California Underground Facilities Safe Excavation Board

July 10-11, 2023

Agenda Item No. 18 Information Item – Staff Report

Potholing Standards Development Update

PRESENTERS

Tony Marino, Executive Officer
Anona Bonner, Policy Manager

SUMMARY

During its September 2022 meeting, the Board directed staff to begin drafting potholing standards for the Board and public review and feedback. The Potholing Committee and staff have developed draft standards as an attachment to this report. Staff recommends the Potholing Committee and staff conduct outreach to stakeholders to obtain feedback on the draft standards as well as to begin identifying which of the standards may be sufficiently universal, straightforward, and necessary as to be suitable for consideration as regulations.

STRATEGIC PLAN

2020 Strategic Plan Objective: Improve Accessibility of Buried Infrastructure Location Knowledge and Understanding

2023 Strategic Activity: Develop Standards to Assist Excavators in Identifying Locations to Pothole

BACKGROUND

Potholing has been a continuous topic of conversation in the Board's standards development, and the Board has held numerous workshops and surveys that involve potholing practices.[1]

[1] November 8, 2018, Agenda Item No. 7, *AB 1914: Initial Discussion on Scope of Implementation*; *April 24, 2019, Reasonable Care Standards Workshop; AB 1914 Workshop Survey – Results Summary;* May 13-14, 2019, Agenda Item. No. 6, *AB 1914 Implementation*; August 27, 2020, Agenda Item No. 1, *Trenchless Excavation Reasonable Care Workshop*; September 14, 2020, Agenda Item No. 18, *Discussion on Reasonable Care Standards Development for Trenchless Excavation Techniques;* October 29, 2020, Agenda Item No. 3, *Reasonable Care in Trenchless Excavation*; November 16, 2020, Agenda Item No. 9, *Update on Reasonable Care Standards Development for Trenchless Excavation Techniques*; *Trenchless Excavation Survey Responses*; July 13, 2021, Agenda Item No. 7, *Update on Safety Standards: Public Works Excavation Survey and Interviews Preliminary Results*; *Preliminary Public Works Excavation Survey Data*; July 21, 2021, Agenda Item No. 1, *Workshop: Earthwork and Road Construction Excavation*; November 9, 2021, Agenda Item. No. 5, *Update on Safety Standards – Next Steps;* January 14, 2019, Agenda Item No. 6, *Legal Counsel Opinion on GOV 4216.4(a) and GOV 4216.4(b)*.

Government Code § 4216 Requirements and Title 19 Regulations

Government Code § 4216 and Title 19 of the California Code of Regulations (CCR) contain provisions related to potholing and the determination of the location of a facility. For instance, excavators must determine the exact location of facilities with hand tools (or vacuum excavation) prior to using power tools,[2] excavators and operators must hold on-site meetings in the vicinity of high priority facilities to determine how to verify the location of the facility,[3] and an excavator must request additional information on the location of a facility if they cannot determine its location with hand tools.[4] Excavators, if they cannot safely expose a facility with hand tools or allowed power tools, may request consultation with an operator, who must respond so that they may come to agreement on the use of different tools.[5]

The Board also created a process for resolving conflicting facility location information in an area of continual excavation. If the operator and excavator disagree as to the exact location of the facility, the operator must demonstrate the facility is in the work path through the provision of documentation on the exact location or by exposing the facility.[6]

During the September 2022 Board Meeting, the Board directed staff to begin drafting potholing standards for Board and public review and feedback. Board standards for potholing could continue to outline standard circumstances and processes for potholing such as these and by providing meaning for many terms in statute, such as "exact location,"[7] "in conflict,"[8] "verify the location,"[9] and "additional information"[10] on the location of a facility. Potholing standards could specify when it is in the interest of public and worker safety to pothole a facility and what additional information an operator should provide when an excavator cannot find a facility through potholing.

DISCUSSION

California Government Code §4216.18[11] requires the Underground Safety Board to develop safety standards for excavation around subsurface installations. The purpose of developing safety standards is to provide utility operators, locators, project designers, prime contractors, and excavators with an understanding of the responsibilities that all actors have in promoting safe excavation and their own role in doing so. These standards are to describe safe practices and are not intended to replace or restate relevant laws around excavation, utility management, or worker safety.

Potholing is the act of excavating to find a specific buried facility to determine its horizontal and vertical location, assisting the excavator in protecting worker and public safety. Potholing

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[2] Cal. Gov. Code § 4216.4(a)(1)
[3] Cal. Gov. Code § 4216.2(c)
[4] Cal. Gov. Code § 4216.4(b)
[5] 19 CCR § 4501(c)
[6] 19 CCR § 4351(c)(1)(A) and (B) Agricultural Operations; 19 CCR § 4361(c)(1)(A) and (B) Flood Control Facilities
[7] Cal. Gov. Code § 4216.4(a)(1)
[8] Cal. Gov. Code § 4216.4(a)(1)
[9] Cal. Gov. Code § 4216.2(c)
[10] Cal. Gov. Code § 4216.4(b)
[11] Government Code §4216.18

is performed using hand tools, vacuum excavation, or (in specific circumstances) allowed handheld power tools, such as electric or pneumatic diggers with a clay spade bit. In the 2021 DIRT Report, "failure to maintain clearance and/or failure to pothole"[12] is in the top six root causes for damages.

Draft Standards Summary

In developing the draft potholing standards, the Potholing Committee and staff started with Common Ground Alliance (CGA) Best Practices[13] as a model, where each standard includes the standard language, a discussion, and references. The draft standards contain references to relevant laws and related requirements which may be useful for various stakeholders seeking to better understand the legal requirements and practices included in the standards. The discussion section elaborates on and provides context for the draft safety standard.

The draft potholing standards include best practices for:

- Activities supporting locating and marking utilities:
    - Utility operators provide employee and contract locators with information to help them identify buried infrastructure locations. This includes the number of facilities, size, material, and status of abandoned facilities. Additionally, operators provide information on changes in buried facility direction, deviations from straight lines, elevation changes, and obstructions.
    - Surface indicators are used to confirm buried facility locations, and if a discrepancy is found, the locator contacts designated utility operator personnel for assistance
    - Operators provide a contact for resolving problems during locating activities and have procedures for correcting mapping errors. Field marks are recorded through photographs, GIS maps, and locate technician sketches, with reference information, particularly for surface indicators and deep subsurface facilities.
- Pre-excavation activities:
    - Potholing is used for facility verification in the design phase of projects, recording buried facility locations and depths.
    - Excavators place traffic control restrictions and contact information on ticket notifications, identifying contacts for locators to use if they have questions.
    - For point excavations, a five- to ten-foot-wide area is delineated to maximize excavation opportunities outside the tolerance zone of buried facilities, using both mechanical and hand tools.
- Excavation:
    - Project owners ensure excavators have on site access to all necessary documents related to buried utilities' location. These documents include tickets, electronic responses, operator contact information, permits, documentation, design plans, and pothole logs. The information is accessible in paper or electronic form, and workers can access it in their preferred languages.
    - After utility operator locate and mark activities, excavators review the site with

[12] Common Ground Alliance 2021 Dirt Report Excavation Practices Root Causes
[13] Common Ground Alliance Best Practices Version 19.10

response information provided by operators. They use this information and surface indicators to confirm that all operators have identified their buried facilities. If the excavator identifies discrepancy, they contact the operator to resolve it.

- Excavators document field markings, including through photographs. Excavators record the results of potholing, including depth, in pothole maps or logs, and identify any appurtenances that could interfere with excavation or clearance requirements.
- Design plans, utility operator marks, maps, and surface indicator surveys help determine pothole locations. The excavator potholes the path of excavation and does not offset pothole to avoid potholing through concrete or asphalt. The excavator potholes at buried facility crossings and intersections to maintain appropriate clearances. If the excavation has potential for continuous encounters with existing buried utilities, the excavator determines where to pothole and how many potholes to make to preserve clearance and depth requirements.
- Operators identify deep subsurface utilities as part of the information provided to designers and excavators. When the facility is significantly deeper than excavation, designers and excavators can use data Quality Level C info in lieu of exposure.
- The excavator examines nearby structures and surface markings, such as sewer manholes, to determine if sewer laterals may be in the area of excavation. If sewer laterals are determined likely, the excavator will look for surface indicators indicating the location of sewer laterals, including cleanouts. Sewer laterals will be protected in the same manner as other buried utilities unless the excavator makes an agreement otherwise with the owner of the sewer lateral.

At this time, items such as design and abandoned lines are not included in the draft. These topics will be drafted with the respective Board committee and will be added at a future date.

Previous Workshop and Survey Feedback Summary

The drafts standards incorporate feedback received via surveys and workshop including but not limited to:

- Potholing can occur for different phases of the project for different reasons, such as design and constructions phases.
- While mapping is generally available to locator in the field, the types of maps made available varies and may consist of inventory maps, circuit maps, field maps, construction prints, and sometimes as-built drawings. Locators may need discern the maps and put down accurate information that can be corroborated with various locating methods. There is no locator's map.
- Potholes in the wrong locations can create a false sense of security. Some excavators will not potholing directly in the bore path but off in the grass area to avoid causing damage to roadways that would require repair. These "offset" potholes in the grass can contribute to an increase of damage incidents and potential safety hazards.
- Emphasized the importance of visual inspection of buried facility—and for boring

methods, the bore head—and the need for potholes deep enough to find the top of the pipe and a clear path.

- Excavators:
    - Emphasized the importance of accurate and complete information for potholing buried facilities. Excavators also emphasized the importance of operators providing accurate and complete information in their marks than just marking the color code of the utility.
    - Often find it time-consuming to open manholes, pull boxes, or other openings, which can be a great distance away, to verify what the facility is. Excavators are limited on what they can see on maps.
- Operators:
    - Emphasized the importance of communication with excavators for effective locating. Accurate information on the dig ticket and phone conversations are crucial for damage prevention. Creating a bridge of communication between the locator and excavator is essential, as there are numerous variables to consider. Locators need to be able to accurately document and communicate this information to their employers. Identified the importance of providing accurate information to locators, as locators must cross-reference multiple documents to get an accurate picture of the facility on the ground. If the operator provides all of information without guidance to an excavator it can be more harmful than good given the excavator may not understand the various documents and items that need to be cross-referenced.

Incident Review

Staff also reviewed several incidents to evaluate if the incidents could have been prevented if various parties had followed the draft standards.

2019 San Francisco Incident:[14]

- **Background:** A mini excavator bucket struck the intersection of 2-inch and 4-inch natural gas mains, rupturing the lines and causing a fireball that engulfed nearby structures. The work was being performed by a subcontractor installing a fiber line in an urban area.
    - Design documents included surface indicators but no existing buried utilities, leading the excavator to be instructed to place the new line in the same location and depth as a gas pipeline main.
    - Facilities were not potholed prior to installation of the fiber line, leading the subcontractor to need to make design decisions—like that of facility alignment and clearances with other utilities—on the fly that should have been made by a licensed engineer.
    - Subcontractor potholed both the 2” and the 4” gas lines, but not at their intersection, where a fusion-welded joint protruded upward six and a half inches.
    - The operator of the mini excavator and his spotter did not have the same

[14] 19SA1279: Geary Street Natural Gas Explosion and Fire

understanding of how deep they were excavating and were digging deeper than each believed.

- **Draft potholing standards review:**
    - *Existing Facility Verification Conducted Prior to and Separate from Construction for Designed Projects:* Facility verification via potholing prior to construction and recording the location information (including depth) in pothole logs would have provided workers a better understanding of where the utilities were located and their depth within the excavation area.
    - *Identification of Potholing Locations:* Had the excavator considered buried facility intersections when determining where to pothole, they likely would have found the fusion weld appurtenance with hand tools and not struck it with an excavator bucket.
    - *Documenting Utility Operator Marks and the Results of Potholing:* Had the excavator measured and recorded the depth of the of 2-inch and 4-inch natural gas mains when they exposed them, the excavator likely would have recognized that the path of their fiber conduit was co-incident with the existing gas line.

2008 Paso Robles Incident:[15]

- **Background:** An excavator bucket struck an 8-inch city water line while installing a large diameter county water pipeline. The water flooded the empty pipeline while two workers were inside removing support struts, drowning them. The project inspector had thought that a water line was in the area, and work stopped briefly, but work continued after a brief discussion until the water line was struck.
    - The water company provided maps in lieu of marks due to traffic from the busy intersection, but map did not include a legend or orienting features.
    - The water company representative and construction foreman performed a walkthrough two weeks prior to excavation. During walkthrough, each had a different understanding about whether line would be marked.
    - The water line was not potholed.
    - That an unmarked water line may have been in the area was not mentioned to crew doing work.
    - A track excavator was digging a trench while workers were working inside the pipeline in that same trench.
    - During the discussion of the possible presence of a water line, no one contacted the city to determine whether a water line was nearby.
- **Draft potholing standards review:**
    - *Traffic Control Information for Locators on Ticket:* The

[15] 2008 Paso Robles Incident video case study

excavator providing traffic control restrictions and other information on the ticket could have assisted with obtaining operator locate and marks for existing subsurface *installations.*

- *Existing Facility Verification Conducted Prior to and Separate from Construction for Designed Projects:* Ensuring that potholing was performed on all facilities in the path of excavation prior to construction and recording location information in pothole logs may have provided a better understanding to the workers of where the utilities were located within the excavation site.
- *Information Kept Onsite:* Keeping ticket and operator contact information onsite allows for all workers to view utility responses and operator contact information. Maintaining contact information specifically encourages workers to use the contact information if they have questions about utility marks (or lack thereof) and unexpected situations in the field. The excavator stopping work and contacting the utility operator to clarify the location of the water line prior to proceeding could have mitigated some of the safety risk.

2004 Walnut Creek Incident:[16]

- **Background:** While digging a trench to install a large diameter waterline, an excavator bucket struck a 10-inch gasoline pipeline killing five and seriously injuring another four. The line had been marked as straight along a street, but it in fact had been installed with a jog to go around an oak tree. The oak tree had since been removed.
  - A new contractor took over job when the previous contractor was let go due to project delays.
  - The line was not marked again after the project had been turned over to the new company; rather the pipeline company and the contractor relied on stakes placed the previous year to identify the potholing locations
  - The potholes were approximately 50 feet apart
  - The construction supervisor relied on the line rider and the stakes of previous potholes and did not consult design documents
  - The petroleum pipeline company's line rider did not consult the maps when locating, which indicated the jog in the line.
- **Draft potholing standards review:**
  - *Relevant Information Provided to Locators:* Had the operator's locators and standby personnel been provided with the drawings provided to the engineering company designing the water project, the line locator and standby personnel may have identified the bend in the pipe prior to excavation.

[16] 2004 Walnut Creek Incident video case study

- *Information Kept Onsite:* Had relevant design documents, which included information about the jog in the pipe, been kept onsite and available for all workers to see, the contractor may have noticed the discrepancy between the straight line of stakes and the bend indicated in the design documents.
- *Identification of Potholing Locations:* Had the excavator used design plans when determining locations to pothole, the potholing crew may have identified the jog in the petroleum pipe during potholing.

Existing Standards, Best Practices, and Related Requirements

Subsurface Utility Engineering (SUE)

SUE is the process and practice of investigating, designing, and protecting buried facilities by identifying and mitigating conflicts prior to construction. The quality levels outlined in *Standard Guideline for Investigating and Documenting Existing Utilities (ASCE 38)* identify Quality Level A as the physical exposure of the subsurface infrastructure via potholing to obtain the horizontal and vertical location as the highest level of quality and accuracy. Additional information such as size and material can also be confirmed. The SUE engineer evaluates the risk of the utility and assigns an appropriate quality level for the buried facilities within the project site. The quality levels for a project may vary within the utility design. The quality level provides for consistent understanding in the accuracy of location information of buried facilities included on engineering plans.

California Department of Transportation

The California Department of Transportation's Project Development Procedures Manual[17] includes standards for potholing subsurface facilities for public road and highway projects. The location of the potholes need to be at sufficient intervals to obtain the utility location and alignment with a minimum of 2 locations. On projects with a high priority line, spacing shall not exceed 100 feet for longitudinal utilities and utility crossings with a few exceptions. All test hole locations including the horizontal location data and elevation must be recorded within the project limits.

Common Ground Alliance

Common Ground Alliance Best Practices define potholing as "exposure of a facility by safe excavation practices to ascertain the precise horizontal and vertical position of underground lines or facilities,"[18] state that excavators should pothole and use other safe excavation practices to avoid damaging buried facilities,[19] state that they should consider potholing as a technique to use in the tolerance zone, [20] and state that vacuum excavation is a safe and efficient alternative to hand digging when used appropriately.[21]

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[17] Caltrans Project Development Procedures Manual Chapter 17 Encroachments and Utilities, pp. 33-36
[18] Common Ground Alliance Best Practice, Appendix A (Glossary of Terms and Definitions)
[19] Common Ground Alliance Best Practice 5.15 (Facility Avoidance)
[20] Common Ground Alliance Best Practice 5.20 (Excavation within the Tolerance Zone)
[21] Common Ground Alliance Best Practice 5.32 (Vacuum Excavation)

RECOMMENDATION

Staff recommends the Board direct staff to conduct outreach to stakeholders, including through one or more workshops, to obtain input and feedback on the draft standards. In addition, the Board should direct staff to begin identifying which of the standards may be sufficiently universal, straightforward, and necessary as may be suitable for regulations. Given the connection between potholing and design, staff also recommends that the Planning and Design Committee oversee the development and presentation of design standards prior to Board approval of potholing standards.

Attachment: Draft Potholing Standards

SAFETY STANDARDS

IN OPERATING AND EXCAVATING AROUND BURIED FACILITIES

OFFICE OF ENERGY INFRASTRUCTURE SAFETY

CALIFORNIA UNDERGROUND SAFETY BOARD

Version 0.X.1

July 2023

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Introduction

Context and Use

Standards

0 Definitions

0.1 Buried Facility

A buried facility means any underground pipeline, conduit, duct, wire, or other structure. Buried facility encompasses the Government Code § 4216 (s) definition of "subsurface installation" but also includes other facilities that may be exempt from the definition, such as nonpressurized sewerlines, nonpressurized storm drains, and other nonpressurized drain lines.

References:

Government Code § 4216 (s)

0.2 Continuous Potential Encounter

A continuous potential encounter means a situation where an excavation could interact with an existing buried facility at multiple locations, such as in the installation of a new buried facility parallel to the existing buried facility or road milling or grading over existing buried facilities. A feature of excavations with continuous potential encounters with existing buried facilities is that it is often infeasible to expose the existing buried facility for the entirety of the potential encounter, either because the excavation is extensive or because, as in the case of road milling and grading, the purpose of the excavation is to prepare the surface.

0.3 Design

[]

References:

0.4 Dig Safe Law

The Dig Safe Law means California Government Code §§ 4216-4216.24 and regulations authorized by it in Division 4 of Title 19 of the California Code of Regulations.

0.5 Excavator

Excavator has the same meaning as that in Government Code § 4216 (h), except that it also encompasses persons exempt from Dig Safe Law requirements, such as homeowners, pursuant to Government Code § 4216.8 (a) and (b).

References:

Government Code §§ 4216 (h), 4216.8.

0.6 One-Call Center

One-call center has the same meaning as regional notification center, as defined in Government Code § 4216 (q).

References:

Government Code § 4216 (q)

0.7 Potholing

Potholing is the act of excavating to find a specific buried facility as to determine its horizontal location as well as its depth. The purpose of potholing is to gather buried facility location information to assist the excavator in protecting worker and public safety. Finding the location of a buried facility by potholing meets the subsurface utility engineering (via ASCE 32-22) requirement for gaining a Quality Level "A" for its location. Potholing is performed using hand tools, vacuum excavation, or certain allowed handheld power tools, such as an electric or pneumatic digger with a clay spade bit. A "pothole" is often referred to as a "test hole."

References:

Government Code § 4216.4 (a)

Title 19 of the California Code of Regulations

- Section 4501 (Use of Equipment Other Than Hand Tools to Determine the Exact Location of a Subsurface Installation)

ASCE 38-22, *Standard Guideline for Investigating and Documenting Existing Utilities.*

0.8 Utility Operator

Utility operator has the same meaning as a "operator" in the Dig Safe Law who is required to be a member of the one-call center and respond to excavation tickets.

References:

Government Code §§ 4216 (o), 4216.1.

1 [Reserved]

2 Design

3 Locate and Mark

3.1 Relevant Information Provided to Locators

Utility operators provide all relevant information, including maps, to employee and contract locators to assist them in correctly identifying the locations of buried infrastructure, as well as:

- The number of facilities where the separation does not allow for a separate tone for each buried facility,
- The size of the buried facility/facilities,
- The material of the buried facility/facilities,
- The commodity or contents of the buried facility/facilities,
- Any status identifying a facility as abandoned,

Utility operators also provide the following information to employee and contract locators to the extent the information exists:

- Changes in buried facility direction,
- Deviations from straight lines that may not be identifiable using electromagnetic locating techniques,
- Elevation changes that may lead to a shallow section of the buried facility,
- The presence of deeply-buried facilities,
- Appurtenances that may interfere with an excavation due to being at a different depth (above or below) or extend laterally from the buried facility

This information is also provided to any standby personnel assigned by the operator to monitor the excavation.

Discussion: Locators must have information at hand to perform the operator's statutory responsibilities. Additionally, locators should be provided information about elevation changes and appurtenances that may not be identifiable by an excavator through potholing.

References:

Common Ground Alliance Best Practice 6.13 (Access to Mapping Data)

Related Requirements:

Government Code §§ 4216.3(a)(1)(A), 4216.3(a)(1)(C), 4216.3(a)(3), 4216.3(a)(4), 4216.3(a)(5)

Common Ground Alliance Best Practices, Appendix B, "Guidelines for Operator Facility Field Delineation" (via Government Code § 4216 (n))

Title 49 Code of Federal Regulations

- Part 192, Section 605 (b)(3) (Procedural manual for operations, maintenance, and emergencies)
- Part 195, Section 402 (c)(1) (Procedural manual for operations, maintenance, and emergencies)

3.2 Information Sharing With Excavators Outside of Uniform Color Code and Marking Guidelines

Utility operators have standardized procedures for sharing relevant buried facility information with excavators that is not captured in the Common Ground Alliance Uniform Color Code and Marking Guidelines. This information includes facilities buried significantly deeper than are easily electromagnetically locatable and deeper than most buried facilities of a similar type.

Discussion: Not all relevant buried facility information can be conveyed via the locate and mark guidelines of the Common Ground Alliance Best Practices. Some information that is excluded will also not be easily gathered through potholing activities, such as appurtenances to the buried facility and sudden elevation changes. Utility operators therefore need processes to convey this information, to the extent that the information exists, to the excavator. If the excavation has been designed, the utility operator provides this information during the design phase. For other excavations, the utility operator may use electronic positive response or direct contact to request field meets, or standbys, or otherwise provide information to the excavator to protect the workers and public and to prevent damage to the buried facility.

References:

Investigation 19SA1279: Geary Boulevard (San Francisco) Natural Gas Rupture and Fire

Case Study: Walnut Creek

Common Ground Alliance Best Practice 2.02 (Gathering Information for Design Purposes)

ASCE 38-22, *Standard Guideline for Investigating and Documenting Existing Utilities.*

Related Requirements:

Government Code § 4216.2 (c)

3.3 Use of Surface Indicators to Confirm Instrument Readings

Locators use surface indicators to assist in confirming the locations of buried facilities. If the locator identifies a possible discrepancy between instrument readings and surface indicators, the locator contacts designated utility operator personnel for assistance.

Discussion: Surface indicators, such as junction boxes, hand holes, transformers, and street lights indicate the presence of buried infrastructure. Appendix A (Surface Indicators of Buried Infrastructure) contains images and descriptions of common surface indicators.

Traditional locating equipment sends a high-frequency electric current through a conductive buried facility or tracer wire. This current can jump to nearby buried facilities, including those for which the locator does not have mapping information, causing the equipment to not accurately identify the location of the buried facility. Personnel using this equipment can use surface indicators to verify that their instruments have found the buried facilities they are attempting to locate.

References:

Appendix A: Surface Indicators of Buried Facilities

Related Requirements:

Government Code § 4216.3 (a)(3)

3.4 Operator Troubleshooting Contact Available to Locators

Operators provide locators with a contact to assist them in resolving problems identified during locating activities. Persons are available to assist the locator during the hours that locators are working.

Discussion: Locates may be challenging for many reasons, including a congested right of way, broken tracer wire, or access to electrical connections to operator equipment. The operator supports locators in the field by responding to locator problems and providing instruction when a facility cannot be effectively located without further intervention.

References:

Investigation 22LA01484: Noble Creek Park (Beaumont) Late Mark Complaint

Related Requirements:

Government Code § 4216.3 (a)(1)(A)

3.5 Operator Process for Identifying and Correcting Mapping Errors

Operators have procedures for correcting mapping errors once identified. Operators have procedures for locators, whether in-house or contract, to report potential mapping errors for review and to facilitate mapping corrections as necessary. Operator procedures identify timeframes for maps to be updated.

Discussion: Utility operators rely on accurate maps for asset management, locate and mark, and other purposes. Contractors and project owners rely on mapping information provided by utility operators in project design to appropriately cost a project, coordinate utility relocation, and protect their workers from unintentionally striking active lines. Utility maps, for various reasons, are not always accurate, and the locate and mark and excavation processes offer opportunity to correct mapping errors. These errors can be detected by locators through electromagnetic location of facilities and by excavators through unearthing and damaging unexpected lines and discovering known lines in unexpected places through their actions to expose the lines.

References:

Common Ground Alliance Best Practice 4.02 (Corrections and Updates)

Related Requirements:

Government Code § 4216.3 (a)(4)

CPUC General Order 128 (*Construction of Underground Electric Supply and Communications Systems*), Rule 17.7-A (Records)

Title 49 Code of Federal Regulations

- Part 195, Section 404 (Maps and records)

3.6 Utility Operator Locate and Mark Documentation

The utility operator records the completed field marks, which may be through photographs, GIS map notations, and locate technician sketches and notes. The field mark documentation includes location reference information where feasible, especially of surface indicators, and indicates the presence of deeply buried facilities.

Discussion: Effective documentation allows project participants to understand, if there is a problem identified later, what the source or sources of that problem may have been. Effective documentation of locate and marks results benefits the utility operator, as it allows the utility operator to demonstrate compliance with locate and mark responsibilities. Documentation can benefit the excavator as positive response codes do not always paint a clear picture and the field marks can be altered or washed out before the excavator returns to the site to begin

work. As enhanced technology continues to occur, the utility operator attaching the documentation to the 811 ticket or emailing it to the excavator can continue to improve the communication between the utility operator and the excavator.

References:

Appendix B: Photographing Delineation, Field Marks, Surface Indicators, and Excavations

Related Requirements:

Government Code § 4216.3 (a)(1)(A)

4 Pre-Excavation

4.1 Existing Facility Verification Conducted Prior to and Separate from Construction for Designed Projects

For projects requiring design, facility verification through potholing is conducted prior to construction. Information regarding the location (including depth) of buried facilities is recorded in pothole logs.

Discussion: The design process requires verification of utility locations by potholing, and discrepancies found through potholing are used to update plans provided to excavators performing construction. As discrepancies identified during potholing may require project redesign or existing facility relocation, project owners should not plan to begin construction until designers have reviewed the results of potholing and had opportunity to modify the plans.

References:

Investigation 19SA1279: Geary Boulevard (San Francisco) Natural Gas Rupture and Fire

Common Ground Alliance Best Practice 2.03 (Identifying Existing Facilities in Planning and Design)

ASCE 38-22, *Standard Guideline for Investigating and Documenting Existing Utilities.*

4.2 Traffic Control Information for Locators on Ticket

Excavators, when placing ticket notifications, place any traffic control restrictions and other information on the ticket. Excavators identify names and contact information for locators to use when asking questions about traffic control.

Discussion: Municipalities and transportation agencies have traffic control requirements, which are addressed through traffic control plans submitted by persons requesting encroachment permits onto roads and highways.

References:

Case Study: Paso Robles

Common Ground Alliance Best Practice 4.06 (Safety)

Related Requirements:

Caltrans Encroachment Permit Application Guide

4.3 Documentation of Delineation

After delineating an area for excavation, the excavator takes photographs of the work area, including the delineation. The photographs of delineation include reference information where feasible, especially of surface indicators.

Discussion: Effective documentation allows project participants to understand, if there is a problem identified later, what the source or sources of that problem may have been. Photographing delineation allows an excavator to demonstrate compliance with the Dig Safe Law's delineation requirement and can be used to assist a locator in finding the work area if the locator contacts the excavator with questions. As delineations can be moved, trampled, and washed away, the excavator should make sure that photographs include relevant landmarks, especially surface indicators.

References:

Appendix B: Photographing Delineation, Field Marks, Surface Indicators, and Excavations

4.4 Delineation for Point Excavations

When planning a point excavation, such as for the installation of a pole, where the exact location of the excavation may be modified to avoid existing subsurface installations, the excavator delineates an area of five to ten feet wide, as available and appropriate for the size of excavation, to maximize the opportunity of performing the excavation outside the tolerance zone of a buried facility. This applies both to excavations using mechanical tools and to excavations using hand tools.

Discussion: Many point excavations, such as driving posts or rods, are performed with hand tools, in which the excavator may excavate within the tolerance zone without determining the exact location of existing buried facilities. Excavators wishing to avoid the tolerance zones of existing facilities need to first delineate a sufficient area.

References:

Common Ground Alliance Best Practices, Appendix B, "Guidelines for Operator Facility Field Delineation" (via Government Code § 4216 (n))

Related Requirements:

Government Code §§ 4216 (d) and 4216.2 (b)

5 Excavation

5.1 Information Kept Onsite

Project owners ensure that excavators are provided all relevant documents in their and their contractors' possession related to the location of existing buried utilities. Excavators keep this information, as well as ticket-related information, onsite and available for all workers to review. Relevant documents include

- the ticket,
- electronic positive responses to the ticket,
- utility operator(s) contact information,
- relevant permits,
- Cal/OSHA-required documentation,
- design plans showing information about subsurface installation locations,
- information regarding the buried facilities in the excavation area that have been provided by utility operators that had not been reviewed in the development of design plans, and
- pothole logs.

The information may be kept in paper copy or electronically, but electronic information is kept on a device available for all workers to access and review. Information is available to workers in their preferred language.

Discussion: Keeping ticket and utility operator information onsite allows for all workers to view information related to utility responses. Maintaining contact information specifically encourages workers to use the contact information if they have questions about utility marks (or lack thereof) and unexpected situations in the field. Maintaining ticket information also allows an excavator to demonstrate compliance with notification requirements of Government Code § 4216.2, and maintaining pothole logs allows an excavator to demonstrate compliance with potholing requirements of Government Code § 4216.4 (a).

References:

Common Ground Alliance Best Practice 5.13 (One Call Reference at Site)

Los Angeles Municipal Code, Section 62.04 (Excavation in and Adjacent to Streets – Performance of the Work)

Related Requirements:

Title 8 of the California Code of Regulations

- Section 341.1 (Posting of Permit)
- Section 1541.1 (Requirements for Protective Systems)

5.2 Confirmation of Marks Using Utility Operator Responses and Surface Indicators

Following utility operator locate and mark activities, the excavator reviews the site with response information provided by utility operators. The excavator uses the response information provided by utility operators and reviews the site for surface indicators to confirm that all utility operators have identified their buried facilities.

Excavators document markings and potentially unmarked surface indicators. If the excavator identifies a discrepancy among utility responses, marks, and surface indicators that could lead to the damage of a buried facility, the excavator contacts the utility operator to resolve the discrepancy.

If a mark by a utility operator does not include the number of buried facilities in a bank of conduit or ducts, the width of buried facilities, or the size or material of the buried facility, the excavator contacts the utility operator for clarification.

Discussion: Surface indicators, such as junction boxes, hand holes, transformers, and street lights indicate the presence of buried infrastructure. Appendix A (Surface Indicators of Buried Infrastructure) contains images and descriptions of common surface indicators.

Additionally, utility operator identification of the number, size, and material of buried facilities is required by law and necessary so that the excavator can identify whether they have found the line identified by the utility operator. Absent this information, the excavator may find an unmarked line (perhaps abandoned), mistake it for the marked line, and subsequently come into unsafe contact with the utility operator's marked line through use of power tools.

References:

Common Ground Alliance Best Practices 5.10 (Locate Verification), 5.11 (Documentation of Marks), 5.12 (Work Site Review with Company Personnel), 5.21 (Mismarked Facilities), Appendix B (Guidelines for Operator Facility Field Delineation).

American Water Works Association California/Nevada Section *Guidelines for Distribution of Nonpotable Water* (1992) Sections 2.5 (Valve Box and Other Surface Identification) and 4.1 (Marking).

Related Requirements:

Government Code §§ 4216 (n) and 4216.3 (a) & (e).

CPUC General Order 128 (*Construction of Underground Electric Supply and Communications Systems*), Rules 17.8 (Identification of Manholes, Handholes, Subsurface and Self-contained Surface-mounted Equipment Enclosures) and 35.1 (Identification of Cables).

5.3 Identification of Potholing Locations

Using design plans (as available), utility operator marks and maps, and surface indicator surveys, the excavator determines where potholes are necessary to determine the exact location of existing buried facilities. To determine where to pothole, the excavator considers:

- The path of excavation. The excavator potholes where the excavation will cross existing facilities. The excavator does not pothole in softscape outside the path of excavation to avoid potholing concrete or asphalt in the path of excavation.
- Buried facility crossings. The excavator potholes where existing buried facilities cross when the depth of the facilities may vary due to those buried facilities being installed to maintain appropriate clearances. As depths may vary at utility crossings, information gathered through potholing at crossings supplement, but does not replace, information gathered from other potholing activities.
- Buried facility intersections. The excavator potholes at T's and other intersections of a buried facility. Intersections, especially where pipes and conduits of two different diameters are connected, may be bulky, depending on their method of joining, and may cause the joint to be shallower than other portions of the buried facility.

If the excavation has the potential for continuous potential encounters with existing buried utilities, such as in trenching or boring to install a new buried utility parallel to an existing one or road milling or grading over existing lines, the excavator determines where to pothole and how many potholes to make to preserve clearance and depth buffers.

Discussion: Design plans (to the extent that design is indicated), utility operator locator field marks and maps, and surveys of surface indicators are all needed to identify where the excavation may encounter existing buried facilities. As each set of plans, field marks, and surface indicators is different, developing a set of general instructions on how many potholes to make at what intervals is not possible. Where design is indicated for a project, the project designers may be able to identify important locations to pothole. Changes in the worksite between the completion of design plans and the excavation are always possible, so the excavator must always exercise vigilance in reading the marks and considering surface indicators for additional potential locations where potholing is needed.

References:

Investigation 19SA1279: Geary Boulevard (San Francisco) Natural Gas Rupture and Fire

Case Study: Walnut Creek

Los Angeles Municipal Code, Section 62.03.1 (Notification and Location Requirements)

Related Requirements:

Government Code § 4216.4 (a)

5.4 Documenting Utility Operator Marks and the Results of Potholing

The excavator records utility operator field marks, including through photographs. The photographs of field marks include reference information where feasible, especially of surface indicators.

The excavator records buried facility location information, including depth, in pothole maps or logs, as well as the presence of any appurtenances that could interfere with the excavation or clearances of the new construction.

Discussion: Effective documentation allows project participants to understand, if there is a problem identified later, what the source or sources of that problem may have been. Effective documentation of potholing results benefits the excavator or potholing crew specifically by pre-empting doubt as to the effectiveness of the job they performed.

References:

Investigation 19SA1279: Geary Boulevard (San Francisco) Natural Gas Rupture and Fire

Common Ground Alliance Best Practices 5.11 (Documentation of Marks)

Appendix B: Photographing Delineation, Field Marks, Surface Indicators, and Excavations

5.5 Deeply Buried Facilities – Exceptions to Positive Confirmation Based on Data Quality C Information

When the utility operator has identified a facility significantly deeper than the excavation, designers and/or excavators can use a combination of Quality Level C and Quality Level D information in lieu of exposure

Discussion: Deeply buried facilities lie at a significant depth below the ground surface. Deeply buried facilities typically include large-diameter pipes, tunnels, and other infrastructure but may include other types of facilities, such as communications conduits, installed through horizontal directional drilling. Utility operators communicate the presence of deeply buried facilities as part of the information provided to designers and excavators. Quality levels are defined in ASCE 38-22, where:

- Quality Level D refers to record research,
- Quality Level C includes a review of surface indicators and comparison to records,
- Quality Level B uses surface electronic locating or other geophysical methods, and
- Quality Level A generally requires exposure of a buried facility to determine its location.

References:

California Government Code § 4216.18(b)

ASCE 38-22, *Standard Guideline for Investigating and Documenting Existing Utilities.*

Related Requirements:

Government Code § 4216.4 (a)

5.6 Identification and Protection of Sewer Laterals

The excavator examines nearby structures, such as homes and businesses, and surface markings, such as sewer manholes, to determine whether sewer laterals may be in the area of excavation. If sewer laterals are determined likely, the excavator will look for surface indicators indicating the location of sewer laterals, including cleanouts.

Sewer laterals will be protected in the same manner of other buried facilities, unless the excavator comes to an agreement with the owner of the sewer lateral.

Discussion: Government Code § 4216 exempts owners of storm drains and sewer laterals from needing to mark them. Most sewer laterals in California are owned by the property owner, rather than the sanitary district. Therefore, it may be difficult for an excavator to collect information records regarding sewer laterals. As the sewer lateral is usually property of the property owner rather than the sewer agency, the excavator must protect the sewer lateral in the absence of any agreement with the property owner.

References:

Cross Bore Safety Association, *Leading Practices for Cross Bore Risk Reduction*, December 2019.

6 Unmarked Buried Facilities

OFFICE OF ENERGY INFRASTRUCTURE SAFETY
UNDERGROUND SAFETY BOARD
www.energysafety.ca.gov

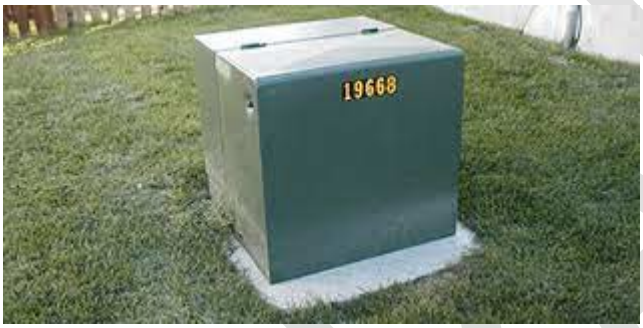
715 P Street, 20th Floor
Sacramento, CA 95814
916.902.6000

APPENDIX A
Surface Indicators of Buried Facilities

Appendix A: Surface Indicators of Buried Facilities

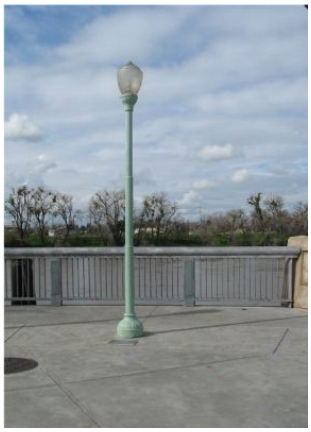
While buried facilities are not themselves directly visible, their presence is rarely completely hidden. Buried facilities can often be identified by personnel access points, surface equipment fed by underground lines, or locations where the facility transitions between above-ground and below-ground. Collectively, these are referred to as “surface indicators.” The following is a collection of different types of surface indicators and description of what numbers and types of buried facilities they may indicate.

1.1 Pad-Mounted Transformer



Pad-mounted transformers are part of the electric distribution system that take distribution-level voltages and step the voltage down to lower voltages to serve homes and businesses. As such, pad-mounted transformers can be expected to have a 4-35 kilovolt input connected and one or more outputs in the hundreds of volts.

1.2 Street Light



Street lights are electrified and indicate the presence of buried electric lines. These lines may be owned by an electric service provider, or they may be owned by a local jurisdiction. Junction box covers may also be visible in the vicinity that indicate the presence of buried electric lines.

APPENDIX B

Photographing Delineation, Field Marks, Surface Indicators, and Excavations

Appendix B: Photographing Delineation, Field Marks, Surface Indicators, and Excavations

Photographs of delineation, field marks, surface indicators, and excavations can allow the photographer to better communicate with others not present at the field and demonstrate compliance with the Dig Safe Law. This appendix provides the basics of good field photography.

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