

COMMON GROUND ALLIANCE BEST PRACTICES COMMITTEE

Proposal Form – Revision to Best Practice

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TRANSACTION RECORD TR-2015-01

Revision to CGA Best Practice 2–5: Markers for Underground Facilities

Purpose:

Add clarity for the installation of tracer wire, warning tape, and electronic marking devices. Include guidelines for the recommended installation of markers for underground facilities.

Current Best Practice

2–5: Markers for Underground Facilities

Practice Statement:

The presence and type of underground facilities are indicated by permanent aboveground and belowground markers and material.

Practice Description:

A combination of aboveground and belowground markers is used to identify and locate underground facilities. The purpose of aboveground markers is to identify underground facilities, not to locate for excavation or circumvent the one call process. However, designing underground facilities for future location reduces the risk of an incorrectly marked underground facility during an excavation project. Aboveground markers are developed during the design process and include the company name, type of facility, emergency contact, and the one call number. The locations and types of markers are specified in the construction plans. The design provides a marker system that includes, but is not limited to, stream crossings, public road crossings, other facilities' rights-of-way, railroad crossings, heavy construction areas, and any other location where it is necessary to identify the underground facility location. If nondetectable facilities are being installed, the design includes a means to accurately locate the underground facility from the surface. The facility is color-coded in accordance with the American Public Works Association (APWA) guidelines to assist in identifying the particular facility. Road decals, stencils, tracer tapes, electronic markers, or other appropriate systems may mark areas where traditional markers are considered impractical. [Below ground markers may include tracer wire, warning tape, and/or electronic marking devices \(see Appendix B Uniform Color Code and Marking Guidelines\)](#)

Benefits:

Provisions to aid in future locating requests are included in the design. In addition, an effective marker system is beneficial to the underground facility owner/operator and first responders to an area involving more than one underground facility or an incident near underground facilities.

References:

- 49 CFR Parts 192 and 195
- Industry standards
- APWA, “Guidelines for Uniform Temporary Marking of Underground Facilities”
- ANSI ASC GPTC Z380 Gas Piping Technology Guide (<https://www.aga.org/gptc>)

Appendix B – Guidelines for Below Ground Marker Installation^{1, 2, 3}

A facility operator marks below ground facility by one or more of the following methods:

1. Tracer Wire

- Coated corrosion-resistant metal wire (#12 AWG or larger) is buried along the facility.
- Tracer wire may be installed physically separated from or immediately adjacent to the facility.
- A separation of 2" to 6" between facility and tracer wire is recommended.
- Tracer wire should never be wrapped around the facility.
- Tracer wire is taped to the outside of facility for installation by boring or plowing-in. A strong or higher gauge wire should be considered for this installation.
- Tracer wire is installed below, above, or adjacent to the facility.
- Cathodic protection for the tracer wire should be considered.
- Ends of the tracer wire may be placed into a curb box, valve box, or on the outside of the above ground connection.
- Proper grounding of the tracer wire by connecting the ends or the dead end of the tracer wire to a steel rod or anode is recommended.

2. Warning Tape

- Warning tape is installed directly above the underground facility.
- Ends of the facility without warning tape are permanently marked with the APWA color code for the facility.
- The warning tape color matches the APWA color code for that facility.
- Care should be taken so the tape is not torn or separated during backfilling operations.

3. Electronic Marking Device

- Electronic marking devices should be installed directly above the underground facility.
- The color of the device should match the APWA color code for the facility.
- Facility operator should consider attaching the device to underground facility with nylon ties.

¹ AGA Plastic Pipe Manual for Gas Service, 2006 Edition

² ANSI ASC GPTC Z380 Gas Piping Technology Guide

³ Columbia Pipeline Group

References for BP 2-5:

ANSI ASC GPTC Z380 Gas Piping Technology Guide

Guide Material 192.321 Installation of plastic pipe, Section 2.4 Means of locating,

(a) Tracer Wire

- (1) A bare or coated corrosion-resistant metal wire may be buried along the plastic pipe. Wire size #12 or #14 AWG is commonly installed.
- (2) Tracer wire may be installed physically separated from, or immediately adjacent to, the plastic pipe. Separation may lead to difficulty in accurately locating the plastic pipe. In determining placement of tracer wire relative to plastic pipe, the operator should consider the relative importance of locating the pipe versus potential pipe damage from a current surge through the tracer wire. Lightning strikes are a source of current surges.
- (3) Tracer wire should not be wrapped around plastic pipe. It may be taped to the outside of the plastic pipe, especially for installation by boring or plowing-in, or placed loosely in the trench directly adjacent to the pipe.
- (4) A separation of 2" to 6" between plastic pipe and tracer wire is commonly used where current surges, such as from lightning, have been experienced or can be expected.
- (5) Leads from tracer wire into curb boxes and valve boxes and on outside service risers can be used for direct connection of locating instruments. Consideration should be given to ensuring that no bare tracer wire is exposed such that a lightning strike could cause a current surge through the wire.
- (6) Splicing of tracer wire, if necessary, should be done in a manner to produce an electrically and mechanically sound joint that will not loosen or separate under conditions to which it may be subjected, such as backfilling operations and freeze-thaw cycles.
- (7) Where the tracer wire is electrically connected to metallic structures (e.g., steel or cast iron pipe) for reasons such as expanded locating capabilities or cathodic protection, consideration should be given to the effects of electrical current surges on the ability to locate the plastic pipe or the increased potential for damage.
- (8) Additional information may be obtained from AGA XR0104, "Plastic Pipe Manual for Gas Service."

(b) Metallic tape. A metallic coated or corrosion-resistant metallic tape may be installed along with the plastic pipe. Care should be taken so that the tape is not torn or separated during backfilling operations. Metallic locating tape normally has no accessible leads for connecting locating equipment, making it necessary to use a passive or induced current locating device.

Guide Material 192.917 How does an operator identify potential threats to pipeline integrity, Section 12.4 Construction Threats,

(a) Potential construction threats, (4) Ability to locate, (i) Installation of tracer wire, warning tape, marker balls, or marker discs. (ii) Electrical continuity of locate wire. (iii) Proximity of locate wire to pipe. (iv) Locatable warning tape. (v) Accuracy of as-built dimensions.

Guide Material 192.614 Damage Prevention Program, Section 2 Written Program, Subsection 2.5 Information to be communicated.

Entities that may engage in excavation activities should be informed of the purpose of the program, how they can learn the location of underground pipelines before commencing excavation activities, and actions to be taken if the pipeline or its related components, **such as tracer wire, warning tape, and passive locating devices, are hit or damaged**. Illustrations or pictures of the various types of pipeline locations should be included. Program information should also advise that even minor residential activities, such as installing fences or performing landscaping, could cause pipeline damage.

- GM Appendix G-192-13. Considerations to minimize damage by Outside forces, Section 8 Other,
 - (e) Where a study indicates the likelihood of future excavation or grading in an area, the use of warning tape, locating wire or other suitable means of warning.

Columbia Pipeline Group Practice

When replacing or installing new pipe in class 3, class 4 and HCA locations, warning tape will be installed above the pipe. Where possible, the tape should be buried at least one foot below the surface of the ground and at least one foot directly above the pipeline. Metallic tape tends to deteriorate and is not recommended.

References for Guidelines for Below Ground Marker Installation:

AGA Plastic Pipe Manual for Gas Service

Tracer Wire

An electrical conductor (i.e. tracer wire) should be installed with direct-burial plastic pipe to facilitate locating with an electronic detector unless other means are available for locating the pipe underground. This conductor can be a coated metal wire or a coated metallic tape, and should be corrosion resistant. Leads into curb boxes, valve boxes, and on service risers can be used for direct connection of locating equipment. See Chapter 6 for additional information. Cathodic protection for the tracer wire should be considered and implemented if warranted. The tracer wire should be selected to last the life of the pipe. The Regulations currently prohibit wrapping the tracer wire around the plastic pipe and contact with the pipe must be minimized, but is not prohibited.

In a 1992 survey by AGA's Plastic Materials Committee, 98 percent of respondents reported using insulated tracer wire to locate plastic facilities. In a 1996 survey, 80% of respondents reported using tracer wire when installing facilities in a joint

trench. Size #12 or #14 wire was predominantly installed as tracer wire. The tracer wire is generally accessible to the locator at the riser, but not electrically connected to the riser. The tracer wire on the service line is connected to the main tracer wire on plastic mains. Some users reported that they installed a warning tape in addition to the tracer wire. Companies have reported that lightning strikes have followed the tracer causing physical damage to plastic pipe. Where practical, a separation of wire and pipe may be beneficial. However, separation may lead to difficulty in precise location of the plastic pipe. The engineer must consider the relative importance of locating the pipe versus the possibility of damage caused by lightning.

Electronic Marking Device

There is a third method currently being used called an EMS (Electronic Marker System). The EMS uses passive antennas. The markers are encased in polyethylene housings that can withstand temperature extremes and are impervious to underground minerals and chemicals. Markers, with housings color-coded per the standards of the APWA, are available for underground gas and electric facilities. The gas markers are yellow, and the electric markers are red. Both are electronically configured to match these color designations.

The markers remain in a passive mode until they are activated by a locating instrument operating at a frequency compatible with that of the markers' antennas. The locating instrument transmits a signal to a buried marker. The marker "reflects" the signal back up to the locating instrument, and both an LED meter reading and an audible tone indicate the location and approximate depth of the marked facility.

Where existing plastic gas facilities are found to not have a locating wire, or where the locating wire is bare, an appropriate electronic marking system device shall be placed in the excavation if other EMS devices do not adequately define this facility. In the course of excavation work by the operator or others, use this as an opportunity to install EMS devices. EMS devices should be installed in incidental excavations at angle points, laterals, main dead ends, and at approximately 50' intervals over the main, where existing plastic gas facilities are found to not have a locating wire or where the locating wire is bare. These marker units shall be documented with dimensions and appropriately mapped on gas distribution plat maps. Plastic main dead ends and service stubs should have an appropriate EMS marker installed to indicate the end of the facility. Based on the anticipated schedule of construction and completion of construction, several methods of marking the end of the facility can be used. Stubs are often marked by using scrap plastic pipe, economy grade 2" x 4" lumber, or EMS devices. EMS devices are recommended where the construction schedule and/or completion dates are tenuous or extended. Plastic main dead ends should normally be marked with an appropriate EMS device. These EMS devices should be documented with dimensions and appropriately mapped on the gas plat maps and/or service records.

ANSI ASC GPTC Z380 Gas Piping Technology Guide

Tracer Wire

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- (8) Additional information may be obtained from AGA XR0104, "Plastic Pipe Manual for Gas Service."

Warning Tape

Guide Material 192.917 How does an operator identify potential threats to pipeline integrity, Section 12.4 Construction Threats, "Potential construction threats, (4) Ability to locate, (i) Installation of tracer wire, warning tape, marker balls, or marker discs. (ii) Electrical continuity of locate wire. (iii) Proximity of locate wire to pipe. (iv) Locatable warning tape. (v) Accuracy of as-built dimensions."

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