

Locating Industry Recognized Practices

Version 1.0

June 2007

LOCATING INDUSTRY RECOGNIZED PRACTICES

Introduction

Those who purchase the services of locating contractors must be confident that the provision of locates will be done in accordance with industry recognized practices to minimize the chances of any locatable buried facility's being missed. The safety of their workers depends on it.

Those who provide contract locating services must be confident that competitive bids for work are based on adherence to industry recognized practices. The credibility of their industry depends on it.

Diligence on the part of both the purchasers and the providers of locating services demands adherence to industry recognized practices as a minimum.

The Canadian Association of Pipeline and Utility Locating Contractors has developed and published the Locating Industry Recognized Practices (LIRP's) included in this document as the minimum level of service expected of CAPULC members. It is recognized that the success of any locate is, in large part, dependent upon a systemic approach to the work at hand.

LIRP's are practices that have been proven effective through experience under a variety of conditions.

This document will increase in size and scope over time as consensus is reached on new LIRP's and as existing LIRP's are revised to accommodate new technology and processes. Each LIRP has been scrutinized by CAPULC's members and has been included in this document only after acceptance through a membership balloting process.

For ease of use, this document has been divided into sections

CAPULC and its members have taken reasonable precautions to ensure that adherence to these LIRP's will result in accurate and complete locates. However, given the complexity of the underground infrastructure, the limitations of current locating equipment, the unlocatability of some buried facilities using commonly available equipment, soil and weather conditions and the human element involved in interpreting equipment signals, neither CAPULC nor its members assumes any liability in connection with the use of these LIRP's.

LOCATING INDUSTRY RECOGNIZED PRACTICES

TABLE OF CONTENTS

Section 000 General

- 001 Glossary
- 002 Acts, Regulations, Codes, Industry Guidelines
- 003 Safety in General
- 004 Job Planning and Preparation
- 005 Identifying and Marking Buried Facilities
- 006 Locate Documentation

Section 100 Locating Methods

- 101 Locating Methods and Factors That Affect Locating
- 102 Direct Hookup Method
- 103 Inductive Clamp Method
- 104 Inductive Method
- 105 Passive Seep Method (Power Mode)
- 106 Passive Sweep Method (Cathodic Protection Mode)
- 107 Passive Sweep Method (Radio Frequency Mode)

Section 200 Locating Procedures – General

- 201 4 – Way Scan Procedure
- 202 360 Degree Scan Procedure

Section 300 Locating Project

- 301 New Well Site / Vacant Land



Locating Industry Recognized Practices

Section 000

General



UNDER DEVELOPMENT

Locating Industry Recognized Practices

LIRP No. 001

Glossary and Definitions

Version 1.0

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CANADIAN ASSOCIATION OF PIPELINE AND UTILITY LOCATING CONTRACTORS

UNDER DEVELOPMENT

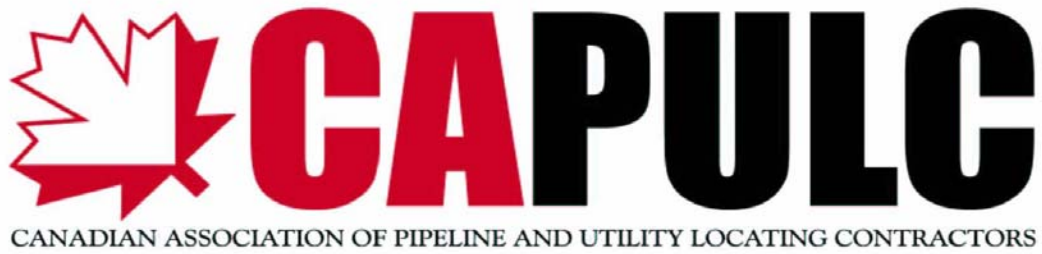
Locating Industry Recognized Practices

LIRP No. 002

Acts, Regulations, Codes and Industry Guidelines

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Locating Industry Recognized Practices

LIRP No. 003

Safety in General

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SAFETY IN GENERAL

Table of Contents

1.0	Health, Safety and Environmental Protection Commitment	3
2.0	Orientation and Safety Training	4
3.0	Incident Management	7
4.0	Safety Equipment	10
5.0	Critical Task Management	16
6.0	Emergency Management	22
7.0	Hazard Management	25
8.0	Reports and Records Management	29

1.0 HEALTH, SAFETY AND ENVIRONMENTAL PROTECTION COMMITMENT

Health, Safety and Environmental Protection Policy

The Canadian Association of Pipeline and Utility Locating Contractors is responsible for establishing and sanctioning the minimum, health, safety and environmental protection standards that govern the locating industry and its members' business operations.

As partners in workplace health and safety CAPULC members are committed to a sharing of knowledge and experience to enhance the locating industry's position as a recognized leader in workplace health and safety and environmental protection.

The following principals will guide CAPULC's members in the achievement of exemplary workplace health and safety performance, environmental protection and client relations.

Principles

CAPULC members will conduct their business operations and day-to-day activities in accordance with CAPULC Competency Standards and Locating Industry Recognized Practices.

CAPULC members will align and integrate their health, safety and environmental protection management systems with those of their clients, Industry Recommended Practice No.16 and governing legislation.

CAPULC members will regularly audit their business practices and take swift and appropriate corrective actions to correct deficiencies and continually strive for improvement in their health, safety and environmental protection performance.

CAPULC members will actively engage and encourage support from their employees in health, safety and environmental protection initiatives.

CAPULC members will provide their employees with the necessary tools and appropriate training, instruction and supervision to allow them to conduct work safely.

Indicators of Success

CAPULC's members' employees have a clear understanding of their health, safety and environmental protection responsibilities and take appropriate care to protect themselves, their co-workers, the public, clients' and company property and the environment.

CAPULC members have a Certificate of Recognition or equivalent and conduct audits on a regularly scheduled basis. Deficiencies are addressed in a timely manner with corrective actions identified, implemented and documented.

CAPULC members assign accountability for health, safety and environmental protection matters to all levels of business operations. Management develops, implements and maintains programs and processes to comply with CAPULC Competency Standards and Locating Industry Recognized Practices.

CAPULC members ensure that all appropriate safety information, including accident and incident reports, is effectively communicated to employees, business partners, contractors, clients and regulatory agencies.

CAPULC members encourage and solicit discussion, input and feedback from employees and other appropriate sources during the development of new, or the review of existing, protocols and procedures. Consideration of a variety of perspectives and experiences is critical to the development process.

2.0 ORIENTATION AND SAFETY TRAINING

2.1 *Objective*

The objective of this section is to provide Locator Technicians with the safety training necessary to meet industry and client standards.

2.2 *Application*

This section applies to CAPULC members, Locator Technicians, clients and regulatory agencies.

2.3 Responsibilities

2.3.1 CAPULC Members

Provide the necessary time and resources to ensure employees obtain appropriate orientation and safety training.

Ensure that all employee orientation and safety training is documented.

Maintain individual files of employees' orientation and training records.

Review employee training records regularly to ensure that training and/or certification is appropriate and current for the work being undertaken.

Provide copies of employee training records and/or certification to clients as requested.

Notify employees at least three months in advance of the expiration date of training certificates.

Provide employees with access to reasonably scheduled in-house and external training and/or retraining courses as necessary.

Ensure that only suitably trained and/or certified employees are allowed to enter worksites.

2.3.2 Locator Technicians

Ensure that they have successfully completed, and arrive on the worksite with valid proof of, appropriate orientation and safety training and/or certification.

Ensure their certificates are current.

Provide their employer with photocopies of orientation and safety training records and/or certificates for tracking purposes.

2.3.3 Clients

Take all reasonable and practical measures to protect the health and safety of contractors on their worksites.

Actively support contractor safety initiatives.

Demonstrate a commitment to a safe work environment

Establish and provide site specific orientation and/or training in safe work procedures for contractors.

Provide contractors with site specific health and safety information.

2.4 Training Courses

The following are some examples of training courses that may be required or appropriate.

2.4.1 Client Orientations

Provide a broad understanding of policies and procedures for client sites, including manuals and documentation.

Annual refreshers reinforce existing and provide information on new or revised policies and procedures.

2.4.2 Standard First Aid and CPR

Provides training in basic first aid and CPR techniques.

Certificates are valid for 3 years.

2.4.3 H₂S Alive

Describes the hazards associated with working on sites containing hydrogen sulphide.

Provides training in the use of self-contained breathing apparatuses.

Certificates are valid for 3 years.

2.4.4 Workplace Hazardous Material Inventory Sheets (WHMIS)

Ensures workers are aware of the controlled products that may be present in their work environment and provides them with the tools to prevent or minimize physical and toxicological risks.

Certificates are valid for 3 years.

2.4.5 Transportation of Dangerous Goods (TDG)

Provides training in the proper packing, handling and documentation procedures for transport of dangerous goods.

Certificates are valid for 3 years.

2.4.6 Confined Space Safe Entry and Rescue

Provides training in procedures for identifying confined spaces and basic rescue techniques while under supplied air.

Certificates are valid for 3 years.

2.4.7 Ground Disturbance – Supervisory Level

Provides training in the buried facility damage prevention process from planning a ground disturbance to the exposure and protection of buried facilities.

Certificates are valid for 3 years.

2.4.8 ATV/Snowmobile Training

Provides hands-on training in pre-use checklists and the uses and limitations of vehicles to increase an operator's level of comfort with the machines.

Certificates have no expiry date.

2.4.9 Defensive Driving

Evaluates driver skill level and teaches situational awareness and collision avoidance techniques.

Certificates have no expiry date.

2.5 Documentation

Documentation will include all orientation and training records and/or certificates and client training acknowledgement forms.

3.0 INCIDENT MANAGEMENT

3.1 Objective

The objective of this section is to establish a process for identifying, responding to and investigating all incidents for the purpose of minimizing the chances of their recurrence.

All incidents that result in undesirable consequences or near hits, that is incidents in which undesirable consequences are narrowly avoided, must be reported.

For all critical or major incidents and near hits that could have been critical or major, CAPULC members shall submit a formal written incident investigation report to the client as soon as possible after the event.

3.2 Application

This section applies to CAPULC members and Locator Technicians.

Depending on the circumstances surrounding an incident, clients may require that work be suspended pending the investigation. In some instances, clients may deem it necessary to participate in investigations. CAPULC members shall cooperate by providing all reasonable information and assistance requested.

3.3 Responsibilities

3.3.1 CAPULC Members (internal incidents)

Contact and request emergency services, as required.

Secure the site to prevent a worsening situation and to preserve evidence.

Notify Workplace Health and Safety.

Assemble an emergency response or investigation team and assign responsibilities.

Assess the situation and decide on a course of action.

Contact family members if appropriate or necessary.

Examine the site, take photographs, interview witnesses or workers, and develop a record of activities and conditions associated with the incident.

Prepare and submit WCB injury report if necessary.

Conduct an investigation and gather evidence to establish facts surrounding the incident.

Complete the investigation report which should include as a minimum:

- Date, time and place of incident
- Weather conditions
- Investigation team
- Date and time of actions taken
- Detailed description of incident (name of worker, extent of injuries or property damage, name of hospital or doctor that treated worker, list of policies, procedures, practices and/or regulations that were contravened)

Identify contributing factors to the incident, their root causes and corrective actions that will be taken to prevent recurrence.

Communicate findings to employees.

Document investigation and findings and retain on file.

3.3.2 CAPULC Members (external incidents)

Notify client representative immediately.

Cooperate with and participate on the incident response team.

Provide all appropriate information related to and knowledge of the incident.

Assist in the ensuing investigation.

Provide technical knowledge.

3.3.3 Locator Technicians

Stop work immediately

Assess the situation and ensure the safety of themselves and others at the site.

Provide first aid and CPR as necessary.

Contact emergency services, client and employer.

Complete incident report and submit to client or employer.

Cooperate with and participate on the incident response team.

Assist in ensuing investigation.

3.4 Documentation

Documentation should include, as a minimum:

- Incident reports
- Investigation and follow up reports
- Applicable company policies and procedures
- Photographs
- Police, hospital and medical reports
- Records of conversations with individuals present at the site doctors, hospital staff, police and emergency responders
- Workplace Health and Safety reports
- WCB reports

4.0 SAFETY EQUIPMENT

4.1 Objective

The objective of this section is to ensure the personal protection, safety and well-being of Locator Technicians.

4.2 Application

This section applies to CAPULC members, Locator Technicians and clients.

CSA approved hard hats, safety glasses and safety boots are the minimum requirements. Hazard Assessments and/or company or client requirements may dictate additional personal protective equipment such as fire retardant coveralls, hearing protection or reflective vests.

4.3 Responsibilities

4.3.1 CAPULC Members

Provide all required safety equipment for employees.

Ensure employees receive training in the use, care, maintenance and storage of safety equipment.

Ensure all safety equipment is in good condition and maintained according to the manufacturer's instructions.

Ensure maintenance of all safety equipment is documented and records are maintained.

Ensure safety equipment meets current CSA or ANSI standards.

Have copies of, and be familiar with the requirements of, the Acts, Regulations and Codes that apply to the locating industry.

4.3.2 Locator Technicians

Ensure they are adequately trained and competent in the use, care, maintenance and storage of safety equipment.

Identify appropriate safety equipment on Hazard Assessment report.

Inspect, calibrate and bump test safety equipment as required and use in accordance with manufacturer's instructions and training received.

Remove any defective equipment from service and report any defects or other equipment problems to the supervisor as soon as possible.

Report any health problems (e.g. claustrophobia) or other concerns which may affect the ability to wear particular safety equipment.

4.3.3 Client

Identify situations and worksites where specialized safety equipment is required (e.g. fire retardant coveralls, respiratory equipment).

Include client standards regarding safety equipment in orientation training.

4.4 Equipment

4.4.1 Protective Headware

Only CSA/ANSI approved hard hats are acceptable on worksites that require hard hats. Metal hard hats are not acceptable. Hard hats provide head protection and must be maintained in good condition. A properly adjusted suspension is critical to the proper performance of a hard hat. Hard hat liners may only be made of cotton, wool or fire retardant materials. Clean hard hats only with mild soap and warm water. Refer to inside of the hard hat for further instructions.

4.4.2 Protective Eyewear

The minimum eye protection required is CSA approved safety glasses with side shields. Goggles and face shields may be required under certain working conditions.

Comfort and fit are very important in the selection of safety eyewear. Lens coatings, venting or fittings may be needed to prevent fogging or allow use with regular prescription glasses.

Contact lens should not be worn on worksites. They may trap or absorb particles or gases causing eye irritation or blindness. Hard contact lens may break into the eye when hit.

Basic eye protection should be worn with face shields. Face shields alone are often not enough to fully protect the eyes from potential hazards. When eye and face protection are required, advice from Workplace Health and Safety, Material Safety Data Sheet (MSDS) or safety equipment suppliers will help in the selection of appropriate protective eyewear.

When cleaning protective eyewear, wash in mild soap and water, rinse in clean water. If using soap and water, air-dry or pat dry with clean, soft tissue. Do not use ammonia, alkaline cleaners, and abrasive cleaning compounds or solvents. Refer to the manufacturer's instructions for specific protective eyewear.

4.4.3 Protective Footwear

CSA approved safety footwear will be worn on all work sites. This footwear will be made of leather or other materials (e.g. rubber) appropriate for the protection required.

4.4.4 Fire Retardant Outerwear (Coveralls)

The intent of fire retardant outerwear is to ensure protection of workers on worksites where there is or may be a fire or explosion hazard. To minimize potential injuries and burns from fires and explosions, all workers who may be exposed to fire or explosion hazards shall wear appropriate clothing. For maintenance and cleaning instruction, refer to the manufacturer's instructions.

The clothing standards are outlined as follows and shall be applicable for the various levels of exposure.

Level 1 – *Anyone whose exposure is restricted to Level 1 hazards is not specifically required to wear fire retardant outerwear.*

Anyone who will be temporarily exposed to Level 2 or Level 3 hazards must comply with the requirements for Level 2 or Level 3 exposure respectively.

Level 2 – Anyone who may be exposed to a Level 2 hazard will minimize potential injuries, in the case of a flash fire, by wearing personal clothing made of 100% cotton. Clothing worn next to the skin should be 100% cotton and an additional layer of at least 35% cotton blended material or of an approved fire retardant material is recommended.

Level 3 – Anyone who may be exposed to a Level 3 hazard must wear fire retardant outerwear. Personal inner clothing must meet the requirements for a Level 2 hazard.

4.4.5 Hearing Protection

Hearing protection must be CSA approved and must be provided for all employees who are exposed to noise above permissible levels. Earmuffs or earplugs must be worn in all high noise areas. The protection must provide sufficient attenuation to reduce noise levels to a safe intensity at the ear. For care and maintenance of hearing protection equipment, refer to the manufacturer’s instructions.

Duration per Day (hours)	Sound Level in DBa (slow exposure)
16	80
8	85
4	90
2	95
1	100
0.5 (30 minutes)	105
0.25 (15 minutes)	110
0.125 (7.5 minutes)	115

Permissible Levels of Noise Exposure

4.4.6 Personal Atmospheric Monitor

Personal atmospheric monitors are intended to alert users of the presence of noxious vapours or the lack of oxygen. It is very important that users of these devices read and understand the manufacturer’s operating instructions and the equipment’s limitations before use.

4.4.7 Respiratory Equipment

Certain situations require the use of respiratory equipment and CAPULC members must ensure their Locator Technicians are trained to recognize such situations.

CAPULC members will ensure their Locator Technicians are trained and proficient in the use of respiratory equipment.

CAPULC members will ensure appropriate equipment is made available to Locator Technicians when required.

4.4.7.1 Limitations

Each type of respiratory device has an associated protection factor (PF). When the PF is multiplied by the occupational exposure limit (OEL) for a contaminant, the resulting number is the maximum concentration of that particular contaminant for which that particular respiratory device can be used.

Respiratory Protection Type	Protection Factor
Half mask air purifying respirator	10
Full face mask air purifying respirator	50
Powered air purifying respirator	100
SABA	2,000
SCBA	10,000

Protection Factors for Various Respiratory Devices

4.5 Documentation

Documentation should include, as a minimum:

- Equipment maintenance records
- Calibration and bump test records
- Equipment manufacturer's operating instruction manuals
- Training records
- Safe Work Permits
- Hazard Assessment Forms
- Confined Space Entry Permit

- Air quality monitoring records
- Company Safety Manual and Codes of Practice

5.0 CRITICAL TASK MANAGEMENT

5.1 Objective

The objective of this section is to provide for the safety of Locator Technicians by identifying Critical Tasks and describing how their hazards are to be controlled or minimized.

5.2 Application

This section applies to CAPULC members, Locator Technicians, clients, contractors, public.

5.3 Responsibilities

5.3.1 CAPULC Members

Identify, document, review regularly and modify Critical Tasks as required.

Ensure identified Critical Tasks are relevant and up-to-date.

Provide required training to workers involved in performing Critical Tasks.

Ensure they are familiar with and understand Critical Task Management.

Ensure that Locator Technicians and other workers have access to, understand and follow the Critical Task Management process.

Conduct periodic worksite inspections to ensure adherence to Critical Task Management.

Continually stress the importance of Critical Task Management to their employees.

5.3.2 Locator Technicians

Conduct a Hazard Assessment, including the identification of Critical Tasks, for every worksite.

Ensure they are familiar with the Emergency Response Plan for each worksite.

Adhere to employer's and/or client's Critical Task Management process, whichever is more stringent.

Recognize and be aware of the characteristics and uniqueness of their work environments.

Understand the obligation to refuse unsafe work provisions of occupational health and safety legislation.

Comply with all safety rules, procedures and instructions to ensure a safe work environment.

Identify any concerns or issues to both the employer and the client's site representative.

5.3.3 Clients

Identify site specific risks and provide site specific procedures for eliminating or minimizing them.

Provide orientation training for contractors.

Conduct frequent safety inspections of their own sites.

Conduct Pre-Job Safety Meetings with contractors.

Address concerns and issues raised by contractors.

5.4 Critical Task List

Task	Hazards	Controls
1. Driving and backing up	<ul style="list-style-type: none"> ▪ Vehicle incident with/without injury and with/without disabling of vehicle ▪ Property damage to on-site facilities 	<ul style="list-style-type: none"> ▪ Vehicle operation procedures ▪ Emergency response procedures ▪ Backing up policy, using spotter and recognized hand signals ▪ Vehicle maintenance procedures ▪ First aid and emergency equipment in vehicle ▪ Communication devices (phone) in vehicle ▪ Provide office with itinerary ▪ Seat belts, mechanical tools, tow rope in vehicle
2. Single worker on worksite	<ul style="list-style-type: none"> ▪ Occurrence of an incident which prevents worker from accessing communication system ▪ Injury which requires more first aid than can be self-administered ▪ Exposure to airborne contaminants, possible loss of consciousness 	<ul style="list-style-type: none"> ▪ Company working alone policy ▪ Provision of first aid and emergency equipment ▪ Provision of communications equipment ▪ Initiate contact with office at beginning and end of shift and every 2 hours during shift ▪ Provide office with itinerary ▪ Portable gas monitoring equipment

<p>3. Working after hours</p>	<ul style="list-style-type: none"> ▪ Vehicle incident resulting worker injury or strands worker at or going to a site ▪ Occurrence of incident which prevents worker from accessing communications equipment ▪ Injury which requires more first aid than can be self-administered 	<ul style="list-style-type: none"> ▪ Company working alone policy ▪ Vehicle operating and maintenance procedures ▪ Provision of communications equipment ▪ Establish communications between worker and office ▪ Portable air quality monitor ▪ Pre-job hazard assessment ▪ Provision of first aid and emergency equipment ▪ On-call supervisor ▪ Mechanical tools in vehicle
<p>4. Driving after extended hours of work and working extended hours</p>	<ul style="list-style-type: none"> ▪ Fatigue, stress, loss of concentration and attentiveness to task (working or driving) ▪ Falling asleep while driving ▪ Sustained body position while driving ▪ Psycho-social hazards ▪ Rushing while working and driving in order to get home 	<ul style="list-style-type: none"> ▪ Driver training and education ▪ Wear seat belts, obey speed limits and rules of the road ▪ Only approved drivers operate vehicles ▪ Work in pairs whenever possible ▪ Take scheduled breaks ▪ Check in and communicate with office ▪ Communicate travel plans and ETA ▪ Company working alone policy

<p>5. Walking and walking in unsafe areas</p>	<ul style="list-style-type: none"> ▪ Walking over uneven and unfamiliar terrain ▪ Natural and man-made obstacles (animal habitat, disturbed ground) ▪ Extended periods of walking ▪ Walking in isolated areas, long distances from vehicle ▪ Exposure to wild animals 	<ul style="list-style-type: none"> ▪ Hazard assessments/tailgate meetings ▪ First aid training ▪ Provision of first aid and emergency equipment in vehicle ▪ Company procedures ▪ Mobile phone on person ▪ Wearing appropriate clothing and footwear ▪ Fitness to work ▪ Situational awareness
<p>6. Airborne contaminants (H₂S etc.)</p>	<ul style="list-style-type: none"> ▪ Exposure to environment with excess concentrations of airborne contaminants ▪ Atmosphere lacking oxygen resulting in loss of consciousness ▪ Injury which requires first aid beyond the ability of worker 	<ul style="list-style-type: none"> ▪ Familiar with and follow site specific procedures and emergency response plans ▪ Company emergency response plan ▪ Training in first aid and CPR ▪ Hazard assessments/tailgate meetings ▪ Calibrated H₂S monitors worn
<p>7. Locating underground facilities</p>	<ul style="list-style-type: none"> ▪ Mistake in locating, putting workers and the public at risk ▪ Unexpected contact with pipe or cable ▪ Pipeline rupture or severed electrical cable 	<ul style="list-style-type: none"> ▪ Understand and follow CAPULC Standards and LIRPS ▪ Interpret acts, regulations, codes, rules, guidelines ▪ Company locating procedures ▪ Client specific procedures ▪ Locating equipment calibrated and in good working order ▪ Competent locators ▪ Company skill development programs ▪ Hazard assessments/tailgate meetings ▪ Plot plans, red-line drawings, EUB plats, pipeline reports, engineering records

<p>8. Working in extreme weather</p>	<ul style="list-style-type: none"> ▪ Exposure to and working extended hours in unfriendly environmental conditions ▪ Unpredictable weather conditions and changes 	<ul style="list-style-type: none"> ▪ Hazard assessments/tailgate meetings ▪ First aid training ▪ Provision of first aid and emergency equipment in vehicle ▪ Vehicles equipped with properly working heating and air conditioning systems ▪ Company procedures ▪ Appropriate clothing and head gear
<p>9. Working on street and along roads or highways</p>	<ul style="list-style-type: none"> ▪ Personal injury, possibly fatal ▪ Damage to vehicle and equipment ▪ Potential to rush work resulting in errors ▪ Impact of irate and impatient motorists 	<ul style="list-style-type: none"> ▪ Hazard assessments/tailgate meetings ▪ Understand nature of traffic ▪ First aid training ▪ Provision of first aid and emergency equipment in vehicle ▪ Assistance of flag person ▪ Use of cones, barricades, 4-way flashers, strobe lights ▪ Conduct work and act in a professional manner
<p>10. Confined space entry</p>	<ul style="list-style-type: none"> ▪ Exposure to concentrations of airborne contaminants ▪ Atmosphere lacking oxygen resulting in loss of consciousness ▪ Injury to worker necessitating rescue ▪ Encountering dangerous wildlife 	<ul style="list-style-type: none"> ▪ Confined space training ▪ Confined space entry permit ▪ Hazard assessments/tailgate meetings ▪ Client procedures ▪ Communications ▪ Atmospheric testing and recording ▪ Emergency response plan ▪ Safety watch ▪ Safety equipment in good working condition available

5.5 Documentation

Documentation should include, as a minimum:

- Safety Reports (Hazard Assessments, Pre-Job and Tailgate Meetings, Safe Work Permits, Confined Space Entry Permits)
- Locator Technician orientation and training records
- Check-in/Call-in logs
- Daily work log and records
- Safety Manual and Codes of Practice
- Emergency response contact list and phone numbers (internal and external)
- Vehicle inventory list, maintenance and inspection records
- Equipment list, maintenance and inspection records
- CAPULC Standards and LIRPs
- Client procedures, contact names and phone numbers
- Acts, Regulations, Codes, rules, industry guidelines

6.0 EMERGENCY MANAGEMENT

6.1 Objective

The objective of this section is to develop a system for advance preparedness and effective management of emergency situations during worksite mobilization/demobilization and while on a worksite.

6.2 Application

This section applies to CAPULC members, Locator Technicians, clients and the public.

6.3 Responsibilities

6.3.1 CAPULC Members

Develop, publish and implement Emergency Management Procedures.

Ensure Emergency Management Procedures are relevant and up-to-date.

Coordinate and integrate Emergency Response Plans with those of clients.

Assign specific responsibilities (e.g. coordinator, emergency call-out, media contact person, family member contact person) in advance of an emergency.

Conduct periodic practice exercises to test Emergency Response Preparedness.

Be prepared to establish an Emergency Response Command Centre.

Ensure all Locator technicians and other employees are aware of the Emergency Response Plan and are adequately trained to follow Emergency Response Procedures.

Provide appropriate first aid and emergency equipment and supplies (first aid kit, blankets, fire extinguisher, cell phone, Safety Manual, Codes of Practice, Emergency Procedures, emergency response contact lists) for all vehicles.

Provide a 7x24 hour communications link for emergency purposes.

Provide Locator Technicians with appropriate communications equipment.

Develop and maintain site specific client emergency contact lists complete with phone numbers.

Develop and maintain site specific emergency responders (e.g. fire, police, ambulance, hospital, regulatory agencies) contact list complete with phone numbers.

Communicate frequently with employees and employees' families during any ongoing emergency situation.

In the case of fatalities, coordinate notification of next of kin with police.

Provide reasonable assistance and expertise to clients and emergency responders during an emergency situation.

6.3.2 *Locator Technicians*

Ensure employer has current next of kin and emergency contact information.

Receive adequate training in and comply with Emergency Management

Procedures.

Participate in Emergency Response Preparedness practice exercises.

Ensure vehicles are equipped with appropriate and adequate emergency equipment and supplies (e.g. first aid kit, blankets, fire extinguisher, cell phone, Safety Manual, Codes of Practice, Emergency Response Procedures, emergency contact lists).

Ensure safe shutdown of work activities and evacuation of worksite to pre-established muster point during an emergency on a worksite.

Initiate Emergency Management Procedures and notify emergency responders, client representative, employer and regulatory agencies as required or necessary in an emergency situation.

Follow instruction of client representative and emergency responders.

Provide reasonable assistance and expertise to clients and emergency responders in managing an emergency situation.

6.3.3 Clients

Develop, implement and coordinate a site specific Emergency Response Plan.

Provide contractors with site specific Emergency Management Procedures.

Provide contractors with site specific Emergency Response orientation and training.

Provide contractors with site specific emergency contact lists complete with phone numbers.

Ensure escape routes are available and clearly identified on worksites.

Facilitate the safe shutdown of work activities and evacuation of worksite to a pre-established muster point in an emergency.

6.4 Documentation

Documentation should include, as a minimum:

- Safety Reports (Hazard Assessments, Pre-Job and Tailgate Meetings, Safe Work Permits, Confined Space Entry Permits)
- Locator Technician orientation and training records
- Safety Manual and Codes of Practice
- Company Emergency Management Procedures
- Client Emergency Management Procedures
- Site specific Emergency Response Plan
- Emergency response contact lists and phone numbers (company, client, Emergency Responders, regulatory agencies)
- Vehicle emergency equipment and supplies inventory list
- Employee next of kin and emergency contact information
- Records and information of events and actions preceding, during and following an emergency
- Employee orientation and training records

7.0 HAZARD MANAGEMENT

7.1 Objective

The objective of this section is to describe the process for identifying, documenting and communicating potential worksite hazards and appropriate measures to prevent or control risks associated with them.

7.1.1 Definition of Hazard

A hazard is any condition which alone, or in some combination, could result in injury, property damage, environmental damage or death. Hazards can be described as Routine (e.g. weather, terrain, traffic etc.) or Non Routine (e.g. open excavation, noise, ice under snow).

7.2 Application

This section applies to CAPULC members, Locator Technicians and clients.

7.3 Responsibilities

7.3.1 CAPULC Members

Develop, implement and review and modify as required Hazard Management Procedures.

Ensure Hazard Management Procedures are relevant and up-to-date.

Ensure Locator Technicians and other employees are adequately trained in Hazard Assessment and Management Procedures.

Review Hazard Assessment Reports, identify and set time lines for the implementation of appropriate corrective actions and conduct follow to ensure corrective action plans have been implemented.

Reinforce Hazard Management Procedures compliance expectations with Locator Technicians and other employees.

7.3.2 Locator Technicians

Before starting work, assess the work site and planned activities for potential hazards from the perspective of “what can go wrong”.

Determine the risk associated with each identified potential hazard and decide on measures to prevent or control the risks.

If the risk associated with a particular hazard is not acceptable, do not proceed with work and cease work already begun. Seek advice from employer on how to proceed.

Wear appropriate Personal Protective Equipment and use appropriate or required monitoring and safety equipment.

Complete Hazard Assessment Report and Tailgate Meeting Report for every worksite.

Submit Hazard Assessment Reports and Tailgate Meeting Reports to appropriate employer representative.

Participate in client on site Pre-Job Safety Meetings.

Inform client representative and employer of unexpected and uncontrolled hazards.

Request clarification from client representative if there is any confusion about site specific hazards or hazard controls.

Stop work when conditions change and reassess potential hazards.

Perform work in a safe manner.

Seek advice from the appropriate employer representative if there is any doubt about identifying or controlling hazards or if a client's expectation of risk acceptance is not reasonable.

7.3.3 Clients

Conduct Pre-Job Safety Meetings with contractors, as necessary.

Identify all known site specific potential hazards and appropriate control measures to contractors.

Maintain records of site specific Hazard Assessments.

Address worker concerns.

Stop work when conditions change and reassess potential hazards.

7.4 Types of Hazards

Physical - buried facilities, confined space, driving, weather, noise, ignition sources, slips/trips/falls

Ergonomic - overexertion, twisting, pulling, lifting, repetitive motion

Environmental - wildlife, soil conditions, noise

Biological - airborne contaminants, animal/insect bites, toxic vegetation, Hanta Virus, West Nile Disease

Mental - working alone, frequent travel, extended hours of work, fatigue, responsibilities

Chemical - hazardous waste, fumes, dust, methanol

7.5 Risk Control Measures

Engineered Controls - design specifications, enclosures, elimination of the hazard

Administrative Controls - permits/procedures/safe work practices/codes of practice, education and training programs, safety manuals and programs, communication devices, air quality monitors, maintenance, fire extinguishers

Personal Protective Equipment - head/eye/foot protection, clothing, gloves, respiratory equipment

7.6 Documentation

Documentation should include, as a minimum:

- Company Safety Manual and Codes of Practice
- Safety Reports (Hazard Assessments, Pre-Job and Tailgate Meetings, Safe Work Permits, Confined Space Entry Permits)
- Locator Technician orientation and training records
- Safety Manual and Codes of Practice
- Company Emergency Management Procedures
- Client Emergency Management Procedures
- Site specific Emergency Response Plan
- Emergency response contact lists and phone numbers (company, client, Emergency Responders, regulatory agencies)
- Vehicle emergency equipment and supplies inventory list
- Employee next of kin and emergency contact information
- Hazard Assessment Form
- Applicable Acts, Regulations, Codes, rules and industry guidelines

8.0 REPORTS AND RECORDS MANAGEMENT

8.1 Objective

The objective of this section is to identify essential reports and documents and ensure they are completed and adequately managed.

8.2 Application

This section applies to CAPULC members and Locator Technicians.

8.3 Responsibilities

8.3.1 CAPULC Members

Assign responsibility for reports and records management to an individual.

Establish and maintain a central repository for reports and records.

Ensure Locator Technicians are adequately trained in the preparation of reports.

Ensure Locator Technicians are adequately trained in what reports are required and the frequency with which they are to be submitted.

Receive, review, track and file reports.

Monitor reports for statistical purposes, trends and the implementation of corrective actions.

Maintain up-to-date orientation and training/certification records files for individual Locator Technicians.

Establish and maintain an up-to-date list of Locator Technician certificate expiration dates and training requirements.

Store records for a minimum of seven years.

8.3.2 Locator Technicians

Complete required reports and forward to appropriate employer representative in accordance with a documented schedule.

Establish and maintain an up-to-date log of personal orientation and training/certification records including any expiry dates of certificates.

Notify appropriate employer representative of any reports that require immediate attention or response.

8.4 Documentation

Typical reports and documents that should be subject to a Reports and Records Management Process include, but are not limited to:

- Employee orientation and training/certification
- Equipment and vehicle inspection and maintenance logs
- Hazard Assessment Reports
- Tailgate Meeting Reports
- Incident Investigation Reports
- Vehicle first aid and emergency supplies inventory logs
- Safety Meeting minutes
- WCB claims
- First Aid Reports
- Safety statistics



Locating Industry Recognized Practices

LIRP No. 004

Job Planning and Preparation

Version 1.0

June 2007

JOB PLANNING AND PREPARATION

1.0 OBJECTIVE

The objective of this LIRP is to establish guidelines for job preparation and planning in the interests of successfully locating buried facilities.

2.0 APPLICATION

This LIRP applies to CAPULC members, Job Schedulers, Locator Technicians and clients/ground disturbers.

2.1 CAPULC Members

Develop and implement documented processes to ensure that when Locator Technicians arrive at worksites they have all the appropriate and available information and equipment required to complete the locates in a timely and accurate manner.

Ensure that the processes are relevant and up-to-date.

Encourage feedback on processes from Locator Technicians.

2.2 Job Schedulers

Receive the work request from the client and confirm all necessary information (e.g. client name, client office and site contact information, worksite location, scope of work, schedule, access routes, special requirements, restrictions, instructions).

Gather all available and appropriate information and documentation on the presence of buried facilities at the worksite (e.g. site plans, as-built records, maps, pipeline plats, Land Titles records, company records, commercial database information).

Determine the project requirements for manpower, Locator Technician competencies, equipment and supplies.

Schedule the project and assign, together with all pertinent information gathered, to a competent, qualified Locator Technician.

2.3 *Locator Technicians (pre-worksite)*

Receive and understand all information as provided by Job Scheduler.

Ensure all required tools and equipment are in vehicle and in working condition (e.g. lath, hammer, paint, ribbon, gas detector, safety equipment, communications equipment, blank report forms, locating equipment, first aid and emergency equipment and supplies, orientation and training records/certificates).

Drive to the worksite in a safe and appropriate manner.

2.4 *Locator Technician (at worksite)*

Position the vehicle in an appropriate location with respect to traffic, facing into the wind and upwind from any wellsite or other oil and gas production facility.

Put on all required Personal Protective Equipment.

Attend client/ground disturber orientation/safety meeting.

Meet with client representative/ ground disturber and review job scope.

Request from client representative/ground disturber all available information including maps and as-built records of existing and abandoned facilities in the area and correlate with information already gathered.

Conduct a visual inspection of the worksite for evidence of underground facilities (e.g. signs, markers, vent pipes, scars, discoloration, pedestals).

Ensure all safety, communications and locating equipment is functioning properly. This will involve a visual inspection, battery check and function test of locating equipment.

Conduct and document a Hazard Assessment of the worksite and a Tailgate Meeting. Other reports may be necessary as per client's site specific procedures.

Determine the most effective locating procedures and discuss the entire locating process with the crew.

Conduct the locates and clearly mark the approximate horizontal alignment of underground facilities as per industry standards.

Record all findings on existing drawings, make and provide to the client representative/ground disturber a legible hand drawn map.

Report all concerns, uncertainties and anything unusual or out of the ordinary to the client representative/ground disturber to avoid any possible incidents.

2.5 Client Representative/Ground Disturber

Provide sufficient information to define the scope of work.

Provide all existing records and known information regarding underground facilities in the vicinity of the worksite.

Communicate, collaborate and cooperate with the Locator Technicians throughout the locating process.

Identify any known and potential worksite hazards.

Allow the Locator Technicians the opportunity to provide appropriate comments, suggestions and input and to present the results of and any concerns about the locating process.

Allow the Locator Technicians uncluttered worksite access and sufficient time to complete locates.

3.0 DOCUMENTATION

Documentation should include, as a minimum:

- Orientation and training records/certificates
- Safety forms (e.g. Hazard Assessment, Tailgate Meeting, Incident Report)
- Locate documentation forms
- Maps and drawings



UNDER DEVELOPMENT

Locating Industry Recognized Practices

LIRP No. 005

Identifying and Marking Buried Facilities

Version 1.0

June 2007



CANADIAN ASSOCIATION OF PIPELINE AND UTILITY LOCATING CONTRACTORS

UNDER DEVELOPMENT

Locating Industry Recognized Practices

LIRP No. 006

Locate Documentation

Version 1.0

June 2007



Locating Industry Recognized Practices

Section 100

Locating Methods



Locating Industry Recognized Practices

LIRP No. 101

Locating Methods and Factors That Affect Locating

Version 1.0

June 2007

LOCATING METHODS IN GENERAL

AND

FACTORS THAT AFFECT LOCATING

1.0 OBJECTIVE

The objective of this LIRP is to identify methods of establishing the horizontal alignment of underground facilities commonly in use and the physical factors and conditions that can affect locating.

Significant research efforts are underway in both Europe and the United States toward the development of new locating technologies and enhancing the performance of existing locating technologies and equipment.

2.0 APPLICATION

This LIRP applies to CAPULC members, Locator Technicians and clients.

3.0 RESPONSIBILITIES

3.1 *CAPULC Members*

Keep current with developments and improvements in locating technology and to locating equipment.

Be aware of and understand the advantages and limitations of the locating technology and specific locating devices they and their Locating Technicians will be using.

Ensure Locator Technicians are familiar with and have a working knowledge of the various technologies and theories associated with each method of locating they will be expected to use.

Ensure Locator Technicians are familiar with and adequately trained in recognizing and adapting to factors, conditions and equipment limitations that can affect the performance of locating equipment and the accuracy of any given locate.

Ensure Locator Technicians have the required level of competency in determining and applying the most effective locating method and equipment to a given locate based on the target buried facility, the nature of the locate and existing circumstances and conditions.

3.2 *Locator Technicians*

Understand and have a working knowledge of the various technologies and theories associated with each method of locating they will be expected to use.

Understand the advantages and limitations of each piece of locating equipment they will be expected to use.

Be aware of the factors, conditions and equipment limitations that can affect the performance of locating equipment and the accuracy of any given locate.

Have the requisite experience to recognize that these factors, conditions and limitations can change during the locating process and adapt or modify the locating process accordingly.

Ensure they have received adequate training and have the requisite experience in determining and applying the most effective locating method and equipment to the locate at hand.

3.3 *Clients*

Have a basic understanding of the theories and technologies associated with locating buried facilities, the limitations of locating equipment and the factors and conditions that can affect the performance of locating equipment and the accuracy of locates.

Ensure worksite is sufficiently clear of equipment and materials to allow Locator Technicians to work efficiently and effectively.

Allow Locator Technicians sufficient time to be thorough and accurate when locating buried facilities.

4.0 COMMON LOCATING METHODS

4.1 *Active Methods (both transmitter and receiver required)*

A signal produced by a transmitter is applied to a target underground facility which returns the signal to a receiver. There are three active methods of locating.

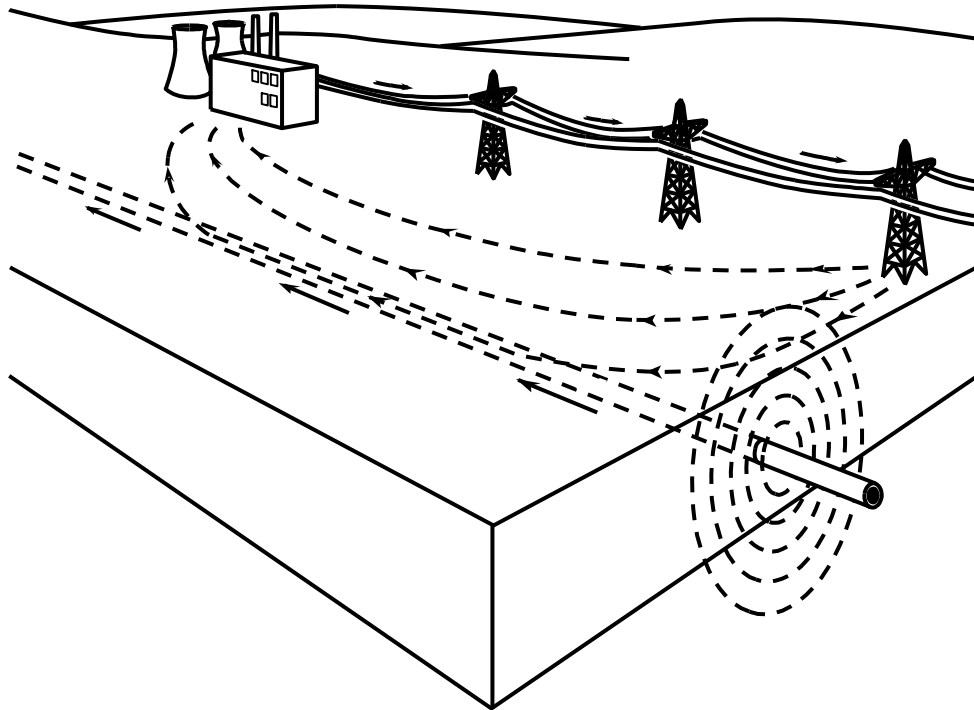
Direct Hookup Method – In the direct hookup method, also known as the **direct connection method** or the **conductive method**, the output signal (alternating current voltage) from a transmitter is connected directly to an access point on the target underground facility, creating an electromagnetic field around the target facility. This electromagnetic field is then picked up through the earth by a receiving antenna in a receiver.

Inductive Clamp Method - The inductive clamp method uses the induction principle to give a similar result to the direct hookup method but without electrical connection to the target underground facility. The output from the signal transmitter is applied to a target underground facility by clamping around it with a split magnetic core. The output signal (alternating current voltage) magnetizes the core, inducing an electromagnetic field onto the target facility. This electromagnetic field is then picked up through the earth by a receiving antenna in a receiver.

Inductive Method - The inductive method, also known as the **indirect connection method**, uses an antenna in a signal transmitter, which is fed with alternating current voltage, to emit electromagnetic energy which in turn induces an electromagnetic field on conductive underground facilities. This electromagnetic field is then picked up through the earth by a receiving antenna in a receiver.

4.2 *Passive Methods (receiver only, no transmitter required)*

Continuous electromagnetic fields are naturally induced onto conductive underground facilities, signals that can be picked up by a receiving antenna to identify the horizontal alignment of the buried facility. There are three passive methods of locating.



Courtesy Radiodetection (Canada) Ltd.

Electrical Power Mode Method – Buried cables carrying alternating current power produce signals in the 50-60Hz frequency range and higher frequency harmonics. Electrical power generating stations and overhead electrical transmission lines induce currents into the ground which produce electromagnetic fields in conductive buried facilities. Both these types of signals can be detected passively by a receiving antenna tuned to the correct frequency.

Cathodic Protection Method – Cathodic protection, a technique used to minimize the rate of corrosion in a metallic underground facility, uses galvanic or sacrificial anodes, whose electrochemical potential, current capacity and consumption rate are higher than the metallic facility. The anodes will corrode faster than the metallic facility thus increasing its life. A cathodic protection system induces an electromagnetic field on the conductive facility which can be detected passively by a receiving antenna tuned to the frequency of the cathodic protection system.

Radio Frequency Mode Method - Very Low frequency (long wave) energy from radio transmitters is present in the atmosphere worldwide. The ground provides a return path for this energy. Electromagnetic fields

are induced onto buried metallic lines creating a signal that can be detected by a receiving antenna tuned to the appropriate frequency. The signal is usually very weak and this method should not be relied on as the method of choice.

4.3 *Ground Penetrating Radar*

By sending electrical pulses into the ground and detecting the "echo" when these signals strike an object, ground penetrating radar can identify both natural materials (such as rock, gravel and dirt) and also man made objects (such as concrete, brick and steel pipe). The main problem with radar is it has a difficult time differentiating between a plastic water pipe and dense soil (such as clay).

It is a very complex, computer-driven system, expensive to own or operate and very dependent on optimal ground conditions, which restricts its current applications. The use of ground penetrating radar to locate buried facilities is an emerging technology.

4.4 *Acoustic Method*

Flow of a liquid or a gas in a pipe produces sound, which can be detected and used to locate the pipe. This technology is mainly used for locating leaks in water lines. Its use for other applications, such as plastic gas lines, is under development.

4.5 *Magnetic Anomaly Detection Method*

This method is based on the differentiation of the magnetic properties of metallic bodies against a non-metallic background. It is very limited in its application to locating buried facilities, but very accurate in its proper applications.

4.6 *Infra-Red Imaging Method*

This method is based on the temperature differential between buried facilities and the surrounding soil. It is used primarily to locate gas leaks and backfill voids. Its application to locating buried facilities is restricted by its limited accuracy which is compromised by the effects of ambient temperature, sunlight and shade.

4.7 **Dowsing Method**

Dowsing, also known as **witching** or **divining** has been used for centuries by those with the “gift” to find hidden water or minerals and more recently to find buried facilities. Divining rods such as forked hazel or willow twigs or bent pieces of coat hanger or welding rod, when held by the practitioner, dip or twist when the practitioner crosses a buried facility.

Like extrasensory perception, this method has no demonstrable scientific explanation and is not recognized by CAPULC as an acceptable method of locating buried facilities

5.0 **FACTORS THAT AFFECT LOCATING**

Soil Type, Moisture Content and pH - Moist and compact soil is ideal for electromagnetic locating. Alkaline soil or soil with high iron content can limit the effectiveness of electromagnetic locating. Loose sandy soil is optimal for ground penetrating radar.

Depth of Facility - The deeper a buried facility, the more difficult it is to locate.

Non-Grounded Facilities - The circuit path on an ungrounded facility, such as a cable that has been disconnected at both ends, is incomplete and very little transmitter signal will reach the receiver making it very difficult to locate.

Short Facilities – Buried facilities that are short are difficult to locate since the transmitter and receiver have to be closer together than normal. In this situation, more signal may reach the receiver through the air than through the target facility resulting in distorted readings.

Common Bonded Facilities - Pipelines that have a common cathodic protection system or multiple buried facilities that have a common ground may exhibit the same signal strength to the receiver making it difficult to isolate one particular facility from the others.

Relative Conductivity - Some buried facilities may carry a signal better than others and may attract signal from less conductive facilities in the area making those less conductive facilities more difficult to locate.

Electromagnetic Interference – Overhead power lines, nearby steel or reinforced concrete buildings or structures, sun spots and solar flares can

all distort the electromagnetic fields associated with target buried facilities during the locating process.

Weather - Varying and extreme weather conditions (e.g. wind, rain, snow, fog, cold and heat) can limit the efficiency and effectiveness of locating equipment and the Locator Technicians.

Type and Composition of Target Facility – Different types of target facilities (e.g. small communication cable vs. large steel pipe) and different compositions of target facilities (e.g. steel vs. cast iron) are better located by selecting specifically appropriate signal frequencies.

Congested Underground Infrastructure – A congested underground infrastructure of multiple buried facilities of various types with bends, tees and stubs and variations in depth of bury will challenge the most experienced Locator Technician.

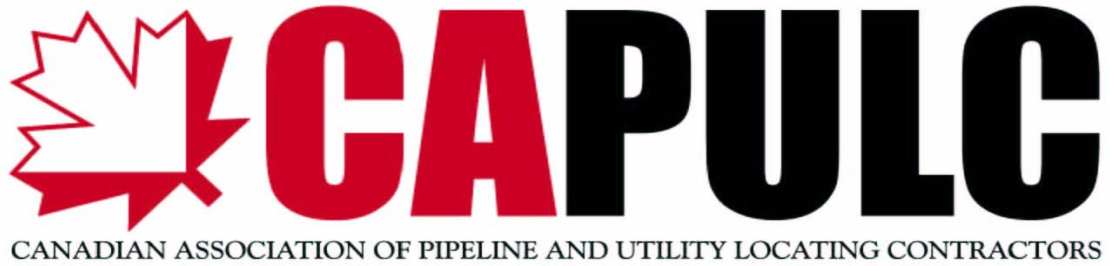
Parallel Buried Facilities – Parallel buried facilities, even of similar size and material, in close proximity to each other can display the phenomenon of relative conductivity and challenge the ingenuity of even an experienced Locator Technician.

Surface and Overhead Facilities – Surface and overhead facilities (e.g. buildings, fences, reinforced concrete structures, power lines) may interfere with the induction of electromagnetic fields on buried facilities or cause distortion of the electromagnetic fields.

6.0 DOCUMENTATION

Documentation should include, as a minimum:

- Equipment manufacturers' operating instruction manuals,
- Training material "tips and traps" information,
- Locator Technician orientation and training records,
- Codes of Practice,
- All available information on target buried facilities (e.g. type, size, composition, horizontal alignment, nominal depth of bury).



Locating Industry Recognized Practices

LIRP No. 102

Direct Hookup Method

Version 1.0

June 2007

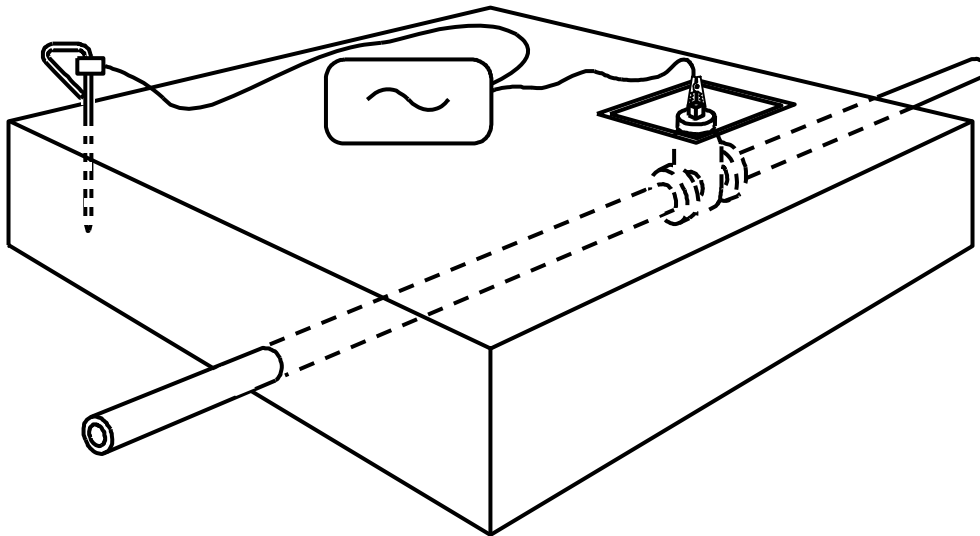
DIRECT HOOKUP METHOD

1.0 OBJECTIVE

The objective of this LIRP is to describe the direct hookup method of locating.

2.0 BASIC DESCRIPTION

In the direct hookup (conductive) method of locating, the amplified output signal from the transmitter is fed directly onto the buried facility through an electrical connection. The electrical circuit is completed through a ground connection.



Courtesy Radiodetection (Canada) Ltd.

3.0 APPLICATION

This method applies to Locator Technicians.

4.0 INCORPORATED REFERENCES

The following LIRPs are incorporated into this LIRP by reference:

- No. 003, Safety in General,
- No. 004, Job Planning and Preparation,
- No. 005, Identifying and Marking Underground Facilities,
- No. 006, Locate Documentation,

- No. 101, Locating Methods and Factors That Affect Locating.

5.0 METHOD

Do not turn locating equipment on until all connections have been made and the worksite has been checked for Lower Explosive Limits (LELs) of vapours that could ignite.

Identify target buried facility to be located.

Find a suitable place on the target facility for the hookup (e.g. tracer wire, flange, valve).

Ensure that the point of connection is free of dirt, rust and paint. This will increase conductivity and improve the locate.

Ensure that the connection point is not electrically isolated from the target buried facility.

Select a suitable ground location, away from the connection point, away from the suspected alignment of the target buried facility and away from other buried facilities.

The ground may be a spike, a rod or a plate, depending on the particular situation, and should be in or on damp ground.

Connect the transmitter output lead to the transmitter and to the connection point on the target buried facility.

Connect the ground cable to the ground and to the transmitter.

Turn on the transmitter and the receiver.

A change in the receiver tone or display indicates a circuit has been completed. If there is no change in tone or display, check the connection to the target buried facility and the ground.

Use the receiver in passive mode to check that there are no buried facilities between the transmitter and the ground location.

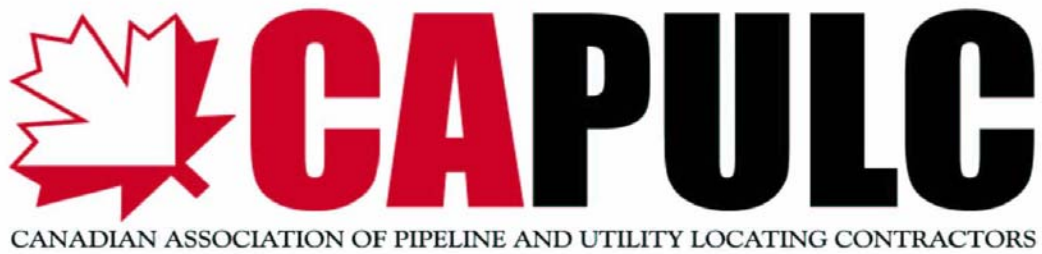
To establish the initial direction the target facility takes from the connecting point, walk in a circle around the connection point with the receiver pointing at the connection point.

Once the initial direction of the target facility takes has been established, locate the target facility while moving away from the connection point.

6.0 DOCUMENTATION

Documentation should include, as a minimum:

- Equipment manufacturers' operating manuals
- Codes of Practice
- Training material "tips and traps" information



Locating Industry Recognized Practices

LIRP No. 103

Inductive Clamp Method

Version 1.0

June 2007

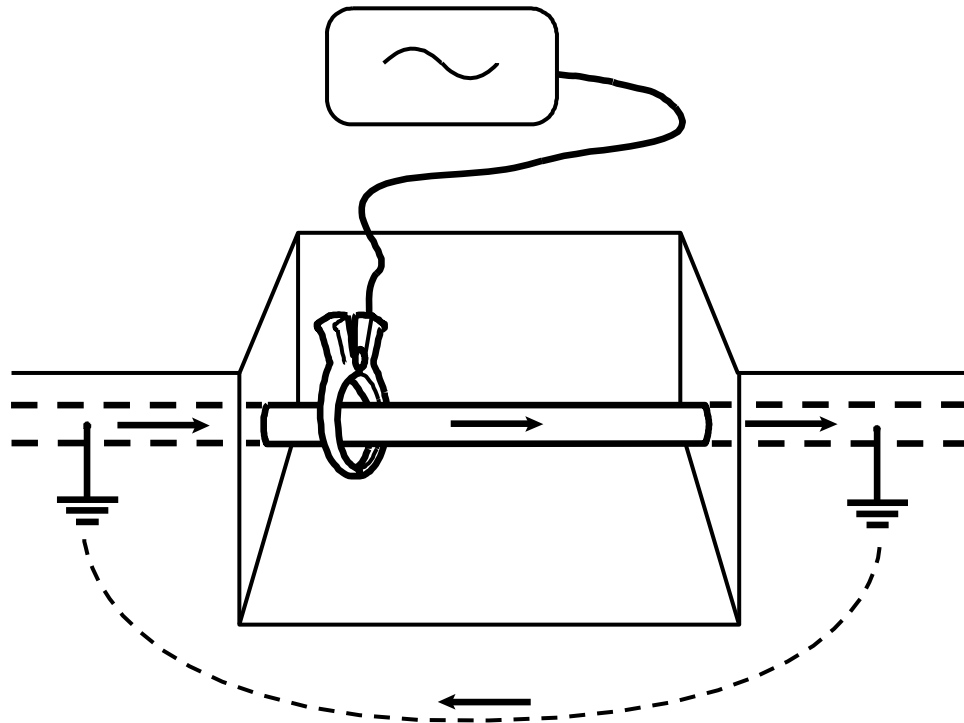
INDUCTIVE CLAMP METHOD

1.0 OBJECTIVE

The objective of this LIRP is to describe the inductive clamp method of locating.

2.0 BASIC DESCRIPTION

In the inductive clamp method of locating, the amplified output signal from the transmitter is fed indirectly to the buried facility through a split magnetic core in the form of a clamp around the target facility. Completion of the electrical circuit relies on the target facility's being grounded at both ends.



Courtesy Radiodetection (Canada) Ltd.

3.0 APPLICATION

This method applies to Locator Technicians.

4.0 INCORPORATED REFERENCES

The following LIRPs are incorporated into this LIRP by reference:

- No. 003, Safety in General
- No. 004, Job Planning and Preparation
- No. 005, Identifying and Marking Underground Facilities
- No. 006, Locate Documentation
- No. 101, Locating Methods and Factors That Affect Locating.

5.0 PROCEDURE

Do not turn locating equipment on until the clamp has been placed around the target facility and closed, all connections have been made and the worksite has been checked for Lower Explosive Limits (LELs) of vapours that could ignite.

Identify target buried facility to be located.

Find a suitable place on the target facility to install the clamp.

Ensure that the clamping point is not electrically isolated from the target buried facility.

Put an appropriate size clamp around the target facility and ensure the clamp is closed.

Connect the transmitter output lead to the transmitter and to the clamp on the target buried facility.

Turn on the transmitter and the receiver.

A change in the receiver tone or display indicates a circuit has been completed. If there is no change in tone or display, check the clamp connection to the target buried facility and the ground.

Use the receiver in passive mode to check that there are no buried facilities between the transmitter and the ground location.

To establish the initial direction the target facility takes from the clamping point, walk in a circle around the clamping point with the receiver pointing

at the clamping point.

Once the initial direction of the target facility takes has been established, locate the target facility while moving away from the clamping point.

6.0 DOCUMENTATION

Documentation should include, as a minimum:

- Equipment manufacturers' operating manuals
- Codes of Practice
- Training material "tips and traps" information



Locating Industry Recognized Practices

LIRP No. 104

Inductive Method

Version 1.0

June 2007

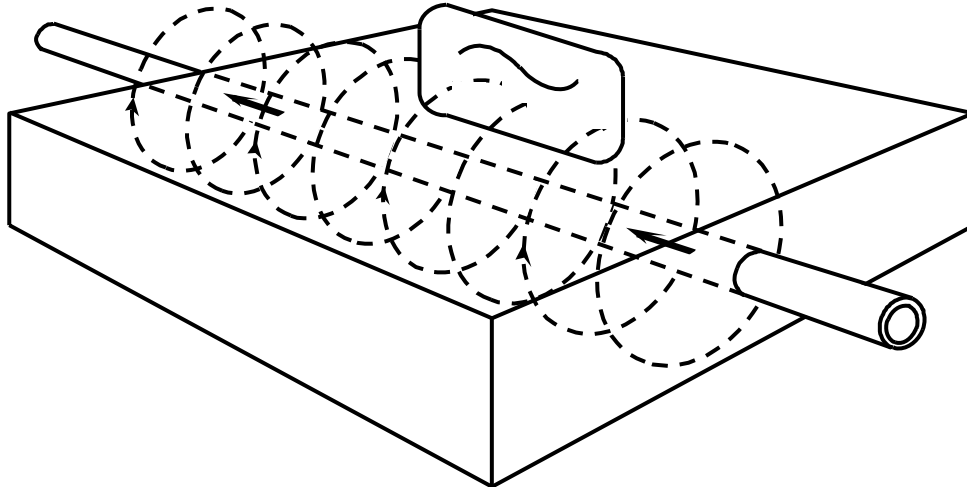
INDUCTIVE METHOD

1.0 OBJECTIVE

The objective of this LIRP is to describe the inductive method of locating.

2.0 BASIC DESCRIPTION

In the inductive method of locating, a signal antenna in the transmitter emits electromagnetic energy which induces an electromagnetic field in conductive buried facilities. This induced electromagnetic field is picked up through the earth by a receiving antenna in the receiver.



Courtesy Radiodetection (Canada) Ltd.

3.0 APPLICATION

This method applies to Locator Technicians.

4.0 INCORPORATED REFERENCES

The following LIRPs are incorporated into this LIRP by reference:

- No. 003, Safety in General
- No. 004, Job Planning and Preparation
- No. 005, Identifying and Marking Underground Facilities
- No. 006, Locate Documentation
- No. 101, Locating Methods and Factors That Affect Locating

5.0 PROCEDURE

Do not turn locating equipment on until the worksite has been checked for Lower Explosive Limits (LELs) of vapours that could ignite.

If the approximate location of the target buried facility is known place the transmitter on the ground above target facility with the antenna in line with the assumed direction of the target facility.

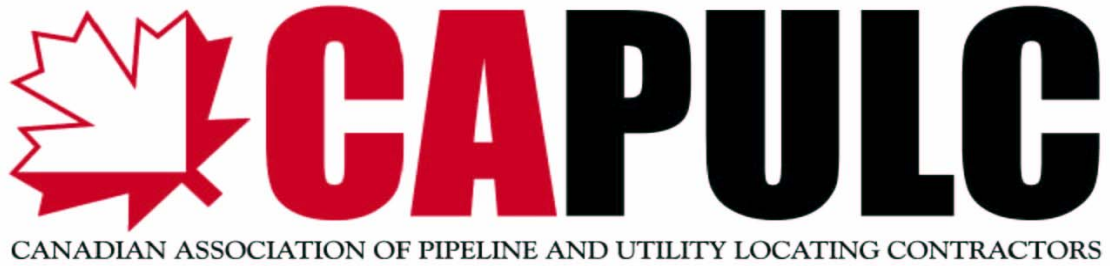
With the receiver, go out a minimum of 10 m from the transmitter minimum to get out of the air couple range and walk in a circle around the transmitter with the receiver pointing at the transmitter.

When the target facility has been found, mark that spot, place the transmitter on it with the antenna aligned with the direction of the target facility and using the receiver, locate the target facility away from the transmitter.

6.0 DOCUMENTATION

Documentation should include, as a minimum:

- Equipment manufacturers' operating manuals
- Codes of Practice
- Training material "tips and traps" information



Locating Industry Recognized Practices

LIRP No. 105

Passive Sweep Method (Power Mode)

Version 1.0

June 2007

PASSIVE SWEEP METHOD (Power Mode)

1.0 OBJECTIVE

The objective of this LIRP is to describe the passive sweep (power mode) method of locating.

2.0 BASIC DESCRIPTION

In the passive sweep (power mode) method of locating, a receiver tuned to the frequency of electrical power (60 Hz) is used in a formal pattern back and forth and across a worksite to identify the electromagnetic fields that occur naturally in energized underground power cables or are induced in other conductive buried facilities by existing electrical power generation and transmission facilities. This is not a preferred method of locating and the horizontal alignment of buried facilities located using this method must be confirmed by an active method of locating.

3.0 APPLICATION

This method applies to Locator Technicians.

4.0 INCORPORATED REFERENCES

The following LIRPs are incorporated into this LIRP by reference:

- No. 003, Safety in General
- No. 004, Job Planning and Preparation
- No. 005, Identifying and Marking Buried Facilities
- No. 006, Locate Documentation
- No. 101, Locating Methods and Factors That Affect Locating

5.0 PROCEDURE

Do not turn locating equipment on until the worksite has been checked for Lower Explosive Limits (LELs) of vapours that could ignite.

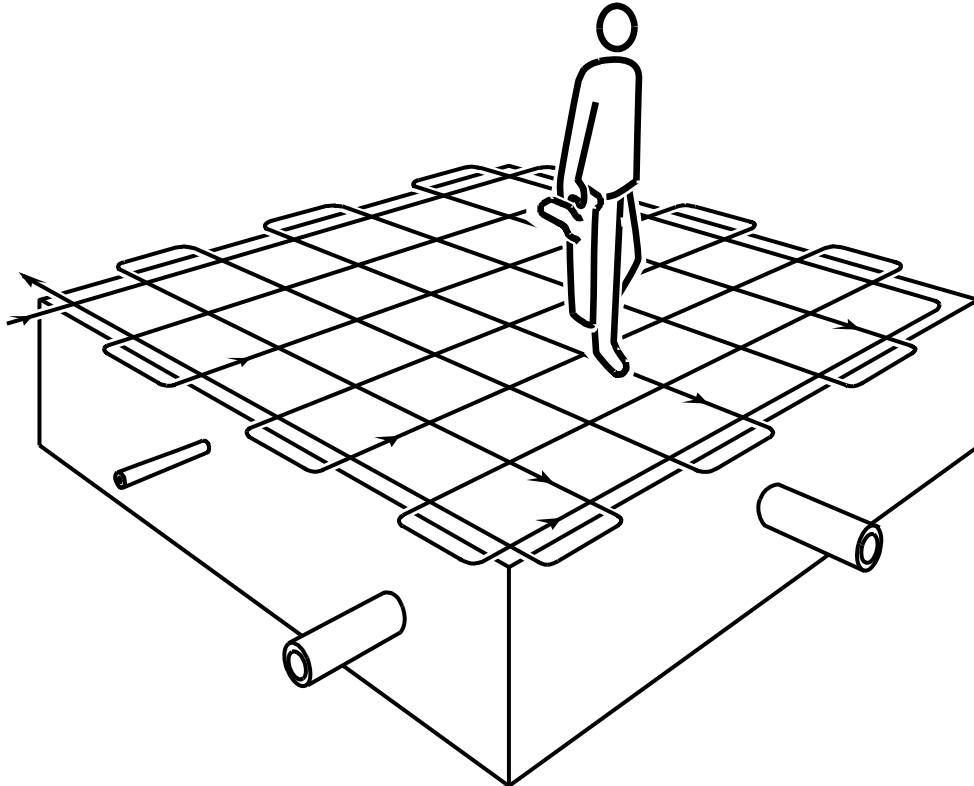
If the target buried facility is an electrical cable, ensure that it is energized.

Turn on the receiver.

Switch unit to power mode.

Scan the worksite by traversing the area in a grid pattern with the receiving antenna at right angles to the route of travel.

Confirm locate with an active method of locating.



Courtesy Radiodetection (Canada) Ltd.

6.0 DOCUMENTATION

Documentation should include, as a minimum:

- Equipment manufacturers' operating manuals
- Codes of Practice
- Training material "tips and traps" information



Locating Industry Recognized Practices

LIRP No. 106

Passive Sweep Method (Cathodic Protection Mode)

Version 1.0

June 2007

PASSIVE SWEEP METHOD (Cathodic Protection Mode)

1.0 OBJECTIVE

The objective of this LIRP is to describe the passive sweep (cathodic protection mode) method of locating.

2.0 BASIC DESCRIPTION

In the passive sweep (cathodic mode) method of locating, a receiver tuned to the frequency of cathodic protection systems is used in a formal pattern back and forth and across a worksite to identify the electromagnetic fields that occur naturally in cathodic protection systems. This is not a preferred method of locating and the horizontal alignment of buried facilities located using this method must be confirmed by an active method of locating.

3.0 APPLICATION

This method applies to Locator Technicians.

4.0 INCORPORATED REFERENCES

The following LIRPs are incorporated into this LIRP by reference:

- No. 003, Safety in General
- No. 004, Job Planning and Preparation
- No. 005, Identifying and Marking Buried Facilities
- No. 006, Locate Documentation
- No. 101, Locating Methods and Factors That Affect Locating

5.0 PROCEDURE

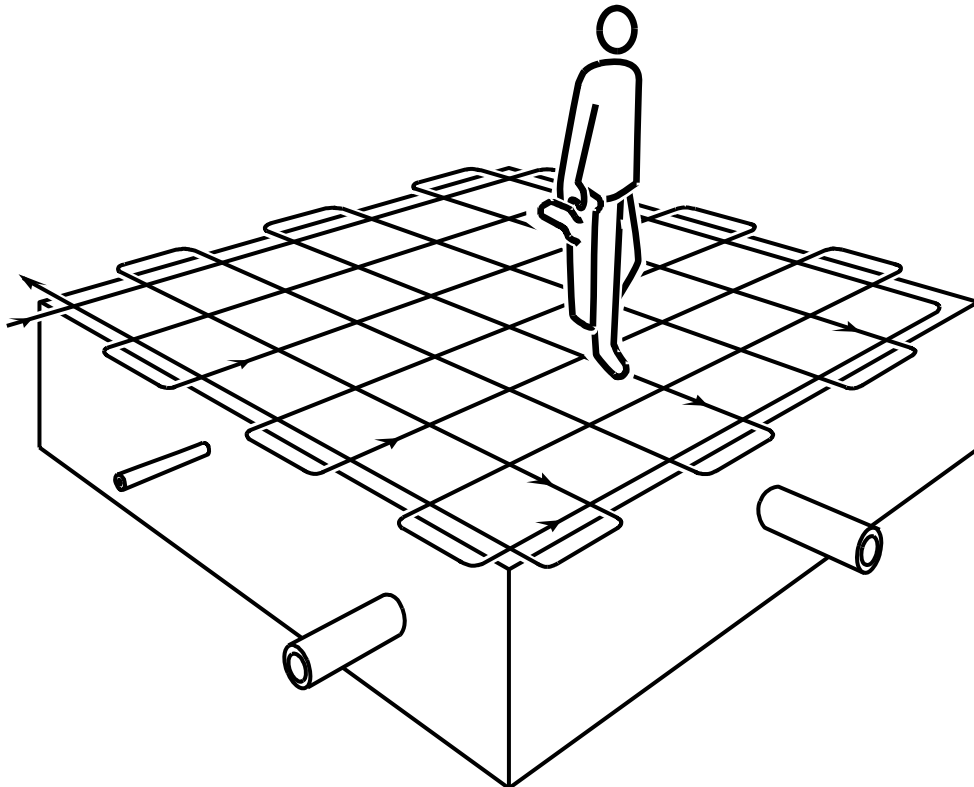
Do not turn locating equipment on until the worksite has been checked for Lower Explosive Limits (LELs) of vapours that could ignite.

Turn on the receiver.

Switch unit to cathodic protection mode.

Scan the worksite by traversing the area in a grid pattern with the receiving antenna at right angles to the route of travel.

Confirm locate with an active method of locating.

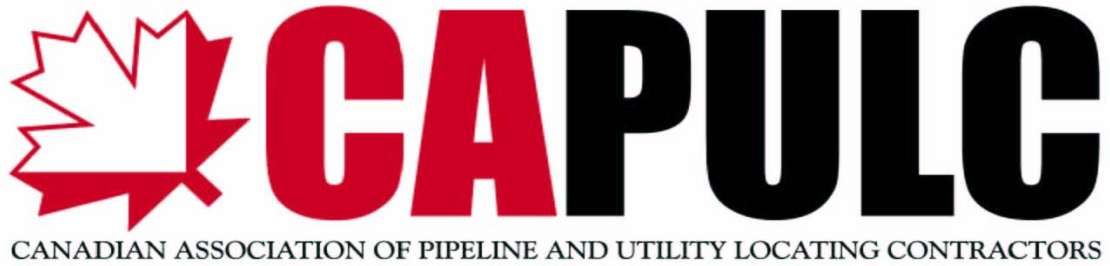


Courtesy Radiodetection (Canada) Ltd.

6.0 DOCUMENTATION

Documentation should include, as a minimum:

- Equipment manufacturers' operating manuals
- Codes of Practice
- Training material "tips and traps" information



Locating Industry Recognized Practices
LIRP No. 107
Passive Sweep Method (Radio Frequency Mode)
Version 1.0
June 2007

PASSIVE SWEEP METHOD (Radio Frequency Mode)

1.0 OBJECTIVE

The objective of this LIRP is to describe the passive sweep (radio frequency mode) method of locating.

2.0 BASIC DESCRIPTION

In the passive sweep (radio frequency mode) method of locating, a receiver tuned to the frequency of radio transmitters is used in a formal pattern back and forth and across a worksite to identify the electromagnetic fields that are induced naturally on conductive buried facilities by radio transmitters. This is not a preferred method of locating and the horizontal alignment of buried facilities located using this method must be confirmed by an active method of locating.

3.0 APPLICATION

This method applies to Locator Technicians.

4.0 INCORPORATED REFERENCES

The following LIRPs are incorporated into this LIRP by reference:

- No. 003, Safety in General
- No. 004, Job Planning and Preparation
- No. 005, Identifying and Marking Buried Facilities
- No. 006, Locate Documentation
- No. 101, Locating Methods and Factors That Affect Locating

5.0 PROCEDURE

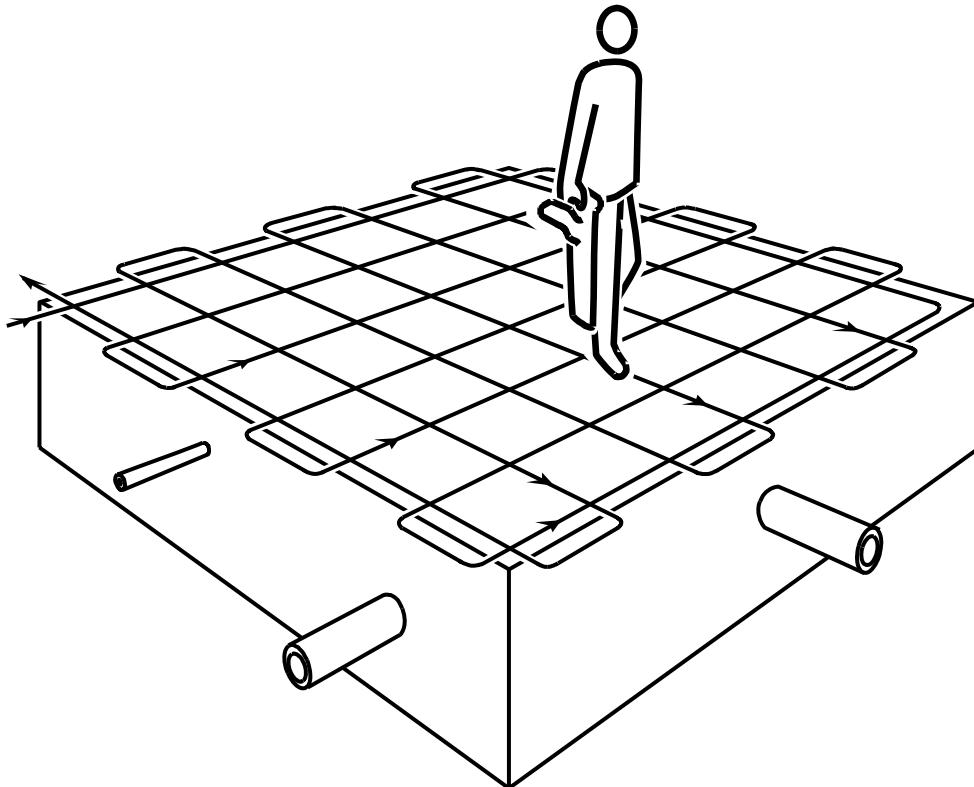
Do not turn locating equipment on until the worksite has been checked for Lower Explosive Limits (LELs) of vapours that could ignite.

Turn on the receiver.

Switch unit to radio frequency mode.

Scan the worksite by traversing the area in a grid pattern with the receiving antenna at right angles to the route of travel.

Confirm locate with an active method of locating.



Courtesy Radiodetection (Canada) Ltd.

6.0 DOCUMENTATION

Documentation should include, as a minimum:

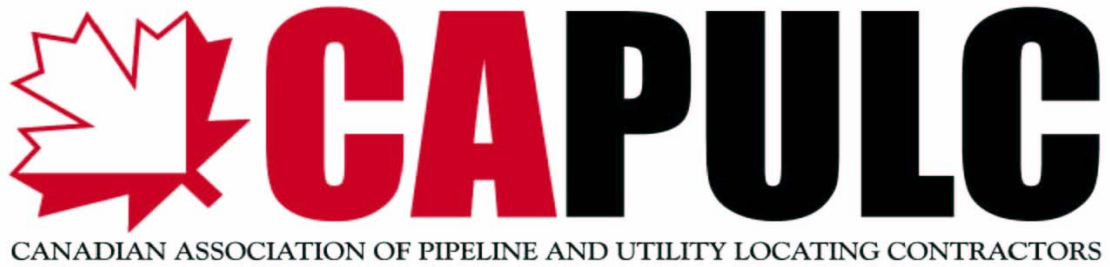
- Equipment manufacturers' operating manuals
- Codes of Practice
- Training material "tips and traps" information



Locating Industry Recognized Practices

Section 200

Locating Procedures - General



Locating Industry Recognized Practices

LIRP No. 201

4 – Way Scan Procedure

Version 1.0

June 2007

4 – WAY SCAN PROCEDURE

1.0 OBJECTIVE

The objective of this LIRP is to describe the procedure for conducting a 4 – way scan.

2.0 BASIC DESCRIPTION

The 4 – way scan procedure, also known as a blind sweep, a scan or an inductive scan, applies the inductive method of locating in four grid patterns to maximize the probability of establishing the presence of all conductive buried facilities on a worksite. Generically, the grid patterns are north – south, east – west, northeast – southwest and northwest – southeast. There is a possibility that the presence of very short conductive buried facilities will not be detected. This procedure requires a Locator Technician and an assistant.

3.0 APPLICATION

This procedure is used by Locator Technicians in the following situations:

- Conducting a passive sweep
- Establishing the approximate horizontal alignment of known conductive buried facilities on a worksite where the use of the direct hookup or inductive clamp methods of locating are not practical or possible
- Establishing the presence and approximate horizontal alignment of unknown conductive buried facilities on a worksite

4.0 INCORPORATED REFERENCES

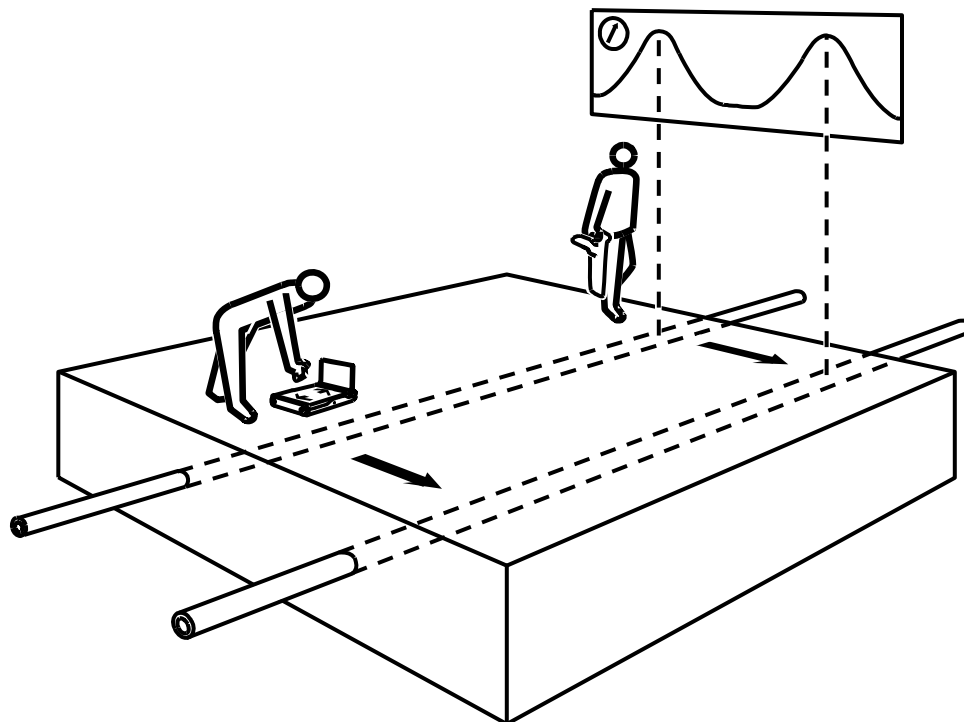
The following LIRPS are incorporated into this LIRP by reference:

- No. 003, Safety in General
- No. 004, Job Planning and Preparation
- No. 005, Identifying and Marking Buried facilities
- No. 006, Locate Documentation
- No. 101, Locating Methods and Factors That Affect Locating
- No. 104, Inductive Method

5.0 PROCEDURE

The procedure, as described, may be subject to modification to accommodate the extent and nature of the worksite. The successful completion of a 4 – way scan requires a systematic approach to ensure that the entire worksite is scanned in four different directions efficiently and effectively.

1. Divide the worksite into manageable sections, if necessary, and establish the most efficient and effective routes and directions of travel.
2. Position the transmitter and receiver approximately 15 m apart to avoid air coupling with the transmitter and receiver aligned according to the manufacturer's instructions.
3. Generically, the first grid pattern will have the locating team in a north – south alignment walking from east to west across the worksite or a section of the worksite.



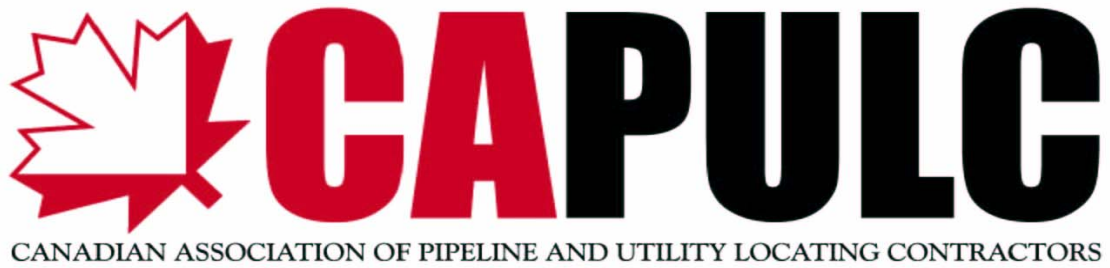
Courtesy Radiodetection (Canada) Ltd.

4. As the locating team walks across the worksite it is important that they maintain consistent separation and alignment. Any buried facilities detected will be noted or flagged temporarily as a starting point for tracing each buried facility separately later.
5. Generically, the second grid pattern will have the locating team in a northeast – southwest alignment walking from west to east along the same paths used in the first grid pattern with the transmitter to the east (ahead) of the receiver. Any buried facilities detected will be noted or flagged temporarily as a starting point for tracing each buried facility separately later.
6. Generically, the third grid pattern will have the locating team in a northwest – southeast alignment walking from east to west along the same paths used in the first and second grid patterns with the transmitter to the west (ahead) of the receiver. Any buried facilities detected will be noted or flagged temporarily as a starting point for tracing each buried facility separately later.
7. Generically, the fourth grid pattern will have the locating team in an east – west alignment with the receiver and transmitter approximately 15 m apart walking from south to north across the worksite or a section of the worksite. Any buried facilities detected will be noted or flagged temporarily as a starting point for tracing each buried facility separately later.
8. If the worksite has been divided into sections, repeat steps 2 through 7 for each section.
9. This completes the 4 – way scan.
10. The buried facilities found during the 4 – way scan now need to be identified and their approximate horizontal alignments traced and marked across the worksite using the appropriate procedures to trace specific target buried facilities.

6.0 DOCUMENTATION

Documentation should include, as a minimum:

- Equipment manufacturers' operating manuals
- Codes of Practice
- Training material “tips and traps” information



Locating Industry Recognized Practices

LIRP No. 202

360 Degree Scan Procedure

Version 1.0

June 2007

360 DEGREE SCAN PROCEDURE

1.0 OBJECTIVE

The objective of this LIRP is to describe the procedure for conducting a 360 degree scan.

2.0 BASIC DESCRIPTION

The 360 degree scan procedure also known as a circle scan or circle sweep, applies the inductive method of locating in a circular pattern to maximize the probability of establishing the presence of all conductive buried facilities that extend radially from a central point or object. This procedure requires a Locator technician and an assistant.

3.0 APPLICATION

This procedure is used by Locator Technicians in the following situations:

- Establishing the approximate horizontal alignment of known conductive facilities on a worksite that extend radially from a central point or object where the use of the direct hookup or inductive clamp methods of locating are not practical or possible,
- Establishing the presence and approximate horizontal alignment of unknown conductive buried facilities on a worksite that extend radially from a central point or object.

4.0 INCORPORATED REFERENCES

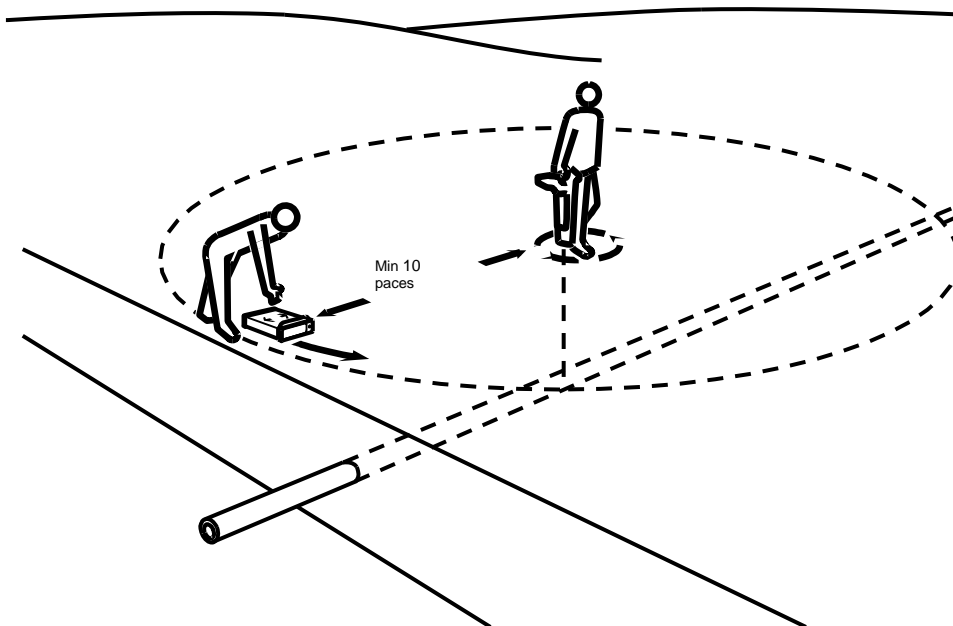
The following LIRPS are incorporated into this LIRP by reference:

- No. 003, Safety in General
- No. 004, Job Planning and Preparation
- No. 005, Identifying and Marking Buried facilities
- No. 006, Locate Documentation
- No. 101, Locating Methods and Factors That Affect Locating
- No. 104, Inductive Method

5.0 PROCEDURE

1. Position the receiver 3 – 5 m from the object or point of origin under consideration.

2. Position the transmitter approximately 15 m away from the receiver to avoid air coupling.
3. Align the transmitter and receiver according to the manufacturer's instructions.
4. While maintaining the correct alignment and separation, both members of the locating team will walk in a circle around the object or point of origin under consideration.
5. Any buried facilities detected will be noted or flagged temporarily as a starting point for tracing each buried facility separately later.
6. When a full circle has been completed, repeat steps 1 through 5 with the positions of the receiver and transmitter reversed so that the transmitter is closest to the object or point of origin under consideration.
7. This completes the 360 degree scan procedure.



Courtesy Radiodetection (Canada) Ltd.

8. The buried facilities found during the 360 degree scan procedure now need to be identified and their approximate horizontal

alignments traced and marked across the worksite using the appropriate procedures to trace specific target buried facilities.

6.0 DOCUMENTATION

Documentation should include, as a minimum:

- Equipment manufacturers' operating instructions
- Codes of Practice
- Training material "tips and traps" information



Locating Industry Recognized Practices

Section 300

Locating Projects



Locating Industry Recognized Practices

LIRP No. 301

New Well Site / Vacant Land

Version 1.0

June 2007

NEW WELL SITE / VACANT LAND

1.0 OBJECTIVE

The objective of this LIRP is to describe the process for providing locates for a new well site or other vacant land worksite.

2.0 SCOPE OF WORK

This process applies to all Locator Technicians undertaking the provision of locates for a new well site or similar project. Similar projects might include bare land development where the worksite is square or rectangular rather than a linear corridor such as a right of way. The key, distinguishing features of a new well site or similar project are:

- No surface improvements such as buildings on the worksite,
- No surface access points for any buried facilities,
- Physical access to the entire worksite is not impeded by trees or bodies of water,
- The worksite is free of heavy equipment.

3.0 INCORPORATED REFERENCES

The following LIRPS are incorporated into this LIRP by reference:

- No. 003, Safety in General
- No. 004, Job Planning and Preparation
- No. 005, Identifying and Marking Buried Facilities
- No. 006, Locate Documentation
- No. 101, Locating Methods and Factors That Affect Locating
- No. 104, Inductive Method
- No. 201, 4 – Way Scan

4.0 PROCESS

This process requires 2 people, a Locator Technician and an assistant.

Confirm with client/ground disturber:

- The boundaries of the work site
- The distance outside the worksite that will be included in the locate
- The marking materials that will be used

- The colour code that will be used
- That all available information on existing buried facilities is at hand
- The locate documentation that will be provided
- Any worksite specific requirements of the client/ground disturber
- Any worksite specific hazards of which the client/ground disturber is aware

Conduct a visual inspection and pre-job survey of the worksite to:

- Identify and document any hazards and how they will be managed
- Establish the limits of the area to be located
- Establish the grid pattern that will be used for the 4 – way scan

Conduct a 4 – way scan of the area to be located noting and preliminarily marking any conductive buried facilities found.

Trace all buried facilities found in the 4 – way scan throughout the area to be located and mark them appropriately.

Prepare locate documentation, including where appropriate:

- Cross references to existing records
- Any inconsistencies with existing records
- Any limitations on or concerns about the locates provided

Provide locate documentation to the client/ground disturber and:

- Address any concerns or questions the client/ground disturber may have
- Ensure the client/ground disturber understands and acknowledges any limitations on or concerns about the locates provided
- Ensure the client/ground disturber understands the relationships between the locate documentation and the locate marks
- If appropriate, have the client/ground disturber sign off on the locate documentation

5.0 DOCUMENTATION

Each LIRP referenced in section 3.0 includes minimum documentation requirements.