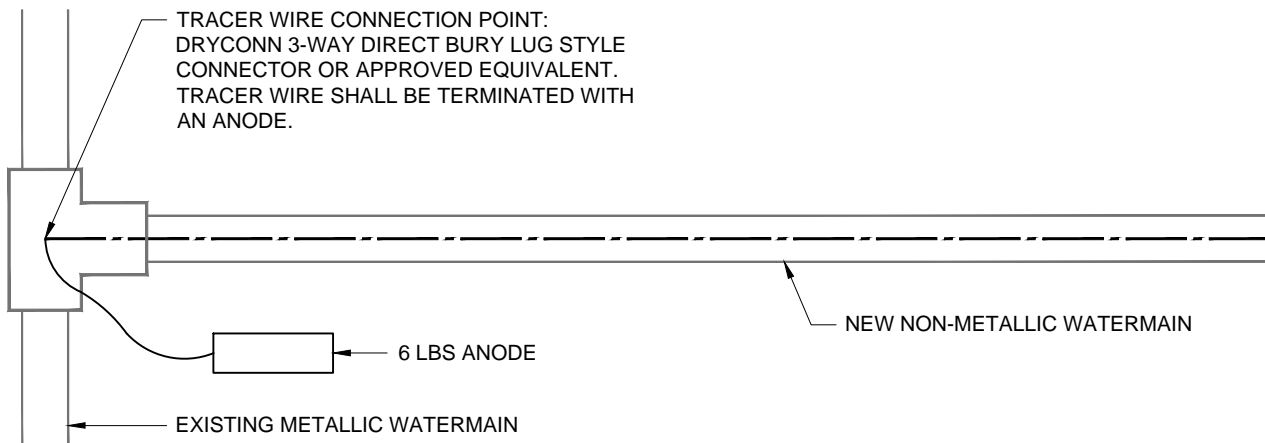
THE CITY OF  
**Waterloo**

DWG NO.

103



**CONNECTION TO EXISTING NON-METALLIC WATERMAIN**



**CONNECTION TO EXISTING METALLIC WATERMAIN**

**NOTES:**

1. REFER TO STANDARD DRAWING 100 FOR GENERAL OVERVIEW OF TRACER WIRE DETAIL.
2. REFER TO CONSTRUCTION SPECIFICATION FOR TRACER WIRE INSTALLATION IN THE CITY OF WATERLOO.

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN.

**STANDARD DRAWING**

REV 2

APR 2019

**TRACER WIRE - DETAIL #4  
CONNECTIONS TO EXISTING WATERMAINS**

THE CITY OF   
**Waterloo**

DWG NO.

**104**