

Locating and Marking Best Practices

1. LOCATORS UTILITZE AVAILABLE FACILITY RECORDS AT ALL TIMES.

Practice Description: Facility locators use available records at all times. Facility records indicate approximate location, number of facilities and access points for buried facilities within a requested area. The use of facility owner/operator supplied records is an effective method of identifying facilities as part of the locating process.

2. IF A FACILITY LOCATOR BECOMES AWARE OF AN ERROR OR OMISSION, THEN THE FACILITY LOCATOR PROVIDES INFORMATION FOR UPDATING RECORDS THAT ARE IN ERROR OR TO ADD NEW FACILITIES.

Practice Description: During the course of a locating activity, a locator may become aware of errors or omissions. Methods are in place to notify a facility owner/operator of that error or omission. The corrections are submitted to the appropriate person or department in a timely manner. The method of notification is determined by the facility owner/operator and includes the following information:

- Name (and company if contracted),
- Contact phone number of the individual(s) submitting change,
- Location (either address or reference points),
- Size and type of facility,
- Nature of the error or omission, and
- Sketch of the change in relation to the other facilities.

Omissions and errors may occur due to misdrawn records, changes during construction at the job site, repair or abandonment of facilities and delays in posting new records. Failure to note errors or omissions when found could result in damages to the facility at a later date. The 1994 NTSB Excavation Damage Prevention Workshop stated: "facility operators should be required to update maps when excavation finds errors in the mapping system."⁷

3. A UNIFORM COLOR CODE AND SET OF MARKING SYMBOLS IS ADOPTED NATIONWIDE.

Practice Description: A national standard is adopted defining color specifications relevant to facility type. The specifications could be similar to the accepted NULCA⁸ or APWA⁹ standards. The December 1997 National Transportation Safety Board safety report¹⁰ cites the use of the APWA/ULCC color code as the model example. (See **Appendix B for Additional Practice Information**)

4. A SINGLE LOCATOR IS USED FOR MULTIPLE FACILITIES.

Practice Description: This practice is employed when determined to be advantageous by the facility owner/operator. The use of a single locator to mark multiple facilities may provide several advantages to both the facility and the excavating communities. Among these advantages are:

- more responsive service to the excavation community,
- better communication with the excavating community (fewer points of contact),
- improved safety due to less traffic on the road,
- improved worker safety,
- reduced environmental impact, and
- maps of multiple facilities.

⁷ National Transportation Safety Board, 1995. Proceedings of the Excavation Damage Prevention Workshop; 1994 September 8-9; Washington, DC, Report of Proceedings NTSB/RP-95/01 (pp.177-178), Washington, DC.

⁸ National Utility Locating Contractors Association, 1998. Underground Facility Marking Standards, Spooner, WI.

⁹ American Public Works Association, 1999. Guidelines for Uniform Temporary Marking of Underground Facilities.

¹⁰ National Transportation Safety Board, 1997. Protecting Public Safety through Excavation Damage Prevention, Safety Study NTSB/SS-97/01 (pp. 25-26), Washington, DC.

It should be noted that this best practice does not suggest that all facilities be located by a single locator, but rather that conditions exist in which locating multiple facilities with a single locator will reduce the likelihood of errors and resulting damage (e.g., multiple facilities with the same owner or multiple facilities that are marked with the same or similar color codes). This practice has been employed by a facility owner in Michigan to enhance safety. The use of a single locator to locate multiple facilities is analogous to the use of one-call systems to handle locate requests from excavators. The use of a one call system allows locate requests for multiple facilities at an excavation site to be issued through a single point of contact, simplifying communications. The use of a single locator to carry out locate requests for multiple facilities further simplifies communications, with fewer links needed between excavator and locator.

5. LOCATORS ARE PROPERLY TRAINED. LOCATOR TRAINING IS DOCUMENTED.

Practice Description: Minimum training guidelines and practices are adopted for locator training. These guidelines and practices include the following:

- Understanding System Design/Prints/Technology
- Understanding Construction Standards and Practices for all Types of Facilities
- Equipment Training and Techniques
- Plant Recognition Training
- Theory of Locating
- Daily Operations
- Facility Owner/Excavator Relationships and Image
- Safety Procedures Per OSHA Regulations/Federal, State and Local Laws
- Written and Field Testing
- Field Training
- Annual Retesting.

The NULCA Locator Training Standards and Practices¹¹ represent an accepted model within the locate industry.

Documentation of all training is maintained to ensure that facility locators have been properly trained.

6. LOCATES ARE PERFORMED SAFELY.

Practice Description: It is the responsibility of the owner/operator and locator to establish when and how the underground facility will be identified. All hazards associated with a performing a locate are identified. Appropriate measures conforming to federal, state, local and industry standards are established. Employees are made aware of these hazards and properly trained in worker safety standards.

A. Pre-Work Safety Considerations

1. Site Background Data. Site information is gathered to determine hazards, exposures, and/or other potential safety problems that might be encountered in connection with on site locate work. This information may be gathered from the facility records and from visual inspection.
2. Site Familiarization. Site characteristics which could affect locate work are analyzed. Areas to be considered include:
 - a. Obstructions. The site is analyzed to determine if physical obstructions are present on the property which would make locate work unsafe. Means for working around such obstructions are defined.
 - b. Traffic. Vehicular arteries (highways, roadways, railways, etc.) at the work site are identified to determine if such traffic would pose any safety hazard to locating the site.
 - c. Physical Site Conditions. Soil conditions and other factors (such as trenches, pits, bores, standing water, etc.) that could affect the safety of the job site are identified. Methods are developed to identify and safely work around these hazards.

¹¹ National Utility Locating Contractors Association, 1996. Locator Training Standards and Practices, Spooner, WI.

3. **External Resources.** Information is gathered about safety-related resources that might be required in the event of an accident or other problem (such as an employee illness). Information needed includes location and contact information for nearest hospital, fire department, police department, and any other public emergency response organization. In addition, access routes and travels plans to emergency response facilities are defined.
 4. **Work Plan.** A work plan in which procedures, employee roles, equipment requirements, time requirements, and other factors are considered is developed to define the most efficient means for safely accomplishing required locate work. This work plan considers all of the safety related information developed in connection with items #2 and #3.
 5. **Job Briefing.** Information developed as discussed in preceding items #1 through #4 is used to conduct a job briefing prior to commencement of on site locate work. The job briefing focuses on safety aspects of the required work.
- B. Locate Work Safety Considerations**
1. **Personnel Protection.** Watchman/lookout capabilities are provided to ensure the safety of personnel in cases where locate work requires that working individuals disrupt traffic flow or otherwise occupy hazardous positions. All working individuals wear proper safety attire. Such attire provides for adequate visibility of the worker and personal protection against hazards.
 2. **Equipment.** All equipment used in connection with locate work is suitable for the intended uses. Items such as ladders, electrical test devices, and other instruments and items are inspected from a safety perspective prior to use. Safety features such as locking devices, grounding, insulation, etc., are thoroughly inspected.
 3. **Exposures.** In cases where locate work requires personnel to enter into spaces with potentially unsafe conditions, appropriate testing is accomplished prior to entry. During times when such spaces are occupied, adequate monitoring and/or ventilation devices are present and properly operating during occupancy.
 4. **Work Activities.** All locate work activities are conducted with safety given first priority. All employees are thoroughly trained and briefed regarding safety measures such as minimizing exposures to potentially hazardous conditions, avoiding unnecessary risks, and giving priority to personal safety.
- C. Post Work Safety Considerations**
1. **Termination of Work Activities.** After locate work is completed, the site is restored and left in such a condition that no safety hazards associated with the locate work activities remain. All personnel and equipment utilized in connection with the work are accounted for and no unsafe conditions remain at the site. Any safety-related equipment used in connection with the work is returned/restored to pre-work status.
 2. **Debriefing.** After completion of locate work, a debriefing safety review of work activities is conducted. This review is conducted with the objective of looking at the safety aspects of all involved work practices as necessary to see where unnecessary exposures may have occurred and where improvements could be made.

7. A VISUAL INSPECTION IS COMPLETED DURING THE FACILITY LOCATING PROCESS.

Practice Description: This inspection includes the following:

- all facilities within a facility owner/operator's service area (to evaluate the scope of the locate request),
- identification of access points,

- identification of potential hazards, and
- assurance that plant facilities shown on records match those of the site.

The primary reason for a visual inspection is to determine if there are facilities placed that are not on record. It is very important that visual inspections be completed in areas of new construction, where records may not indicate the presence of a facility. The visual inspection is necessary because the time it takes for a facility placed in the field to be placed on permanent records varies by facility owner/operator and location. Evidence of a facility not on record includes, but is not limited to, poles, dips, enclosures, pedestals (including new cables found within the pedestals), valves, meters, risers, and manholes.

8. FACILITIES ARE ADEQUATELY MARKED FOR CONDITIONS.

Practice Description: Facility locators match markings to the existing and expected surface conditions. Markings may include one or any combination of the following: paint, chalk, flags, stakes, brushes or offsets. All marks extend a reasonable distance beyond the bounds of the requested area. Proper training for all facility locators includes properly identifying the varying surface and environmental conditions that exist in the field and what marking methods should be used. Conditions which may affect markings are rain, snow, vegetation, high traffic, construction, etc.

9. POSITIVE RESPONSE IS PROVIDED TO FACILITY LOCATE REQUESTS.

Practice Description: All facility locate requests result in a positive response from the facility owner/operator to the excavator. A positive response may include one or more of the following: markings or documentation left at the job site, callback, fax, or automated response system. A positive response allows the excavator to know whether all facility owners/operators have marked the requested area prior to the beginning of the excavation.

10. MULTIPLE FACILITIES IN THE SAME TRENCH ARE MARKED INDIVIDUALLY AND WITH CORRIDOR MARKERS.

Practice Description: In general, the number of lines marked on the surface equal the number of lines buried below. "All facilities within the same trench should be individually marked and identified. In situations where two facilities share the same color code (such as telephone and CATV) both facilities should be identified and the marks placed parallel, but with enough separation so that they may be readily identified."¹² In circumstances where the total number of lines buried in the same trench by a single facility owner/operator may not be readily known, a corridor marker is used. The corridor mark indicates the width of the facility.

11. INFORMATION ON ABANDONED FACILITIES IS PROVIDED WHEN POSSIBLE.

Practice Description: When the presence of an abandoned facility within an excavation site is known, an attempt is made to locate and mark the abandoned facility. When located or exposed, all abandoned facilities are treated as live facilities. Information regarding the presence or location of an abandoned facility may not be available because of updating or deletion of records. In addition, the process of abandoning an existing facility, damage to an abandoned facility, or limited or non-existing access points may render an abandoned line non-locatable. It should be emphasized that recommendation of this practice is not an endorsement of the maintenance of records for abandoned facilities.

12. WHEN LOCATING ELECTRO-MAGNETICALLY, ACTIVE/CONDUCTIVE LOCATING IS PREFERABLE TO PASSIVE/INDUCTIVE LOCATING.

Practice Description: The preferred method of actively applying a signal onto a facility is to use direct connection. Direct connection is the process of connecting a direct lead from the transmitter to the

¹² National Utility Locating Contractors Association, 1998. Underground Facility Marking Standards, Spooner, WI.

target facility, and connecting a ground lead from the transmitter to a ground point in order to complete a circuit. This process provides the strongest signal on the line and is less likely to “bleed over” to adjacent facilities than other methods of applying a signal. This method allows a greater range of frequency and power output options. It is good practice to use the lowest frequency possible at the lowest power output possible to complete the locate. If direct connection is not possible, use of an induction clamp (coupler) is the most effective method of applying a locate signal onto the target conductor. This method is more limiting for the choices of frequency and power outputs than direct connection. Using an induction clamp is not as effective at transmitting a signal as direct connection, can only be used within certain frequency ranges, and must use a higher power output. The least preferred method is induction or broadcast mode on a transmitter. This usually results in a weak signal that will “bleed over” to any conductor in the area.

13. THE FACILITY OWNER/OPERATOR IS IDENTIFIED

Practice Description: When feasible, the owner/operator of a facility is identified by markings at the time the facility is located. This practice facilitates a positive response for all facilities within the requested area. The NULCA Marking Standards recommends “In situations where two facilities share the same color code (such as telephone or CATV) both facilities should be identified. . . .”¹³

14. COMMUNICATION IS ESTABLISHED BETWEEN ALL PARTIES.

Practice Description: One-call centers, facility owners/operators, and excavators all have clearly defined processes to facilitate communication between all parties. If the complexity of a project or its duration is such that a clear and precise understanding of the excavation site is not easily conveyed in writing on a locate request, then a pre location meeting is scheduled. This pre-location meeting is on-site to establish the scope of the excavation. Written agreements between the excavator(s) and the locator(s) include:

- date
- name
- company
- contact numbers for all parties
- a list of the areas to be excavated
- a schedule for both marking and excavating the areas
- any follow up agreements that might be necessary

Any changes to the areas that are to be located are in writing and include all parties responsible for the excavation and marking of the excavation sites. Locators also schedule meets if the complexity of the markings requires further explanation.

15. DOCUMENTATION OF WORK PERFORMED ON A LOCATE IS MAINTAINED.

Practice Description: A facility locator always documents what work was completed on a locate request. This assists in the locate process by making a locator review what was located and then verify that all facilities within the requested area were marked. Careful documentation helps ensure that there is an accurate record of the work that was performed by the locator and helps eliminate confusion over what work was requested by the excavator.

16. A DAMAGED FACILITY IS INVESTIGATED AS SOON AS POSSIBLE AFTER OCCURANCE OF DAMAGE.

Practice Description: Any time a damage occurs, a proper investigation is performed. This is to determine not only the responsible party but also the root cause of the damage. The information gathered from damage investigations is essential in preventing future damages.

¹³ National Utility Locating Contractors Association, 1998. Underground Facility Marking Standards, Spooner, WI.

17. FORECASTING/PLANNING FOR PREDICTABLE WORKLOAD FLUCTUATIONS. A PLAN IS DEVELOPED FOR DEALING WITH UNPREDICTABLE FLUCTUATIONS.

Practice Description: Facility owners/operators and/or their representatives develop methods to sufficiently forecast and plan for future workloads in order that ticket requests may be completed in a timely manner. This will ensure that adequate personnel and equipment will be available to complete all locate requests. It should be noted that this practice does not involve limiting the number of one-call requests from excavators.

18. UNDERGROUND FACILITY OWNERS/OPERATORS HAVE A QUALITY ASSURANCE PROGRAM IN PLACE FOR MONITORING THE LOCATING AND MARKING OF FACILITIES.¹⁴

Practice Description: The process of conducting audits for locates is a critical component to the protection of underground facilities. The recommended components below were assembled from multiple sources and are meant to provide general guidelines for auditing the work of locators.

Components:

1. Field audits are to be conducted and some locations to be audited/surveyed are chosen purely at random.
2. Accuracy to within, governed, contractual, minimum, tolerance levels are checked.
3. Timeliness, as defined by regulation/statute is measured.
4. Completion of request is checked.
5. Evidence of accurate and proper communication is checked.
6. Proper documentation is checked.
7. Audit/Survey is documented.
8. Results are communicated to applicable personnel.
9. Audits are traced for trend analysis.
10. Proper hook-up and grounding procedures are verified where applicable.
11. Verify reference material used when providing the locate was up to date (electronic plans or paper plans).
12. Verify that appropriate safety equipment and procedures were used by the locator.
13. Tools and equipment be in proper working order and properly calibrated.

References: Health Consultants Incorporated; Central Locate Services, LTD; Great Plains Locating, ATCO Gas; Utiliquest

¹⁴ TR-2003-02: Amendment Approved by the CGA Board on March 26, 2004.