

Materials

General

The work covered by this section of the specifications consists of the furnishing of all labor, supplies, equipment and materials and performing all operations in connection with the installation of tracer wire and appurtenances, as shown on the plans, as herein specified and directed by the Engineer to comply with Senate Bill 18-167. The bill requires that all new underground facilities, including laterals up to the structure or building being served, installed on or after August 8, 2018, must be electronically locatable when installed per section 9-1.5-103(10), C.R.S.

All tracer wire and tracer wire products shall be domestically manufactured in the U.S.A.

All tracer wire shall have HDPE insulation intended for direct bury, color coated per APWA standard for the specific utility being marked.

Tracer Wire

- **Open Trench** - Tracer wire shall be #12 AWG copper clad steel, high strength with minimum 450 lb. break load, with minimum 30 mil HDPE insulation thickness.
- **Directional Drilling/Boring** - Tracer wire shall be #12 AWG copper clad steel, extra high strength with minimum 1,150 lb. break load, with minimum 30 mil HDPE insulation thickness.
- **Tracer wire - Pipe Bursting/Slip Lining** - Tracer wire shall be 7 x 7 stranded copper clad steel, extreme strength with 4,700 lb. break load, with minimum 50 ml HDPE insulation thickness.

Connectors

- All mainline tracer wires must be interconnected in intersections, at mainline tees and mainline crosses. At tees, the three wires shall be joined using a single 3-way lockable connector (SnakeBite™ or approved equal). At crosses, the four wires shall be joined using a 4-way connector. Use of two 3-way connectors with a short jumper wire between them is an acceptable alternative.
- **Direct bury wire connectors** - Shall include SnakeBite™ 3-way lockable connectors (or approved equal) and mainline to lateral lug connectors specifically manufactured for use in underground tracer wire installation. Connectors shall be dielectric silicon filled to seal out moisture and corrosion and shall be installed in a manner so as to prevent any uninsulated wire exposure.
- Non-locking friction fit, twist on or taped connectors are prohibited.

Termination/Access

- All tracer wire termination points must utilize an approved tracer wire access box (above ground access box or grade level/in-ground access box as applicable), specifically manufactured for this purpose.
- All grade level/in-ground access boxes shall include a dual terminal switchable lid (SnakePit® LD14G2T-SW or approved equal), be appropriately identified with "sewer" cast into the cap, and color coded per APWA standard for the specific utility being marked.
- A minimum of 2 ft. of excess/slack wire is required in all tracer wire access boxes after meeting final elevation.
- All tracer wire access boxes must include a manually interruptible conductive/connective link between the terminal(s) for the tracer wire connection and the terminal for the ground rod wire connection.
- Ground wire shall be connected to the identified (or bottom) terminal on all access boxes.
- **Service Laterals on public property** - Tracer wire must terminate with a coil of 6 feet of tracer wire for future extension to the building, located at the edge of the road right-of-way, and out of the roadway.
- **Service Laterals on private property** - Tracer wire must terminate at an approved above-ground tracer wire access box, affixed to the building exterior directly above where the utility enters the building, at an elevation not greater than 5 vertical feet above finished grade, or terminate at an approved grade level/in-ground tracer wire access box, located within 2 linear feet of the building being served by the utility.
- **Long-runs, in excess of 2,500 linear feet** - Tracer wire access must be provided utilizing an approved grade level/in-ground tracer wire access box, located at the edge of the road right-of-way and out of the roadway. The grade level/in-ground tracer wire access box shall be delineated using a minimum 48" polyethylene marker post, color coded per APWA standard for the specific utility being marked or other approved marker by the City of Pueblo.

Grounding

- Tracer wire must be properly grounded at all dead ends/stubs.
- Grounding of tracer wire shall be achieved by use of a drive-in magnesium ground rod with a minimum of 20ft of #12 red HDPE insulated copper clad steel wire connected to anode (minimum 1.5 lb.) specifically manufactured for this purpose and buried at the same elevation as the utility.
- When grounding the tracer wire at dead ends/stubs, the ground rod shall be installed in a direction 180 degrees opposite of the tracer wire, at the maximum possible distance.
- When grounding the tracer wire in areas where the tracer wire is continuous and neither the mainline tracer wire or the ground rod wire will be terminated at/above grade, install ground rod wire directly beneath and in-line with the tracer wire. Do not coil excess wire from ground rod wire. In this installation method, the ground rod wire shall be trimmed to an appropriate length before connecting to tracer wire with a mainline to lateral lug connector.
- Where the ground rod wire will be connected to a tracer wire access box, a minimum of 2 ft. of excess/slack wire is required after meeting final elevation.

Installation

General

- Tracer wire installation shall be performed in such a manner that allows proper access for connection of line tracing equipment, proper locating of wire without loss or deterioration of low frequency (512Hz) signal for distances in excess of 1,000 linear feet, and without distortion of signal caused by multiple wires being installed in close proximity to one another.
- Tracer wire systems must be installed as a single continuous wire, except where using approved connectors. No looping or coiling of wire is allowed.
- Any damage occurring during installation of the tracer wire must be immediately repaired by removing the damaged wire and installing a new section of wire with approved connectors. Taping and/or spray coating shall not be allowed.
- Tracer wire shall be installed at the top of the pipe and secured (taped/tied) at 5' intervals.
- Tracer wire must be properly grounded as specified.
- Tracer wire on all service laterals/stubs must terminate at an approved tracer wire access box located directly above the utility, at the edge of the road right-of-way but out of the roadway. (See Tracer wire **Termination/Access**)
- At all mainline dead-ends, tracer wire shall go to ground using an approved connection to a drive-in magnesium ground rod, buried at the same depth as the tracer wire. (See **Grounding**)
- Mainline tracer wire shall not be connected to existing conductive pipes. Treat as a mainline dead-end and ground using an approved waterproof connection to a ground rod buried at the same depth as the tracer wire.
- All service lateral tracer wires shall be a single wire, connected to the mainline tracer wire using an approved mainline to lateral lug connector, installed without cutting/splicing the mainline tracer wire.
- In occurrences where an existing tracer wire is encountered on an existing utility that is being extended or tied into, the new tracer wire and existing tracer wire shall be connected using approved splice connectors and shall be properly grounded at the splice location as specified.

Storm & Sanitary Sewer Systems

- All service lateral tracer wires must be properly connected to the mainline tracer wire to ensure full tracing/locating capabilities from a single connection point.
- Lay mainline tracer wire continuously, by-passing around the outside of manholes/structures on the north or east side.
- Tracer wire on all sewer laterals must terminate at the property line with a coil of 6 feet of tracer wire taped directly to the service lateral at the edge of the road right-of-way or at an approved location.
- The City of Pueblo Stormwater Department or Wastewater Department must be contacted to inspect tracer wire installation prior to backfilling any infrastructure that connects to the City's storm sewer or sanitary sewer system.

Prohibited Products and Methods

The following products and methods shall not be allowed or acceptable:

- Uninsulated tracer wire
- Tracer wire insulations other than HDPE
- Tracer wires not domestically manufactured
- Non-locking, friction fit, twist on or taped connectors
- Brass or copper ground rods
- Wire connections utilizing taping or spray-on waterproofing
- Looped wire or continuous wire installations, that has multiple wires laid side-by-side or in close proximity to one another
- Tracer wire wrapped around the corresponding utility
- Brass fittings with tracer wire connection lugs
- Wire terminations within the roadway, i.e. in valve boxes, cleanouts, manholes, etc.
- Connecting tracer wire to any conductive utilities

Testing

- All new tracer wire installations shall be located using typical low frequency (512Hz) line tracing equipment, witnessed by the contractor, engineer and facility owner as applicable, prior to acceptance of ownership.
- This verification shall be performed upon completion of rough grading and again prior to final acceptance of the project.
- Continuity testing in lieu of actual line tracing shall not be accepted.

Products

The following products have been deemed acceptable and appropriate. These products are a guide only to help you choose the correct applications for your tracer wire project.

• **Copper-Clad Steel (CCS) Tracer Wire**

- o **Open Trench** - Copperhead® #12 High Strength part # 1230G-HS or approved equal.
- o **Directional Drilling/Boring** - Copperhead® Extra High Strength part # 1245G-EHS or approved equal.
- o **Pipe Bursting/Slip Lining** - Copperhead® SoloShot Extreme Strength 7 x 7 Stranded part # GPBX- 50 or approved equal.

• **Connectors**

- o Copperhead® 3-way locking connector part # LSC1230C or approved equal.
- o DryConn 3-way Direct Bury Lug: Copperhead® Part # 3WB-01 or approved equal.

• **Termination/Access**

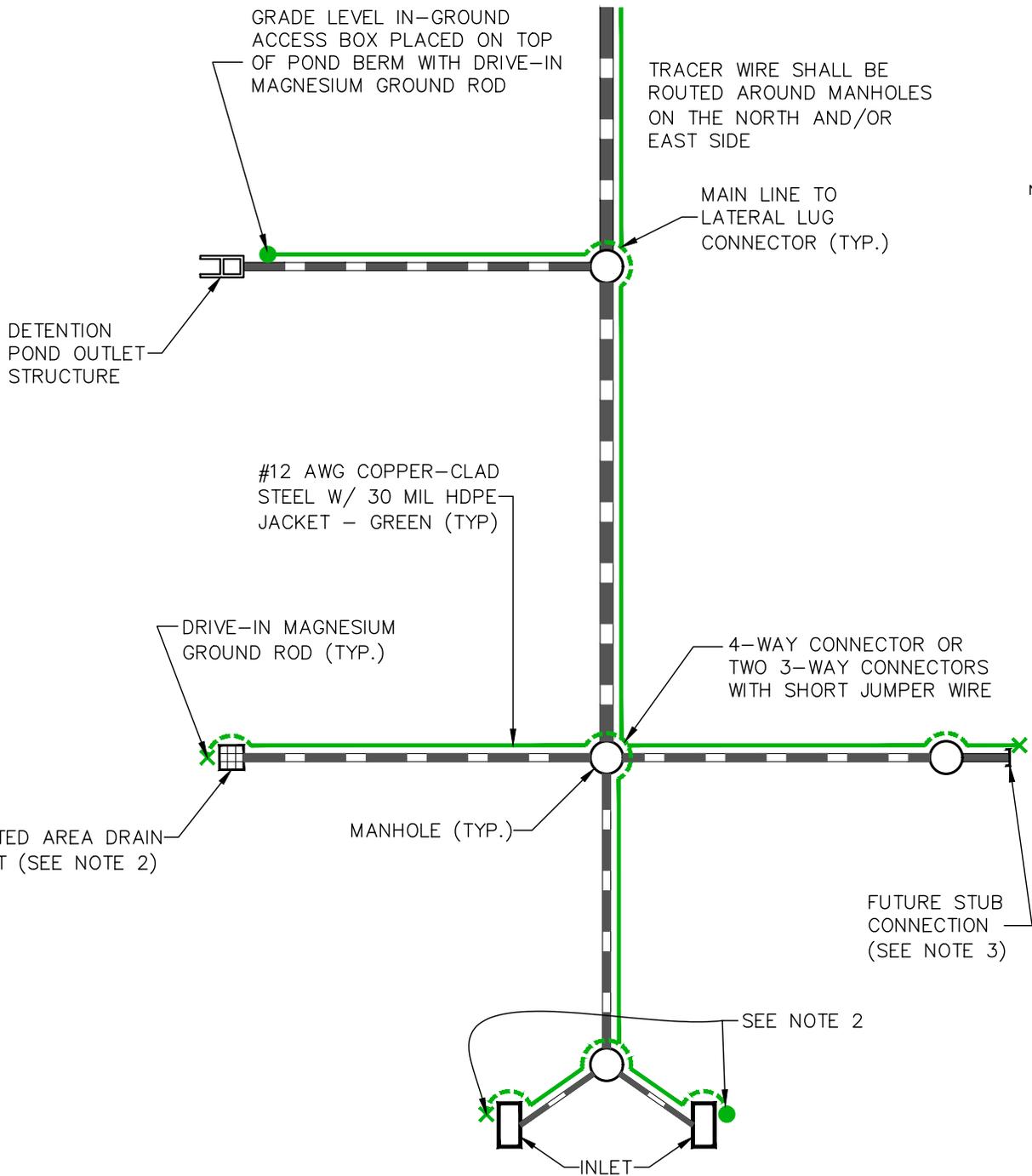
- o **Non-Roadway access boxes applications:** Tracer wire access boxes grade level Copperhead® 3-way Direct Bury Lug adjustable lite duty Part # LD14G2T-SW or approved equal.
- o **Concrete / Driveway access box applications:** Tracer wire access boxes grade level Copperhead® Part # CD14G2T-SW or approved equal.

• **Grounding**

- o **Drive in Magnesium Ground Rod:** Copperhead® Part # ANO-12 (1.5 lb.) or approved equal.

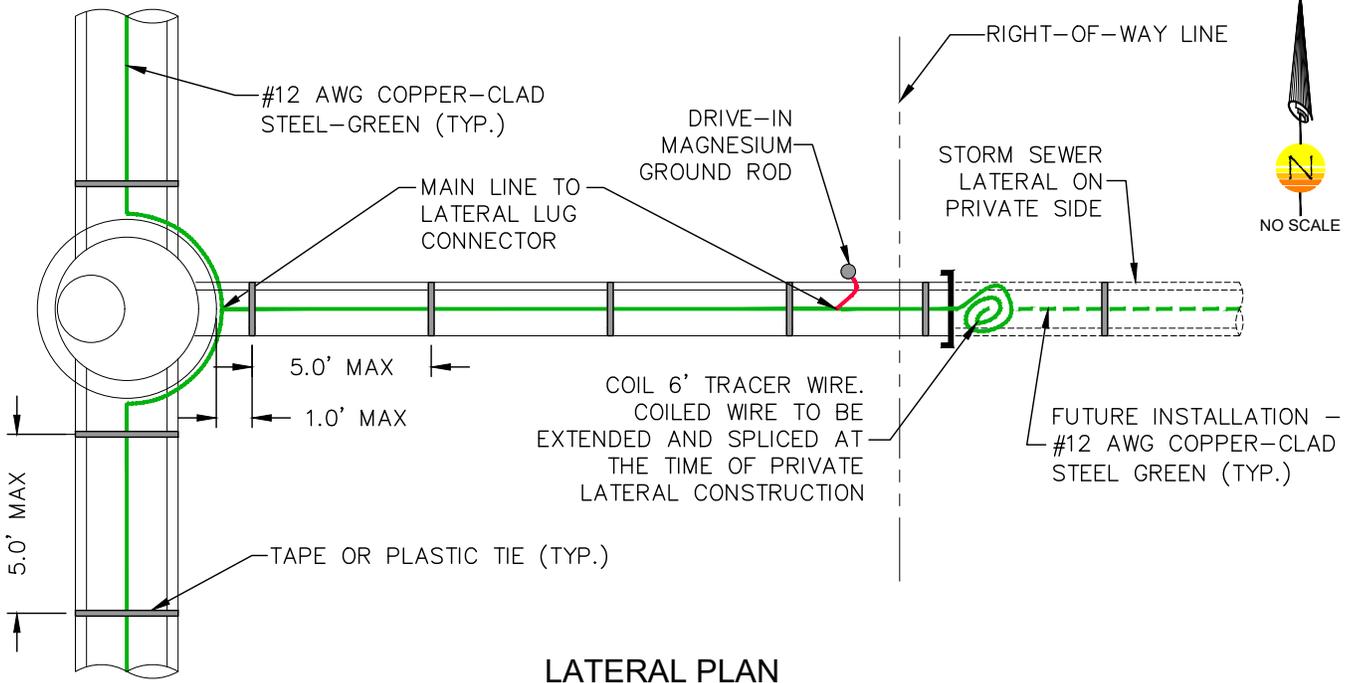
Manufacturer Product Options:

Copperhead® products or approved equal.

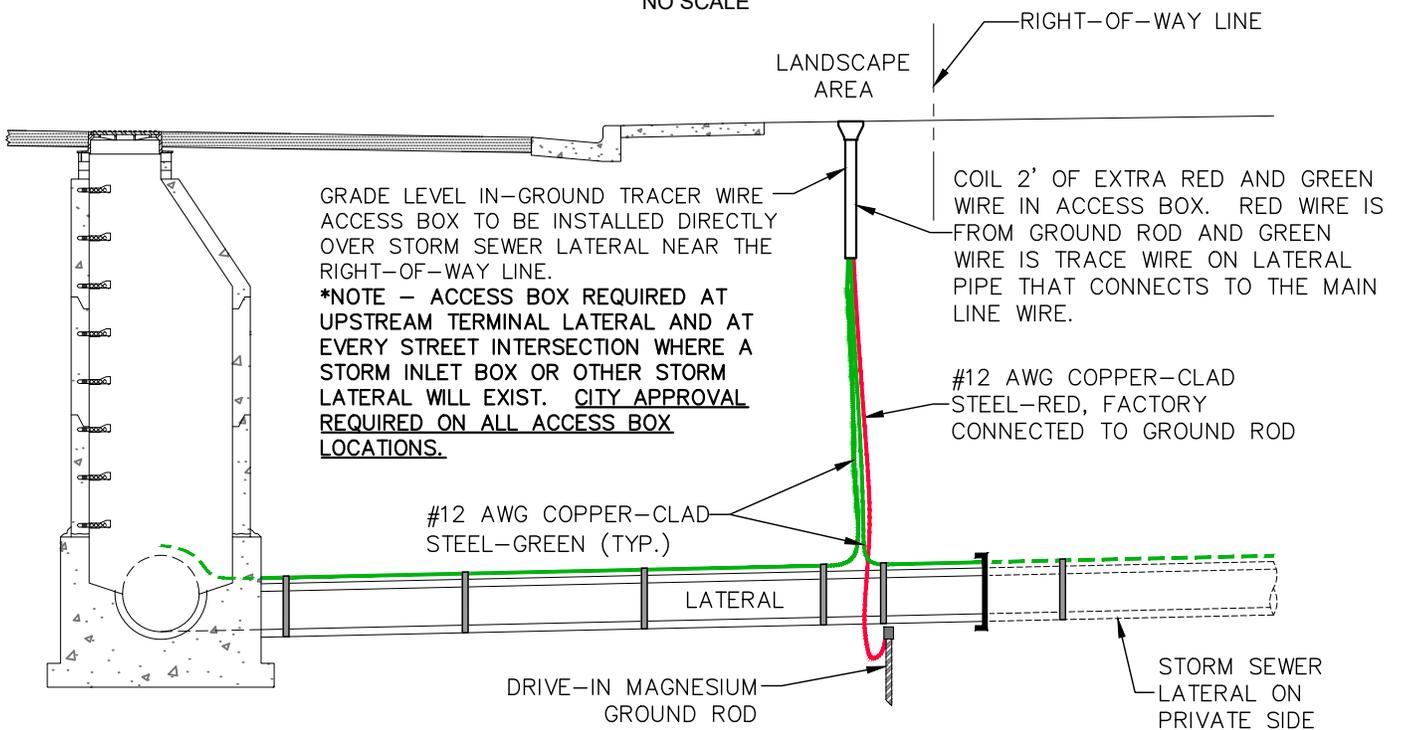


NOTES:

1. WIRE SHOWN AWAY FROM PIPE FOR CLARITY. WIRE SHALL BE INSTALLED ON THE TOP OF THE PIPE. THE WIRE SHALL BE FASTENED TO THE PIPE WITH TAPE OR PLASTIC TIES AT 5' INTERVALS.
2. TRACER WIRE FOR INLETS MAY TERMINATE INSIDE OF INLET BOX BELOW THE ACCESS (SEE DETAIL SHEET 6 OF 8) OR A GRADE LEVEL IN-GROUND ACCESS BOX MUST BE USED (OPTION REQUIRES CITY APPROVAL IN PAVED AREAS). DRIVE-IN MAGNESIUM GROUND ROD MUST BE USED FOR EITHER OPTION.
3. AT ALL FUTURE STUB CONNECTIONS, A MINIMUM OF 6 FEET OF TRACER WIRE SHALL BE EXTENDED BEYOND THE END OF THE PIPE, COILED AND SECURED FOR FUTURE CONNECTIONS. THE END OF THE TRACER WIRE SHALL BE SPliced TO THE WIRE OF A DRIVE-IN MAGNESIUM GROUND ROD AND IS TO BE BURIED AT THE SAME ELEVATIONS AS THE SEWER MAIN.



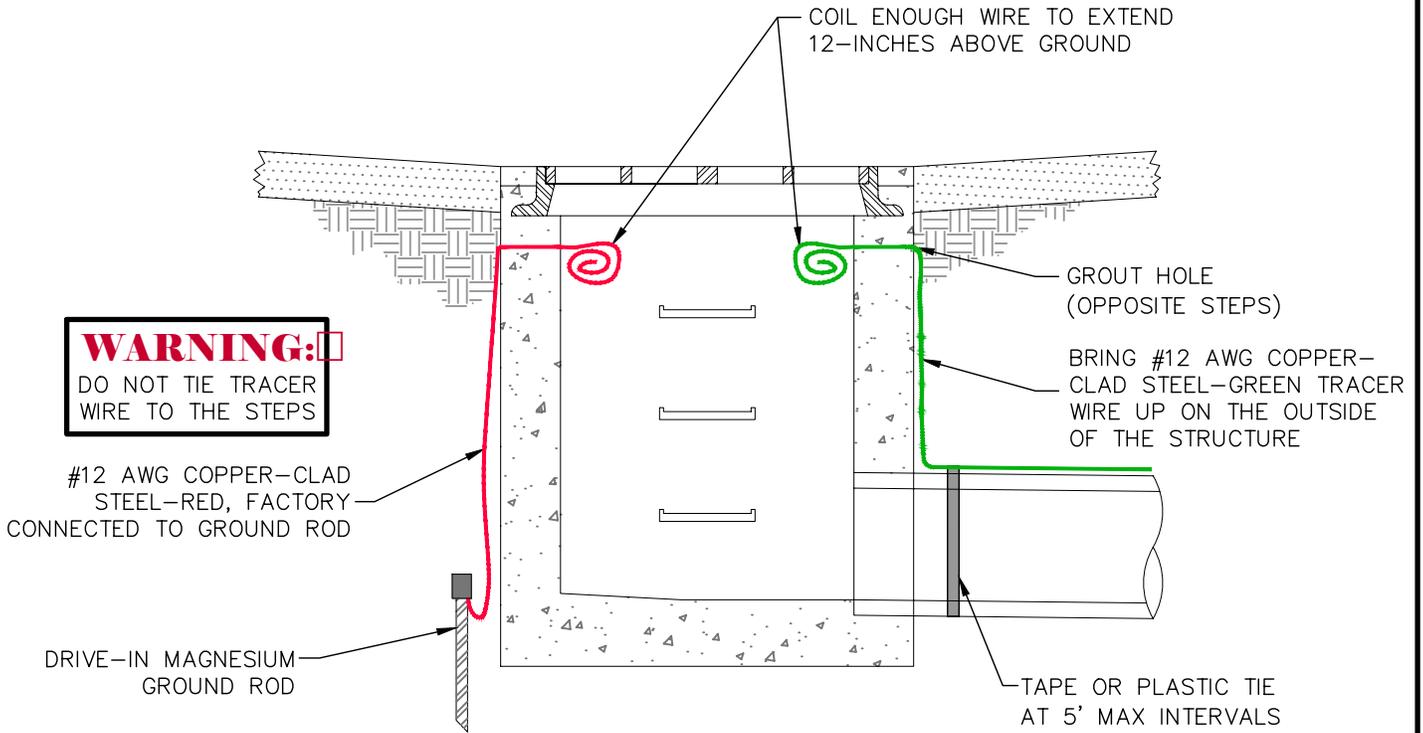
LATERAL PLAN
NO SCALE



LATERAL PROFILE
NO SCALE

NOTES:

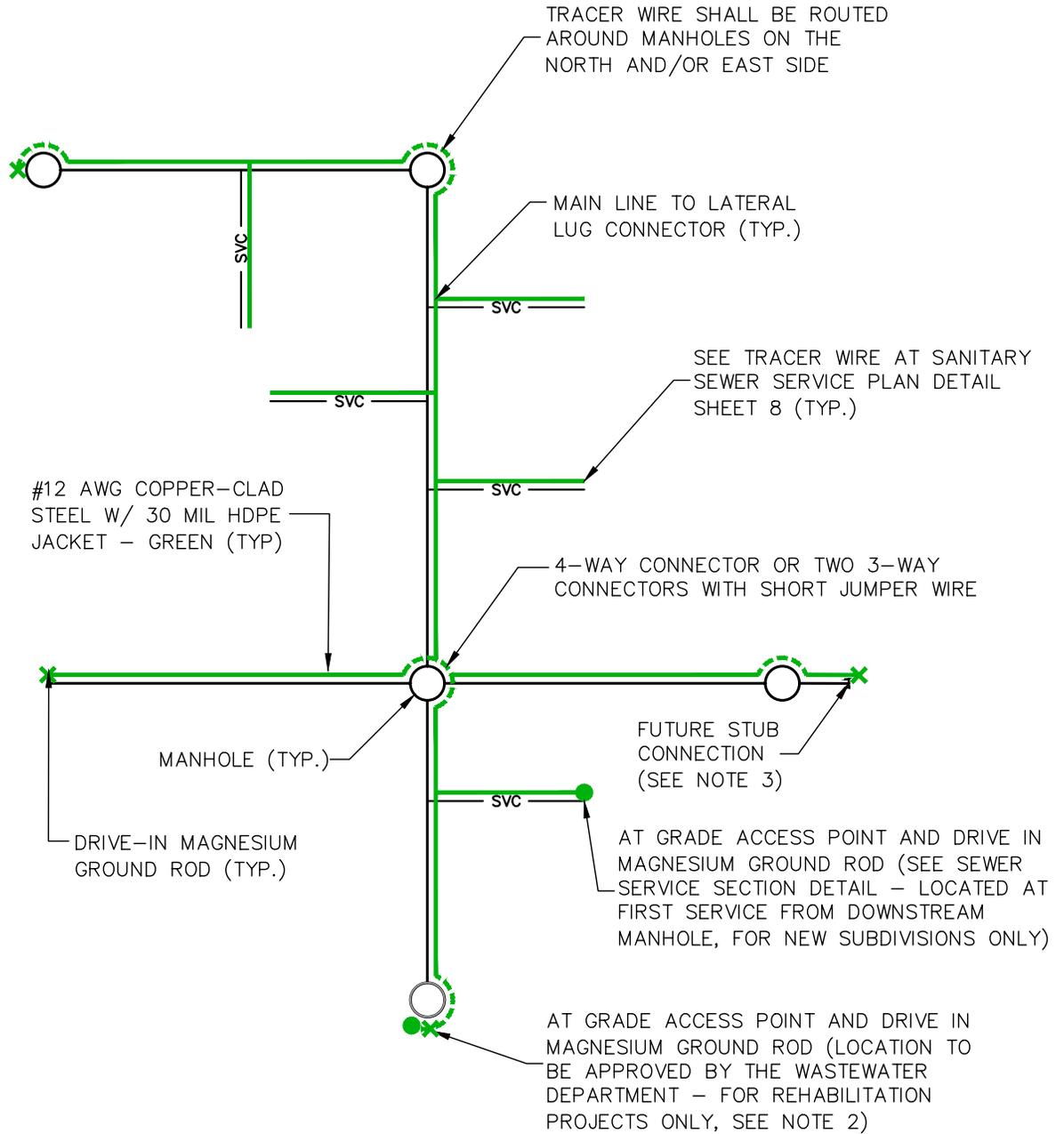
1. WIRE SHOWN AWAY FROM PIPE FOR CLARITY. WIRE SHALL BE INSTALLED IMMEDIATELY ADJACENT TO THE SERVICE PIPE. THE WIRE SHALL BE FASTENED TO THE PIPE WITH TAPE OR PLASTIC TIES AT 5' INTERVALS.
2. TRACER WIRE NOT REQUIRED FOR REHABILITATION PROJECTS.



NOTE:

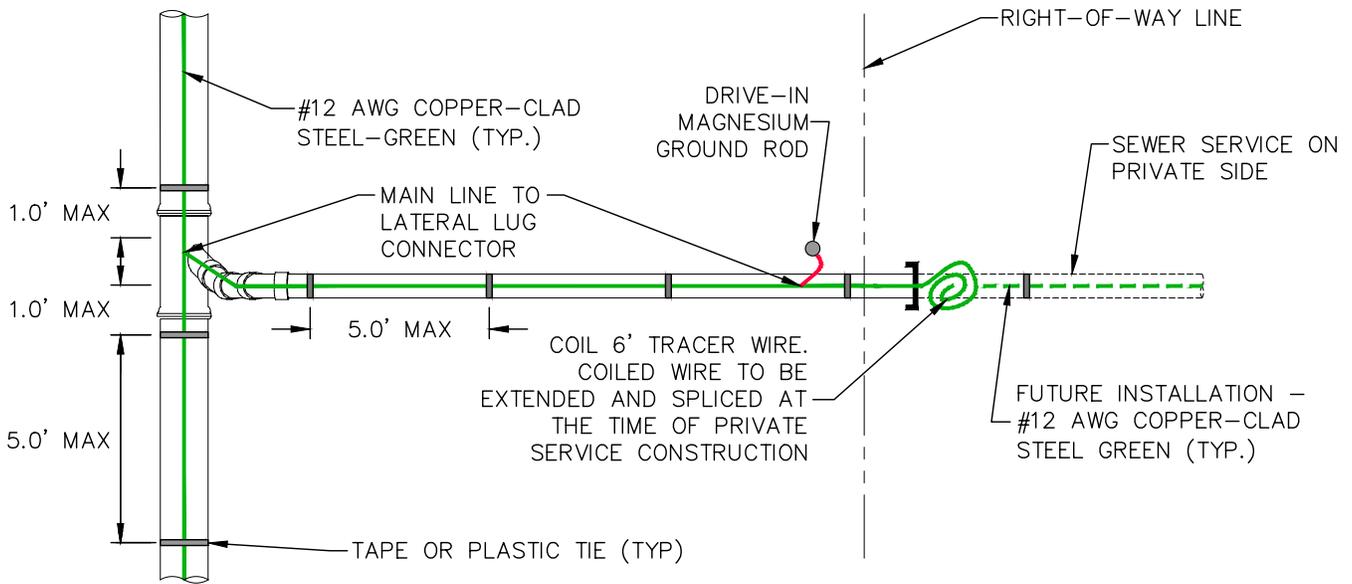
THIS OPTION IS RECOMMENDED FOR INLETS IN A PARKING LOT WHERE A LEVEL IN-GROUND TRACER WIRE ACCESS BOX HAS POTENTIAL TO BE COVERED BY ASPHALT OVERLAY. THIS OPTION REQUIRES CITY OF PUEBLO STORMWATER APPROVAL AND MAY BE SUBJECT TO ADDITIONAL REQUIREMENTS.

**INLET OR MANHOLE LOCATED
IN A PAVED SURFACE**
NO SCALE

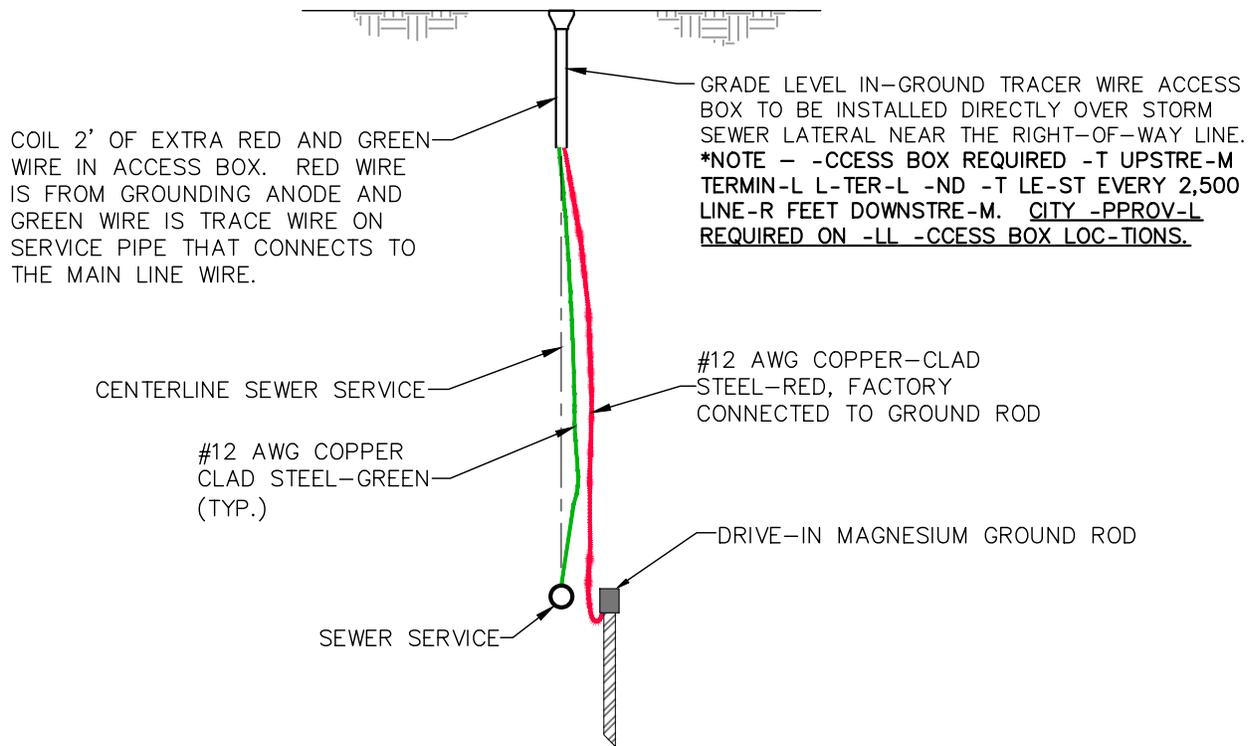


NOTES:

1. WIRE SHOWN AWAY FROM PIPE FOR CLARITY. WIRE SHALL BE INSTALLED ON THE TOP OF THE PIPE. THE WIRE SHALL BE FASTENED TO THE PIPE WITH TAPE OR PLASTIC TIES AT 5' INTERVALS.
2. REHABILITATION PROJECTS SHALL HAVE A DRIVE-IN MAGNESIUM GROUND ROD INSTALLED ON THE UPSTREAM AND DOWNSTREAM MANHOLES AS WELL AS A GRADE LEVEL IN-GROUND ACCESS BOX INSTALLED AT THE DOWNSTREAM MANHOLE (ACCESS BOX TYPE AND LOCATION TO BE APPROVED BY WASTEWATER DEPARTMENT).
3. AT ALL FUTURE STUB CONNECTIONS, A MINIMUM OF 6 FEET OF TRACER WIRE SHALL BE EXTENDED BEYOND THE END OF THE PIPE, COILED AND SECURED FOR FUTURE CONNECTIONS. THE END OF THE TRACER WIRE SHALL BE SPLICED TO THE WIRE OF A DRIVE-IN MAGNESIUM GROUND ROD AND IS TO BE BURIED AT THE SAME ELEVATIONS AS THE SEWER MAIN.



SEWER SERVICE PLAN
NO SCALE



SEWER SERVICE SECTION
NO SCALE

NOTES:

1. WIRE SHOWN AWAY FROM PIPE FOR CLARITY. WIRE SHALL BE INSTALLED IMMEDIATELY ADJACENT TO THE SERVICE PIPE. THE WIRE SHALL BE FASTENED TO THE PIPE WITH TAPE OR PLASTIC TIES AT 5' INTERVALS.
2. TRACER WIRE NOT REQUIRED FOR REHABILITATION PROJECTS.