



**Markers for Underground Facilities**

**Sample Specifications**

The Common Ground Alliance (CGA) [Best Practices Guide](https://commongroundalliance.com/BPguide) sections on [Markers for Underground Facilities](https://commongroundalliance.com/best-practices/best-practices-guide/25-markers-underground-facilities) and [Electronically Locatable Lines](https://commongroundalliance.com/best-practices/best-practices-guide/217-electronically-locatable-lines) provide practice descriptions of to identify, locate and mark underground lines.

**This model form/template must be customized to meet your Agency’s needs.**

Marker System

According to the CGA, the purpose of aboveground markers is to identify underground facilities, not to locate for excavation or circumvent the one-call process. Belowground markers used in conjunction with aboveground markers may include tracer wire, warning tape, and/or electronic marking devices. CGA [best practices](https://commongroundalliance.com/best-practices/best-practices-guide/25-markers-underground-facilities) include proper grounding, marking the end placement or approximate location of belowground markers with aboveground markers, protecting belowground markers from damage during backfill operations, and placement/method of installation.

WARNING/IDENTIFICATION TAPE (sample specifications)

Warning/identification tape shall be installed to identify the location of underground utilities and to act as a warning against accidental excavation of buried utilities. Warning/identification tape shall be used on all underground water and recycled water mains, potable and recycled water irrigation systems, sewer mains, and all related appurtenances. Warning/identification tape shall also be used on cathodic protection wiring systems and tracer wire brought into and out of access ports.

TRACER WIRE

Tracer wire shall be installed on all buried water lines, recycled water lines, sewer mains, and laterals to provide a continuous signal path used to determine pipe alignment after installation.

* + 1. Tracer Wire:
       1. Tracer wire shall be installed above all buried piping outside of structures. Tracer wires shall be terminated above grade at the end of each pipe run.
       2. Tracer wire shall be installed in accordance with the US Department of Transportation Gas Pipeline Safety Standards in [49 CFR 192.321](https://www.govinfo.gov/app/details/CFR-2010-title49-vol3/CFR-2010-title49-vol3-sec192-321) “Installation of plastic pipe (e). Plastic pipe that is not encased must have an electrically conducting wire or other means of locating the pipe while it is underground. Tracer wire may not be wrapped around the pipe and contact with the pipe must be minimized.”
       3. Tracer wire shall be polyethylene insulated 30 mils minimum thickness 12-gauge annealed copper wire or steel core copper wire. Insulation shall conform to ANSI requirements. Bare wire or nylon jacketed wire such as type THHN is not acceptable.
       4. Tracer wire shall be Republic Wire, Inc.; Copperhead Industries LLC; or equivalent.
       5. Nonmetallic tracer spacers shall be used where needed to hold the wire in position while backfilling the pipe trenches.
       6. Wires with cut or damaged insulation are not acceptable and replacement of the entire wire which has been damaged will be required at the Contractor's expense.
       7. Tracer wire shall be tested and verified by the District Engineer, or designated representative.

MARKER POSTS

When pipeline is located outside of a paved street, provide marker posts for buried pipelines at 500 feet on center or as directed by the District Engineer. Use 6-inch diameter schedule 40 steel pipe, (min. 48 inches above finish grade, buried 18 inches in firm earth).filled with cement grout and painted white with blue stenciled lettering indicating “WATER,” or approved equal.

WARNING TAPE AND TRACING WIRE

TAPE**:** During the backfilling process, all PVC and Ductile Iron water mains, service lines, and system appurtenances shall have a continuous warning tape placed immediately above them and throughout their length at a depth of eighteen (18) inches above the utility line surface. The tape shall be six (6) inches wide. Tape material shall be formulated from 100 percent virgin polyolefin resins. Resins shall be pigmential for chemical stability and resistance to sulfide staining (color fastness). Tape shall be constructed by the mechanical (non-adhesive) lamination of two plies of three layers blown film in such a manner as to produce a bi-axially oriented structure. The tape shall be able to provide a 700 percent elongation prior to rupture as per ASTM-D882.

The tape shall meet or exceed the standards provided in the Materials Specification List, included in these Standards. The warning tape shall be manufactured with a permanent APWA line color pigment at a maximum of every thirty (30) inches along its length, be imprinted with a continuous warning message as follows:

**“CAUTION: (State Type) WATER LINE BURIED BELOW”**

At tees, tape ends, etc., the warning tape shall be tied together (spliced) with a knot to create a continuous warning tape throughout the length of the pipeline and associated branch lines, appurtenances, etc.

TRACING WIRE**:** In addition to the installation of warning tape, copper tracing wire is to be installed with all water mains. This includes all mains and individual hydrants. The tracing wire shall be taped, using electrical tape, on top of the pipe at ten (10) foot centers, for the total length of the pipe.

The tracing wire shall be 12 AWG (Average wire gauge), solid core, copper wire (solid core meaning one (1) single continuous strand of copper wire). In addition, the wire insulating coating (jacket) shall be blue in color and shall have 45 mils of polyethylene insulation thickness and high molecular weight. In addition, the tracing wire shall be HMW-PE and rated for UL 600V construction. The wire shall be suitable for wet or dry applications. The wire size (gauge) shall be continuously affixed (printed on) the entire length of all tracing wire coating and shall be easily read.

Where a splice is required, or when a three (3)-way splice is necessary, the wires shall be joined together with an appropriate size (blue) wire nut which shall then be placed inside a 3M brand Direct Bury Splice kit (DBR), or approved equal, of appropriate size. No bare wire shall be left exposed anywhere. All wires shall be spliced to all other wires for a continuous tracing wire system.

On all hydrants and above-ground appurtenances, the tracing wire shall be run up and protected. This wire end shall not be bare but shall have the coating jacket intact. The location and frequency of test boxes shall be as directed by P.M., or designee. Test boxes, connected onto tracing wire system as per detailed drawings herein, shall be required where hydrants are not used or where hydrant spacing exceeds 500 feet.

No electrical connections of the tracing wire to any metal pipes or metal service lines will be allowed and care shall be taken to ensure that the tracing wire is not damaged during installation. The tracing wire will be tested for continuous signal (continuity test) and shorts to ground across all main and service lines before asphalt is installed, and prior to subgrade preparation. The tracing wire must be able to conduct a continuous signal before the pipe is accepted.

References:

* Common Ground Alliance [2.5](https://commongroundalliance.com/best-practices/best-practices-guide/25-markers-underground-facilities) and [2.17](https://commongroundalliance.com/best-practices/best-practices-guide/217-electronically-locatable-lines)
* Common Ground Alliance New Technologies Making [Non-Metallic Facilities Locatable without Tracer Wire](https://commongroundalliance.com/sites/default/files/toolkits/CGA_Technology_3M_Locating%20nonmetallic%20webinar_100218%20%28002%29.pdf) Webinar - Oct 2, 2018. To view the webinar recording click [here](https://commongroundalliance.com/sites/default/files/toolkits/New%20Technologies%20Making%20Non%20Metallic%20Facilities%20Locatable%20without%20Tracer%20Wire%20Webinar%20-%20Oct%202%2C%202018.zip).
* [ASTM D248](https://www.astm.org/Standards/D1248.htm) Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable
* [ASTM-D882](https://www.astm.org/Standards/D882) Standard Test Method for Tensile Properties of Thin Plastic Sheeting
* EMWD Tracer Wire Specification