

ACES Intl



The Association of Communications & Electronics Schools International Inc.

Competency Requirements For:

Certified Utility Locator Technician™ - C.U.L.T.

Certified Utility Locating Technicians are expected to acquire knowledge of utility locating principles and actual practices, as well as acquire “hands on” skills which are then applied to all of the normal functions and techniques required to safely and completely locate and mark underground utilities/facilities according to Industry Best Practices, State/Provincial and Local Laws, Regulations, Codes and Industry Standards. Upon obtaining this knowledge and “hands on” skills, a Certified Utility Locator Technician will be able to enter employment in entry-level positions of underground Utility Locating as well as various utility/facility excavation and maintenance fields. Additional minimal training in areas unique to the special requirements of individual systems and company protocols will allow a Certified Utility Locator Technician to become an efficient and profitable part of the Utility Location, Excavation, Construction, Maintenance and Critical Infrastructure Protection Industries.

Certified Utility Locator Technicians must be knowledgeable and have sufficient “hands on” skills in the following technical and related areas:

1. Basic Electricity & Electronics Principles/Theory of Locating

- 1.1 Explain the three basic components of an electrical circuit to include the transmitter, conductor and ground.
- 1.2 Explain the mathematical relationships between voltage, current and resistance as expressed in Ohm's Law.
- 1.3 Describe the effects of an increase or decrease of each of the following: voltage, current and resistance to include their resultant effectual changes upon the other elements of the circuit.
- 1.4 Describe the difference between an open and a closed circuit.
- 1.5 Explain the difference between good and poor conductors of electricity to include high and low resistance factors, commonly used conductor and commonly used insulator materials.
- 1.6 Describe how alternating current passing through a conductor produces a magnetic field.
- 1.7 Explain the difference between active and passive signals of electromagnetic origin to include signals produced naturally as a result of the earth's electromagnetic field.
- 1.8 Define the term "Bleed-over" as it applies to transmitted and received electromagnetic fields.
- 1.9 Define the term "Frequency" of an alternating current to include its measurement term (Hz), phases (positive and negative) and cycles (or oscillations) per-second that characterize a high or low value in relation to electromagnetic location techniques and procedures.
- 1.10 Explain the terms "ground", "grounding", "insulation", and "capacitance" as they relate to electromagnetic location techniques and procedures.

- 1.11 Explain the inter-relationships between transmitted frequency changes (higher or lower) at a constant power level to include: distance; bleed-over; conduction; grounding (or tendency to flow to ground); and capacitance.
- 1.12 Explain how transmitted electromagnetic signals applied through an underground conductor are affected by: soil conditions; passive and active signals; grounding; condition of the conductor; conductivity of the conductor; diameter of the conductor; congestion of associated or proximal conductors; and interference from other conductive materials.

2. Facility System Design

- 2.1 Describe the three basic parts of each of the following Facility/Utility System: 1. Electric Power 2. Gas, Oil, Steam, Petroleum or Gaseous Materials 3. Communications (Telephone and CATV) 4. Potable Water 5. Reclaimed Water 6. Sewer; to include: Transmission System; Distribution System; and Service System.
- 2.2 Describe the service path of each "product" for each facility from its origination to final destination.
- 2.3 Explain the advantages and disadvantages of burying cables and pipes below the surface to include: safety; ease of locating facilities; improving or detracting from physical surroundings; protection from harsh weather conditions and accidental damage; and complexities to manage.
- 2.4 Explain the following methods of design: 1. Master Plan; 2. Joint Trench; 3. Aerial Installation; 4. Direct Buried; 5. Duct Installation.
- 2.5 Explain/define the following Excavation Methods and Processes to include:
 - 1. "Excavation"; 2. Auguring; 3. Digging; 4. Grading; 5. Drilling; 6. Plowing;
 - 7. Potholing; 8. Scraping; 9. Trenching; 10. Tunneling; 11. Boring; and
 - 12. Vacuuming.

3. Facility System Print Reading & Identification of Print Symbols

- 3.1. Identify the following to include the most common Basic Plant Facility Print Symbols used for each Facility: 1. Electric Power 2. Gas, Oil, Steam, Petroleum or Gaseous Materials 3. Communications (Telephone and CATV) 4. Potable Water 5. Reclaimed Water 6. Sewer.
- 3.2 Describe how the term "Prints" when referring to facilities' identification may include records, engineering job orders, diagrams, maps and other records and list the sources and the steps necessary to retrieve all applicable "Prints" related to a locate request or ticket.
- 3.3 Explain the accuracy of prints to include the contention that prints should only be used by a locator as a "guide" and not as the only acceptable true verification of a utility's location.
- 3.4 Describe what information is contained on owner/operator supplied available facility records to include: 1. approximate location of facilities, 2. number of facilities and 3. access points for buried facilities within a requested area.
- 3.5 Describe the procedure for updating records that are in error or to add new facilities to include the following information: 1. Name (and company if contracted) 2. Contact phone number of the individual(s) submitting change 3. Location (either address or reference points) 4. Size and type of facility 5. Nature of the error or omission and 6. Sketch of the change in relation to the other facilities.
- 3.6 Explain the importance and function of Plat designation and notices of existing underground facility easements and proposed development plans on facility owners/operators.
- 3.7 Explain how the planning phase of excavation projects in which gathering underground facility information can 1. Enhance safety, 2. Significantly reduce or eliminate conflicts with facilities, and 3. Minimize relocation of facilities.
- 3.8 Explain the following terms: "Plot Plan", "As Built" and "Customer (or Facilities) Map".
- 3.9 Demonstrate the ability to read street maps, access and reference land survey forms and access land survey systems within a specific geographical area of responsibility.
- 3.10 Demonstrate the ability to read and understand customer-specific facility symbol identification and owner maps and drawings which approximate the location, number and access points to buried facilities within a requested geographical area.

- 3.11 Accurately describe Federal, State, Provincial and Local Laws, Regulations, Codes, Standards and Industry Best Practices in support of accurately locating and marking facilities for excavation or projects which require underground facilities be located and marked prior to excavation or project commencement.

4. Facility System Equipment, Technologies & Processes

- 4.1 Accurately describe the permanent structures used to house utility equipment and provide access to facilities underground to include: Manholes, Vaults, Hand Holes and Controlled Environment Vaults (C.E.V.).
- 4.2 Define and/or identify the following Electric Power system equipment, technologies & processes: Electric Generating Station (Power Plant), turbines, three-phase AC, "in-phase", power grid, lines (also called wires, cables, line conductors, and cable conductors), line construction materials (including copper, steel-reinforced aluminum wire, copper-welded steel line, solid wire, stranded wire or stranded conductors and a neutral wire, and concentric neutral), Transmission line (three phase), transmission substation, Bulk transmission line (three phase), Sub-transmission Substation, Subtransmission line (three phase), Distribution Station, single-phase primary feeder, three phase primary feeder, Load Break Center, Substation, Single-Phase Transformer, Switchgear, Three-phase Transformer, Secondary main, Secondary Pedestal (or Box), Service line, Meters, Radial Distribution Systems, Loop Distribution Systems, breakers, transformers, switching towers, risers, dips, Load Break Centers, fuse cutouts, primary feeders, lightning arresters, fuses, three-phase pad-mounted transformers, single-phase pad-mounted transformers, voltage regulators, reclosers, capacitors, electric services and secondary pedestals.
- 4.3 Define and/or identify the following Natural Gas system equipment, technologies & processes: Production Well or Off-Shore Production Well, Gathering lines, Compressor Station, Transmission line, Processing Plant, Transmission line (900-1000 psi), Storage & Compressor Station, Pipeline Regulator Station, LDS Gate Station, High-pressure distribution main (150-300 psi), District Regulator Station, Distribution main (10-60 psi) Regulator Station, Farm Tap, Service line (40-60 psi) Service line (1/4 psi), Regulator and Meter and Service Meter, high-pressure distribution main valves & permanent markers, above ground farm tap, enclosed farm tap, service riser, service regulator, steel service riser, manifolds, regulator pit, low-pressure services, steel gas pipelines, plastic gas pipelines, tracer wire, cathodic protection systems, gas rectifier, gas rectifier station, galvanic cathodic protection system, anode, test stations, compression couplers, couplers, gas transition connector, tees, caps, plastic gas line insertion, casings, vent stacks, metal valves, gas valve box and cover, gas bypass, gas drips and gas drip covers.
- 4.4 Define and/or identify the following Telephone system equipment, technologies & processes: Central Office, Copper or Fiber Optic Trunk or Toll Cable (or Wireless Trunk or Toll Connection), feeder cables (copper or fiber optic), repeaters, multiplexers, multiplexed circuits, crossboxes, distribution cables, pedestals, service drops, terminals, exchanges, manholes and handholes, vaults, duct banks, innerducts, load coils, copper splice cases, fiber optic splice cases, lead-sheath splice cases, slick cabinets, electric meter/panels, pole-mounted repeaters, repeaters on pads or pedestals, aerial load coils, aerial splice cases, amplifiers, distribution panels, feeder panels, splice enclosure cases, utility boxes, pads, cabinets and pedestals, bonded and unbonding telephone cabling, grounding systems (series, parallel and air gap), bonding straps, grounding bars, access points, terminal blocks, terminal interfaces, grounding sheaths, common grounds, bonding clamps, conductors, air gap assemblies, jumper cable, fiber optic cable construction, metallic armored fiber optic cable (metallic sheath), fiber optic cable with metal tracer wire, fiber optic cable without metallic armoring or metal tracer wire, copper cable construction, shielded copper cabling, unshielded copper cabling, pulp cables, plastic insulated conductor (PIC) cables, gel-filled PIC cables (or "icky-PIC" cables), cable pair, 6-pair service wires, 25-pair, 50-pair, 100-pair, 200 pair, 300-pair, 600-pair, 900-pair, 5,400 pair, tip & ring, binder groups, bundles, cable coding systems, cable color coding, AWG measurements, access points and locations, ground wire inside permanent markers, metal and plastic splice-cases in manholes, lead-sheath splice cases in manholes, fiber loops in manholes, fiber tracer wire in manholes, splice cases in pits and

- pedestals, valve stems in pits and pedestals, valve stems at air pressure testing stations, telephone cables in handholes and flush-mounted enclosures, telephone cables in multiplexers, repeaters in pedestals, telephone cables in crossboxes, telephone cables in pedestals and cabinets, service drops in terminals, service drops in terminals inside commercial buildings, and lateral ducts.
- 4.5 Define and/or identify the following Cable (CATV) system equipment, technologies & processes: Headend, Headend Controller, Satellite Dishes, Data Transmitter, Coaxial trunk line, trunk line amplifier, trunk station pedestal, cascade, Fiber Optic trunk line, AC power, fiber node, bridging amplifier, feeder line, line extender, subscriber tap, service drop, security boxes, optical network unit, combiner, twisted pair, fiber pair, Fiber-to-the-Curb (FTTC), broadband signals, two-way communications, coaxial cable construction, fiber optic cable construction, jacketing, shielding, dielectric, center conductor, glass fibers, lasers, trunk line amplifiers on pedestals, aerial trunk lines, aerial fiber nodes, manholes, hand holes, vaults, AC to DC converters, directional couplers, splitters, terminators, fiber loops, subscriber tap pedestals, line extender amplifiers, line extender pedestals, addressable taps, indoor/outdoor taps, 2,4, 6, or 8 port taps, ground blocs, ground rods, common grounds, access points, amplifiers and cables in trunk amplifier pedestals, amplifiers and cables in trunk station pedestals, amplifiers and cables in bridging amplifier pedestals, fiber loops near fiber nodes, risers, line extenders in pedestals, subscriber taps in pedestals and hand holes, and subscriber drops.
- 4.6 Define and/or identify all Potable water system equipment, technologies & processes.
- 4.7 Define and/or identify all Reclaimed water, irrigation and slurry line system equipment, technologies & processes.
- 4.8 Define and/or identify all Sewer and draw line system equipment, technologies & processes.
- 4.9 Define and/or identify all other underground structures, system equipment, technologies & processes not previously listed.

5. Facility Location Equipment Technologies

- 5.1 Explain the advantages and disadvantages of locating buried cables and pipes using Ground Penetrating Radar (GPR) to include: (1) whether this technology is suitable for everyday use in the Facility Locating Industry, (2) what specific uses this technology may be employed to perform as a way to improve facility location accuracy and (3) what specialized knowledge and skills must an operator possess in order to employ this technology safely and effectively as an aid to underground facility location.
- 5.2 Explain the advantages and disadvantages of locating buried cables and pipes using Acoustic Location to include: (1) whether this technology is suitable for everyday use in the Facility Locating Industry, (2) what specific uses this technology may be employed to perform as a way to improve facility location accuracy and (3) what specialized knowledge and skills must an operator possess in order to employ this technology safely and effectively as an aid to underground facility location.
- 5.3 Explain the advantages and disadvantages of locating buried cables and pipes using Infra-Red Imaging to include: (1) whether this technology is suitable for everyday use in the Facility Locating Industry, (2) what specific uses this technology may be employed to perform as a way to improve facility location accuracy and (3) what specialized knowledge and skills must an operator possess in order to employ this technology safely and effectively as an aid to underground facility location.
- 5.4 Explain the advantages and disadvantages of locating buried cables and pipes using Facility Prints to include: (1) whether this technology is suitable for everyday use in the Facility Locating Industry, (2) what specific uses this technology may be employed to perform as a way to improve facility location accuracy and (3) what specialized knowledge and skills must an operator possess in order to employ this technology safely and effectively as an aid to underground facility location.
- 5.5 Explain the advantages and disadvantages of locating buried cables and pipes using Electromagnetic Location to include: (1) whether this technology is suitable for everyday use in the Facility Locating Industry, (2) what specific uses this technology may be employed to perform as a way to improve facility location accuracy and (3) what specialized knowledge and skills must an operator possess in order to employ this technology safely and effectively as an aid to underground facility location.

- 5.6 Explain the advantages and disadvantages of locating buried cables and pipes using the Geographic Information System (GIS) to include: (1) whether this technology is suitable for everyday use in the Facility Locating Industry, (2) what specific uses this technology may be employed to perform as a way to improve facility location accuracy and (3) what specialized knowledge and skills must an operator possess in order to employ this technology safely and effectively as an aid to underground facility location.
- 5.7 Explain the advantages and disadvantages of locating buried cables and pipes using the Global Positioning System (GPS) to include: (1) whether this technology is suitable for everyday use in the Facility Locating Industry, (2) what specific uses this technology may be employed to perform as a way to improve facility location accuracy and (3) what specialized knowledge and skills must an operator possess in order to employ this technology safely and effectively as an aid to underground facility location.
- 5.8 Explain the advantages and disadvantages of locating buried cables and pipes using Orthographic and Satellite Images to include: (1) whether this technology is suitable for everyday use in the Facility Locating Industry, (2) what specific uses this technology may be employed to perform as a way to improve facility location accuracy and (3) what specialized knowledge and skills must an operator possess in order to employ this technology safely and effectively as an aid to underground facility location.

6. Construction Standards & Practices: Facilities

- 6.1 Demonstrate a thorough knowledge of construction standards & common practices in excavation methods to include: the purposes and uses of a trencher in excavation practices, the purposes and uses of trenchless excavation in excavation practices, the purposes and uses of a backhoe in excavation practices, the purposes and uses of a cable plow in excavation practices, the purposes and uses of a pull plow in excavation practices, the purposes and uses of a static plow in excavation practices, the purposes and uses of a vibratory plow in excavation practices, the purposes and uses of boring and drilling in excavation practices, the purposes and uses of directional drilling in excavation practices, the purposes and uses of a horizontal directional drill (HDD) in excavation practices, the purposes and uses of an auger in excavation practices, the purposes and uses of a vacuum excavator in excavation practices.
- 6.2 Identify and describe the "tolerance zone" as it relates to facility location and marking practices to include the Best Practices definition: "The excavator observes a tolerance zone which is comprised of the width of the facility plus 18" on either side of the outside edge of the underground facility on a horizontal plane. This practice is not intended to preempt any existing State/Provincial requirements that currently specify more than 18"."
- 6.3 Explain the excavator's responsibilities in exercising due care and special care when working within the tolerance zone to include methods of "soft digging", the use of test holes (pot holing), hand digging, the use of pneumatic hand tools and other non-invasive methods of excavation within the tolerance zone.
- 6.4 Explain the term "Supply Line Separation" to include the Best Practices definition: "...a minimum or 12 inch radial separation should be maintained between supply facilities..." and list instances where this construction/excavation practice may not be maintained.
- 6.5 Describe "Subsurface Utility Engineering" (SUE) as it is used during the design phase of construction involving underground excavation to include: its relevance to ASCE 38-02 "Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data"; the various Quality Levels of ASCE 38-02 including: QLD: "...involves utility records research and interviews with knowledgeable utility personnel...", QLC: "...involves surface survey, identifying and recording aboveground features of subsurface utilities, such as manholes, valves and hydrants...", QLB: "...EM-based locating, GPR, Metal Detectors, optical instruments...", and QLA: "...soft digging, (vacuum excavation or hand digging)...".
- 6.6 Explain the importance of the facility owner/operator's "Positive Response" to Locate Requests which include: State/Provincial-specific and One-Call Center-established time periods for non-emergency Locate Requests; notification of the excavator by the facility owner/operator of the tolerance zone of the underground facility by marking, flagging, or other acceptable methods at the work site, or notification of the excavator that a "No Conflict" situation exists.
- 6.7 Explain the importance and consequences of a facility owner/operator's "Failure to Respond" to Locate Requests within the time specified by State/Provincial requirements

or if the facility owner/operator notifies the excavator that the underground facility cannot be marked within the time frame and a mutually agreeable date for marking cannot be arrived at which includes: (1) the responsibility of the excavator to re-call a One-Call Center, and (2) that the excavator may proceed with excavation at the end of two working days unless otherwise specified in State/Provincial law, provided the excavator exercises due care in his endeavors.

7. Equipment Training and Techniques: Location Equipment

- 7.1 Explain the "10 Steps for Every Locate" to include: Step 1. Follow safety procedures and use safety equipment, Step 2. Read the entire ticket carefully, Step 3. Visually scan the entire area, Step 4. Check all prints before starting the locate, Step 5. Create a good ground, unbond, and apply the signal appropriately, Step 6. Use the lowest possible power and frequency settings, Step 7. Locate, paint, flag, or otherwise appropriately mark the facilities, Step 8. Verify the accuracy of locate marks, Step 9. Use high-profile locating procedures as needed, and Step 10. Take photographs or make sketches, complete all documentation and bill properly.
- 7.2 Demonstrate the ability to properly check the operational functioning of locating equipment to include: the proper use of manufacturer's instructions, cleaning, storage, maintenance, performing a proper function test, performing a continuity test on the transmitter, testing the receiver for response in both peak and null modes, testing for battery life, calibration requirements, diagnostic tests, antenna function tests and comparing operational tests to a known facility's actual location and depth to ensure accuracy under actual or simulated site conditions.
- 7.3 Demonstrate the proper set up and use of an Electromagnetic Transmitter during actual or simulated site conditions.
- 7.4 Demonstrate the proper set up and use of an Electromagnetic Receiver during actual or simulated site conditions.
- 7.5 Demonstrate the proper set up of all Electromagnetic Equipment for conductive locating circuits during actual or simulated site conditions to include: adjusting the frequency, sensitivity and gain; performing a function test as per manufacturer's instructions; selecting the appropriate antenna (peak or null) for the type of response mode being applied; battery tests; optimal power outputs; and proper storage, maintenance and cleaning under actual or simulated site conditions.
- 7.6 Explain the ground path return for a transmitted signal to include the effects of the following: type of soil; moisture content of soil; lack of continuity in target facility's insulation; presence of joints, transition fittings, or splices in target facilities; conductivity of target facility; diameter of target facility; depth of target facility; congestion in area (other facilities being near target facility); presence of metallic objects in area; common grounding (target facility sharing a ground with other facilities); poor grounding of target facility; poor grounding of transmitter.
- 7.7 Explain why a standard ground stake or rod might not work when used in the following conditions: when there is nothing but deep gravel in the locate area; when the locate area is completely covered by concrete or asphalt; and when the soil is completely frozen.
- 7.8 Demonstrate the ability to "adjust as necessary" to ensure a proper signal is applied and received to include: move the transmitter ground to another area, find another access point, change the power and/or frequency settings on the transmitter or apply water around the grounding point under actual or simulated site conditions.
- 7.9 Explain the factors that affect the strength of a locatable EM signal to include: resistance of conductor; chosen frequency of the transmitter; and applied power level of the transmitter.
- 7.10 Demonstrate the proper set up for the use of an Induction Clamp (or Coupler) for locating circuits in actual or simulated site conditions.
- 7.11 Demonstrate the correct conductor grounding requirements for using the induction clamp method of location to include that the facility must be grounded on both ends when using an induction clamp in actual or simulated site conditions.
- 7.12 Demonstrate the techniques for improving grounding conditions at the transmitter to include applying a far end ground by physically attaching a jumper lead to the ground rod and topside access to the conductor under actual or simulated site conditions.

- 7.13 Describe how you would identify the best method of signal transmission.
- 7.14 Demonstrate the technique used to check continuity of transmitter leads under actual or simulated site conditions.
- 7.15 Explain the equipment indications when a good signal transmission has been achieved to include: the audible tone of the transmitter; visual indications such as bar levels or mA reading of the transmitter.
- 7.16 Demonstrate the proper set up for the use of inductive locating techniques for locating facilities under actual or simulated site conditions.
- 7.17 Demonstrate the proper distance requirements for EM Receiver placement to resist air coupling when using inductive locating techniques under actual or simulated site conditions.
- 7.18 Explain the dangers of using induction techniques to locate facilities to include: difficulty in differentiating the target facility from other facilities in the area; the susceptibility of inducing signals on facilities near the target facility due to bleed-over; the fact that a significant part of the signal strength is lost in the soil; in order to induce a receivable signal, the receiver needs to be 30 feet or more away from the transmitter.
- 7.19 Describe conditions that determine strategic transmitter placement for inductive locating techniques to eliminate signal bleed off to include that: typically, the transmitter should be placed on the ground in an area that will increase the chances that a detectable signal will be greatest on the targeted conductor, preferably in a known area of the conductor's presence away from other non-targeted conductors in the ground.
- 7.20 Demonstrate each of the following EM Locating techniques during actual or simulated site conditions: Circle Sweep; Tracing; and Blind Sweep to designate the position of underground facilities.
- 7.21 Explain the advantages and disadvantages of each of the following methods of locating facilities with standard EM locating equipment: Direct Connection, Inductive Clamp, and Inductive Locating.
- 7.22 Explain the problem of "signal splitting" to include these factors: the length of the facilities; the metallic mass of the facilities; and the quality of the far-end ground of the facilities.
- 7.23 Explain how the following factor's affect electrical circuits used to locate target facilities: transmitter frequency used to apply the signal; the electrical resistance of the soil in which the target facility is buried; the condition of the target facility's insulation; and the quality of the target facility's ground.
- 7.24 Explain the proper setting of the transmitter's frequency to begin an EM direct connection locate to include: that a high frequency signal does not transmit as far as a low frequency signal set at the same power level; that high frequency signals flow to ground more easily than low frequency signals; and that using the lowest possible power and frequency settings provides for the best possible readings displayed for the target facility.
- 7.25 Explain the advantages and disadvantages of Audio Frequencies (20kHz or lower) and Radio Frequencies (above 20 kHz) used in facility locating to include: Audio Frequencies result in less bleed-over errors than Radio Frequencies; Audio Frequencies transmit greater distances than Radio Frequencies; Radio Frequencies are affected less by poor sheath continuity than Audio Frequencies; Audio Frequencies are more susceptible to stubs, dead-ends and poorly grounded laterals than Radio Frequencies; Audio Frequencies require higher power levels than Radio Frequencies.
- 7.26 Explain the steps necessary to activate a signal on a fiber optic cable attached to a permanent bay-mounted transmitter to include: Bay-mounted transmitters are assigned a telephone number in a Central Office. The bay-mounted transmitter is attached to multiple fiber optic cables. The Locator must call the bay-mounted transmitter using a telephone and when the assigned fiber number for a specific fiber route is reached, a Low Frequency signal is activated on the desired fiber by the bay-mounted transmitter. The Locator then sets his Electromagnetic Receiver to the known Low Frequency signal produced by the bay-mounted Transmitter and, using his Electromagnetic Receiver, detects that Low Frequency signal being broadcast through the specific fiber optic cable.

8. Multi-Plant Facilities Recognition: Visual Observation Skills, Site Familiarization/Site Characteristics

- 8.1 Explain the importance of above ground visual observations of above ground indications that there may be underground facilities in the area in relation to its relevance to ASCE 38-02 "Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data" Quality Level C "QLC" during the Construction Design Phase.
- 8.2 Explain the importance of visual observations of above ground indications that there may be underground facilities in the area prior to conducting a requested locate.
- 8.3 Describe the Industry Best Practices "Site Familiarization" or "Site Characteristics" ("4-6: Locates Are Performed Safely", "A.. Pre-Work Safety Considerations", CGA Best Practices Version 3.0) main categories of required observations to include: Obstructions; Traffic; and Physical Site Conditions, giving examples of each condition that would warrant special considerations or actions on the part of the facility locator and define those special considerations.
- 8.4 Describe physical evidence or signs of recent excavation in the area to include: back-filled trenches: patched pavement: and any new markers of undocumented underground facilities.
- 8.5 Identify a "dip" to include its definition of "aerial utility lines that transition into an underground type of line construction through a riser" and identify this type of transitioning facility by sight, in visual depictions, prints, maps and diagrams.
- 8.6 Identify common above ground signs of underground facilities to include but not limited to: manhole covers, valve boxes, pedestals, overhead lines, utility poles, meters, regulator stations, risers, transformers, and permanent markers.
- 8.7 Explain who you should notify or contact if a visual observation of a site reveals unsafe conditions or if the visual observation reveals that all underground facilities are not marked on maps, prints or are unexpectedly present where they should not be.
- 8.8 Explain how varying surface and environmental conditions affect marking and locating practices to include: rain, snow, vegetation, high traffic, construction, standing water, obstructions, hazards, exposures to toxic fumes or chemicals and explain what methods to use to identify and safely work around these conditions.
- 8.9 Identify visually all Facility System Equipment listed in 4.1 through 4.9 of these Competencies, paying particular attention to all above ground indicators of facilities or systems.

9. Locate Procedures: One-Call Centers

- 9.1 Explain the process and routing of a Locate Request "Ticket" through a One-Call Center to include: 1. An excavator, business or homeowner planning on excavating in an area calls the One-Call Center providing all necessary information and details regarding the area to be excavated, the start date and time of the planned excavation work; 2. After all relevant information is collected by the One-Call Center, a log number (also called a LRA) or "ticket number" is assigned with the "ticket" representing a document or electronic file that contains all required information for the locate request and the log number is simply the reference number for that "ticket"; 3. The ticket is sent electronically (e.g. e-mail, fax) to the appropriate utility companies or contract locating companies working for the utility companies who must respond to the locate request within a State/Provincial-mandated time frame; 4. The ticket received for the One-Call Center is logged into the databases of the appropriate utility companies or contract locating company; 5. The ticket is routed electronically to a Certified Utility Locator Technician/Certified Damage Prevention Specialist responsible for that given geographical area; 6. The Certified Utility Locator Technician/Certified Damage Prevention Specialist includes the ticket in his or her route or itinerary, based upon the area, due date, and time indicated on the ticket; 7. Once the Certified Utility Locator Technician/Certified Damage Prevention Specialist completes the location and marking of the facilities required on the ticket, he or she documents the work performed by "completing the ticket"; 8. The completed ticket is processed, which includes billing the utility companies for the locating and marking work performed; 9. Once the One-Call Center is notified of the completed ticket, and depending on State/Provincial laws, the excavator may be notified that the locate and marking of the facilities in the area to be excavated have been completed and a "Positive Response" is

- given; 10. The completed ticket is saved as an electronic file for future reference by the One-Call Center.
- 9.2 Describe the advantages of establishing a One-Call Center to include: pro-active public awareness, education and damage prevention awareness program; specifically defined geopolitical service area with no overlap; formal agreements with members; governance by a board of directors representing facility owners/operators, designers, contractors, project owners and government; single toll free Statewide number with nationwide access; 24/7 hours of operation; voice record of all incoming calls; retention of voice records according to applicable statutes; caller feedback; printed ticket recall; verification of data submitted; practices to reduce over-notifications; disaster recovery; direct electronic locates; acceptance of multiple reference points for locate requests; security; and established performance standards.

10. Locate Procedures: All States

- 10.1 Explain the Federal, State, Provincial, and Local Laws, Regulations and Codes (for individual States without a One-Call Center) which govern the process and routing of a Locate Request "Ticket" through a facilities owner/operator and to a Certified Utility Locator Technician/Certified Damage Prevention Specialist to include: State-specific, Provincial-specific or Local-specific routing and processing procedures.
- 10.2 Explain how the Federal, State, Provincial, and Local Laws, Regulations and Codes (for individual States without a One-Call Center) ensure a timely response is given for a Locate Request.

11. Industry Best Practices Guidelines

- 11.1 Describe the purpose of the Common Ground Alliance Industry Best Practices Version 3.0 to include: "...to identify and validate existing best practices performed in connection with preventing damage to underground facilities" and that it "...contains validated experiences which have been incorporated into State/Provincial and private stakeholder underground damage prevention programs and laws".
- 11.2 Explain how the Industry Best Practices were developed to include: Industry Best Practices grew out of the Common Ground Task Force established by the Department of Transportation (DOT) in 1998.
- 11.3 List the Industry Standards contained in Appendix B: Uniform Color Code & Marking Guidelines of the CGA Best Practices Version 3.0 to include: APWA (ANSI Z535.1) Uniform Color Code for marking excavation sites and underground facilities; and Industry Guidelines for Excavation Delineation; and, Guidelines for Operator's Facility Field Delineation.
- 11.4 Demonstrate using current Industry Standard Color Codes and Marking Procedures the correct method to mark underground facilities during a simulated or actual Locate Request.

12. Industry Standards: Color Code

- 12.1 List each color of the APWA Uniform Color Code (ANSI Z535.1) and its designated represented use to include: White: Proposed Excavation; Pink: Temporary Survey Markings; Red: Electric Power Lines, Cables, Conduit and Lighting Cables; Yellow: Gas, Oil, Steam, Petroleum or Gaseous Materials; Orange: Communication, Alarm or Signal Lines, Cables or Conduit; Blue: Potable Water; Purple: Reclaimed Water, Irrigation and Slurry Lines; and Green: Sewers and Drain Lines.

13. Daily Operations and Procedures

- 13.1 Describe the procedures for scheduling and completing a locate request to include: where to check for assigned tickets, where to find the applicable prints for the facility to be located, how to include the ticket assigned into a daily route log.
- 13.2 Explain the importance of organizing and checking the position of locating equipment in a vehicle before and after assigned locates.
- 13.3 Demonstrate the proper use of safety procedures, safety gear, safety cones and traffic alerts while performing a facility locate to include: all required safety measures for the scene, lookout requirements for busy traffic conditions, required personal visibility gear

- (safety vests), required construction site safety gear and procedures (hard hats and steel-toed shoes) and gas free requirements for confined space entry.
- 13.4 Describe the required post-locate cleanup requirements of a locator to include: re-bonding all facilities that were un-bonded and replace any grounding devices removed, replace any manhole covers that were removed and leave no unsafe conditions, pick up all materials, equipment and tools used at the job site and all personal litter.
- 13.5 Explain the importance of the term "Emergency" when applied to utility locating to include: a sudden or unforeseen occurrence involving a clear and imminent danger to life, health or property or the interruption of utility services or public transportation that requires immediate action.

14. Facility Owner/Excavator Relationships and Public Image

- 14.1 Explain the importance of providing a good public image of facility owners and excavators and how it relates to a professional utility locator.
- 14.2 Explain the relationships of facility owners and excavators with respect to safely locating and excavating around existing facilities.
- 14.3 Describe the procedures to be taken by a locator when a resident of private property with facilities to be located on that property is not at home.
- 14.4 Describe the procedures to be taken by a locator when an excavator on a site to be located becomes irate.
- 14.5 List what an individual utility locator can do to maintain good excavator relationships and a good public image.

15. Locating Pipelines (US) To Comply With CFR 192.614(b)(5)

- 15.1 Explain the history of CFR 192.614(b)(5) to include: that CFR 192.614(b)(5) is a subpart of the US Department of Transportation (DOT) Pipeline Safety Rule which addresses specifically the locating of pipelines, that this rule establishes specific procedures to use when locating pipelines, that there are certain mandatory requirements contained within this rule which governs the actions of a utility locator and that this rule is to be followed in all cases where pipelines are located within the US.
- 15.2 List the steps to locating pipelines contained within CFR 192.614(b)(5) to include: 1. performance of an equipment operation check; 2. verification of the scope of the locate request; 3. visual inspection of the locate area; 4. locate and mark facility(ies); and 5. recognize and react to Abnormal Operating Conditions.
- 15.3 Define "Abnormal Operating Conditions" contained in CFR 192.614(b)(5) to include recognition of: damaged pipe, damaged pipe coatings, excavation activities started prior to facility locating procedures (blasting, earth movement by excavators, trenching or other such excavation practices conducted prior to locating procedures), missing or broken tracer wires and/or the inability to locate the targeted pipeline.
- 15.4 Perform pursuant to CFR 192.614(b)(5) and prior to the utility locate: 1. an equipment operational check in accordance with manufacturer's instructions; 2. verify the battery strength; 3. perform corrective actions for equipment out of specifications prior to the locate.
- 15.5 Verify the scope of the locate request pursuant to CFR 192.614(b)(5) and prior to the utility locate: 1. determine the type of pipe required to be located; 2. verify conclusively the geographic location of the job site; and 3. verify the full extent of the locate request as it appears on the ticket.
- 15.6 Identify adjacent facilities, structures, or obstructions that may affect the successful completion of the locate request.
- 15.7 Compare prints, records and any written or observed information to conditions which exist prior to the locate and communicate these discrepancies to the proper authorities
- 15.8 Describe how additional locate requirements may be included in the locate ticket and identify where to look for additional locate instructions on the ticket or how additional requirements may be contained in various areas of the ticket.
- 15.9 Demonstrate the ability to select a type of locate to include: 1. conductive; 2. inductive; and 3. measurement to locate utilities in accordance with CFR 192.614(b)(5).
- 15.10 Demonstrate the ability to locate utilities in accordance with manufacturer instructions.

- 15.11 Demonstrate the ability to initiate the proper corrective action to regain or acquire a signal if a signal is lost or too weak to provide an adequate signal.
- 15.12 Demonstrate the ability to complete a locate within the entire scope of the locate request.
- 15.13 Mark (paint, flag or stake) the location of the facility(ies) according to Industry Best Practices to include: 1. mark changes in direction; and 2. place or provide marks so as to ensure the conclusiveness of the location of the facilities.
- 15.14 Demonstrate the ability to compare records to existing conditions after a facility is located and marked and identify and communicate those discrepancies via photos, sketches, drawings and written notations and descriptions to the proper authorities.
- 15.15 Demonstrate the ability (through actual or simulated conditions) to recognize Abnormal Operating Conditions while performing a locate.
- 15.16 Demonstrate what actions should be taken by the utility locator in reacting to Abnormal Operating Conditions (through actual or simulated conditions) including: 1. describe the Abnormal Operating Condition correctly; 2. determining if remedial action is necessary; 3. determining which remedial action to take to correct the Abnormal Operating Condition; 4. initiating remedial action; 4. reporting Abnormal Operating Conditions; and 5. describing various responses to Abnormal Operating Conditions dependant upon the nature of the Abnormal Operating Condition (damaged pipe, damage pipe coating, excavation activities begun prior to the locate, missing or broken tracing wire, and the inability to locate the pipeline).

16. Safety Procedures Per OSHA Regulations, Federal, State, Provincial and Local Laws

- 16.1 Describe the Occupational Safety and Health Administration's (OSHA) role in providing employers and their employees with rules and regulations concerning worker safety.
- 16.2 Explain what safety precautions a utility locator must take in accordance with OSHA Regulations, Federal, State, Provincial and Laws when performing duties as a facilities locator.
- 16.3 Describe all Federal, State, Provincial and Local Regulatory Laws regarding safety procedures as they pertain to the specific geographic area of responsibility of the utility locator.
- 16.4 Demonstrate how to reference and access specific geographical area regulatory information pertinent to the performance of utility locating.
- 16.5 Demonstrate the ability to perform utility locating while observing and adhering to all applicable OSHA, Federal, State, Provincial and Local Regulatory Laws as they pertain to the specific geographical area of the utility locator.

17. Written Examinations and "Hands On" Skills Testing (Field Testing)

- 17.1 Demonstrate a thorough knowledge and mastery of utility locating principles and practices by successfully completing all required "Hands On" Skills Testing (Field Testing) requirements.
- 17.2 Demonstrate a thorough knowledge and mastery of utility locating principles and practices by successfully passing a 50 question, closed book multiple-choice written exam by a score of 75% or better (12 wrong or less).

18. Field Training Requirements

- 18.1 Demonstrate a thorough knowledge and mastery of utility locating principles and practices through field training while employed by and under the supervision of a professional utility locator trainer/training division.

19. Annual Re-testing

- 19.1 Upon entry into employment as a Professional Utility (Facilities) Locator each individual must receive annual documented Re-testing to include: "Hands On" Skills Testing (Field

Testing); and (Written Examination) successfully passing a 50 question, closed book multiple-choice written exam by a score of 75% or better (12 wrong or less).

Suggested Study Materials

Prerequisite 40 hour Classroom theory course.

Pulse® Development Program for Damage Prevention Specialists, Version 6.0u 06/06, © Copyright 2003-2006 Discovery Enterprises, Inc. (All rights reserved) or equivalent, CGA Best Practices Guidelines (current version), current Industry Standards, CFR 191.614(b)(5), S.U.E. (Subsurface Utility Engineering Planning Guide) and "Hands On" Field Testing conducted by an ACES Int'l Certification Administrator.

Training Videos

- Get the Dirt: Dig Safely (Copyright Mobile Equipment Safety)
- Best Effort! The Art of Utility Locating (Copyright Underground Focus Magazine)
- Digging Dangers III: Anatomy of an Accident (Copyright Underground Focus Magazine)
- Digging Dangers X: Deadly Surprises (Copyright Underground Focus Magazine)
- The Electron Theory and Ohm's Law (Copyright Herb Thomas Productions)

Course Length: 40 hours with "Hands on" with an ACES Int'l Certified Administrator.

40 contact hours – 50% Field lab

Certified Utility Locator Technician Exam Review Committee

Chairman: Robert P. Nighswonger, (Program Manager) (President, Utility Training Academy)

Eric Churchill, (Regional Manager, UTI Locating Services)

Kelly Hardy, (Regional Manager, UtiliQuest LLC)

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