

AEUSA

**ALBERTA ELECTRICAL UTILITY
SAFETY ASSOCIATION**

CODE OF PRACTICE

**Guidelines for Working
Near Electrical Lines and Equipment**

Preface

This Guide was developed to meet three objectives:

- ✦ To reduce the number of accidental contacts with electrical lines and equipment.
- ✦ To provide information to workers that will allow them to work safely in close physical proximity of electrical lines and equipment.
- ✦ To provide information for workers in applying appropriate emergency response measures in the event of an electrical utility contact.

This guide is intended to assist contractors in their hazard assessment and work planning process and does not replace or supersede provincial legislation. The best practices within this document have been developed and approved for technical merit by industry stakeholders across Alberta. This document is based upon several fundamental assumptions:

- ✦ Workers operating machinery in the vicinity of electrical lines and equipment must be aware of the information contained within this Code of Practice.
- ✦ Workers must be familiar with and able to demonstrate the safe work practices and standards of their respective industries.
- ✦ This Code of Practice is a general guideline. A comprehensive site specific hazard assessment must be completed prior to starting any work in order to determine the nature of the actual and potential hazards present.

Complying with this Code of Practice will reduce fatalities, injuries, Workers Compensation costs, incident investigations, power outages, damaged equipment and construction delays.

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LEGISLATION & REGULATIONS

The Alberta Occupational Health and Safety (OHS) Act assigns specific responsibilities to an owner or Prime Contractor, contractors, employers, supervisors, and workers, at any worksite to ensure that work is carried out in a safe manner. The Alberta OHS Regulation states that only competent workers are allowed to work without direct supervision. The Alberta OHS Code requires that all existing and potential hazards be identified and controlled and that both the employer and the workers are involved in the hazard assessment process. It is expected that employers and Prime Contractors in charge of worksites will be familiar with the appropriate sections of this legislation.

In addition to the Occupational Health and Safety legislation, the Alberta Safety Codes Act, and the Alberta Electrical Utility Code contain specific instructions for people working in the vicinity of energized lines and electrical equipment. Any time work must be performed and you will not be able to maintain at least seven (7) metres of clearance from a powerline you must contact the owner of the electrical facilities at your worksite. The electric utility will have trained personnel who can assist you in ensuring all work can be completed safely.

SAFE WORK PLANNING

It must be determined at the planning stage whether or not a potential hazard with underground or overhead electrical equipment exists. A site visit is required to properly assess the hazards. Always consider electrical utilities to be live with the potential of causing serious injury or death. Contact with electrical equipment, either overhead lines or buried cables, must be avoided. When developing a Safe Work Plan, consider such factors as:

- Actual and potential hazards
- Scope of work
- Type of excavation, hoisting, or other equipment that will be required
- Height and reach of the equipment
- Equipment placement
- Equipment or material loading/unloading
- Worker competency
- Soil condition
- Interruptions to electrical services
- Hazard to public
- Use of ladders, pipe and other conducting materials
- Need to notify electric utility owner and obtain specific line voltage clarification for each site
- Need to communicate all hazards to all workers including contractors or sub-contractors through documentation (i.e. Tailboard, Field Level Hazard Assessment)
- Changing conditions
- Other hazards present (i.e. gas or chemicals)

Excavating

The Contractor shall ensure that the locations of all buried electrical cables, and other buried services, are marked before work begins on any excavation. Arrangements to have this done can be made through Alberta One-Call at:

1-800-242-3447

Or

***3447 on Cellular**

At least two (2) full working days notice required.

Before using mechanical equipment within one (1) metre of the locate marks, the buried electrical cables must be exposed, using non-destructive excavation techniques acceptable to the Electrical Utility. There may be several cables buried near each other, side by side, or at different depths. If the locate marks have been tampered with, or if you do not begin work within fourteen (14) days of the date locates were done, a new request for relocates through Alberta One-Call is required.

In excavation planning, overhead and above ground electrical equipment must also be identified and controlled. Utility pole bases or other electrical equipment foundations and systems must not be exposed or damaged during excavation. Additionally, the excavation equipment must be able to maintain a minimum seven (7) metre clearance from overhead lines. Other considerations in safe work planning for excavation in the vicinity of buried electrical equipment include:

- Arranging to meet locators at site
- Marking locations of all buried electrical equipment on plans and drawings
- Reviewing locate slips before excavating
- Posting warning signs along the buried electrical equipment corridor
- Planning location of spoil piles so as not to reduce clearances to power lines

Overhead Electrical Equipment

Overhead electrical equipment including power poles and lines are the electrical equipment contacted most often. If any activity is to be undertaken within seven (7) metres of an overhead power line the contractor must contact the electric utility owner. A representative of the utility owner will meet with the contractor to determine the voltage of the line and establish a safe limit of approach for workers and equipment.

If equipment or buildings are to be moved under an overhead power line, and the total height including the transport vehicle is lower than 4.15 metres, you may move the load. If the total height is greater than 4.15 metres you must contact the operator of the overhead lines for assistance.

The Alberta Electric Utility Code sets the minimum design clearances for electrical lines over all types of ground. These clearances may have been correct upon installation. In safe work planning it is essential to determine that the clearance has not been altered by such factors as new or modified buildings, excavation work, landscaping work, or spoil piles.

In some cases the safe work plan may need to consider horizontal distances to electrical equipment, such as working from a bridge, landscaped berm, landfill berm, building, or scaffold near an overhead power line. Do not attempt to trim or prune trees if the branches are closer than seven (7) metres to an overhead power line.

There may be several services mounted on utility poles such as:

- More than one high voltage power line
- Low voltage power lines
- Telephone Multi-Pair cables
- Cable T.V. Coaxial cables
- Fibre Optic cables

It is important not to contact any of these overhead services. Contacting telephone or communication lines for example, can cause power lines to break or come down. Contact the electrical utility owner to confirm line voltages or to measure the line to ground clearance. Contact Alberta One-Call at 1-800-242-3447, or *3447 cellular, to find out who operates the electrical utility in your work area.

Unqualified persons must never attempt to measure clearances to power lines.

Other considerations in safe work planning for work near overhead electrical equipment include:

- Marking location of all overhead power lines on plans and drawings
- Posting warning signs along their route
- Using a designated signaller
- Marking of the power lines to make them visible to the equipment operator
- Physical guarding of the overhead power lines
- Marking the limits of approach on the ground using a brightly coloured ribbon or rope.

You may want to contact your local electric utility to discuss options such as:

- Move the overhead power lines
- Shut off the power to overhead power lines
- Cover the overhead power lines with electrical protective equipment
- Remove the automatic reclosing feature of power lines

Emergency Response Plan

Create an emergency response plan to deal with a potential line contact. The emergency response plan must be reviewed with the workers to ensure that if a contact occurs, every worker knows what to do. The emergency response plan should include:

- Knowing what to do if people contact or equipment becomes energized.
- First aid plan
- Public protection

- Notification of authorities
- Availability and communication with emergency responders
- Medical aid beyond first aid

CRANES, EXCAVATORS AND OTHER EQUIPMENT

Whenever machinery is being used near electrical equipment, all workers in the vicinity shall be instructed to remain clear and out of contact with the frame of the equipment, hoisting lines, or the hoisted load, except to attach or detach the load. The height, width and maximum reach of the equipment shall be known by the operator of the machine.

When working near electrical equipment signs stating "**Keep clear - working near electrical lines and apparatus**" should be displayed on the exterior of machines. A notice giving the following shall be posted in the cabs of machines working near electrical equipment:

- The Safe limits of approach to overhead power lines for persons and equipment
- The machine shall not be moved near electrical equipment without the aid of a signaller.
- Maximum height and reach of the machine with the boom or bucket fully extended (Machine Data Sheet) shall be posted in view of the operator of the machine.

A signaller or observer shall alone direct the moving of equipment near overhead power lines or other electrical equipment. The signaller shall be identified by a bright traffic vest or other high visibility items. The designated signaller shall not be assigned any other duties during the times when the equipment is near the safe limits of approach. The crane operator and the signaller should know all standard crane and hoist hand signals.

The important consideration in signalling is that the signaller and operator understand each other completely and communicate effectively. The signaller shall know the limits of approach distances to overhead lines and ensure that at no time is there a limit of approach encroachment.

ACCIDENTAL CONTACT

In an electrical contact emergency, stay calm and think before you act. Don't become a second victim while trying to provide assistance. Call for help and activate the emergency response plan. If you attempt to pull the victim clear while the hazard still exists you can also become a path for electricity.

The passage of electricity through the body is called "electrical shock". An electrical shock that may not be enough to kill or injure, can cause a worker to drop tools and materials, or let go of the controls. This can result in a domino effect of undesired events. Small amounts of electrical current can cause involuntary muscle contractions and will often prevent the victim from letting go of a conductor or calling for help.

Burns are the most common electrical related injury. Electricity can cause severe burns at points of entry and exit. Although entry and exit wounds may be small, bone and muscle can be extensively damaged.

Electrical contact passing through the heart can cause the heart to stop beating.

The effects of an electrical contact are determined by:

- How much current is flowing through the body (current is measured in amperes and determined by a combination of the system voltage and the impedance of the victim)
- The length of time and the path of current flow through the body

EQUIPMENT IN CONTACT WITH AN ELECTRICAL CONDUCTOR

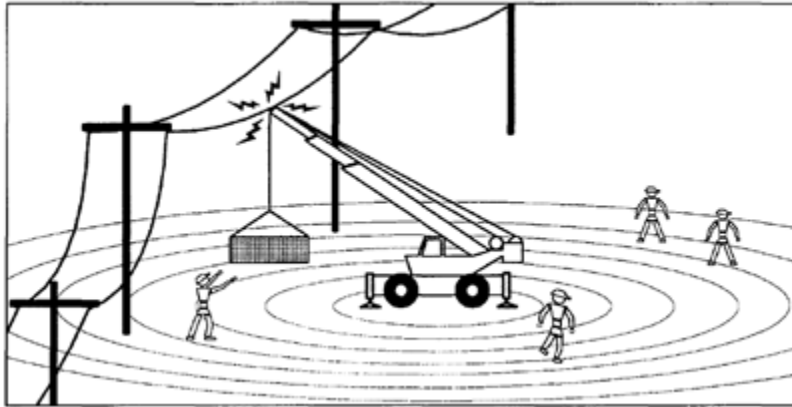


Figure 1

Contact with a high voltage line will result in electrical current flowing through the machine to ground. The ground will then be energized with a high voltage near the crane and lower voltage farther away.

If the equipment makes accidental contact with an electrical conductor, or an overhead conductor is broken and drops to the ground, everyone within 10 metres of the work area must stop and stand still with their legs together immediately. The ground around the machine or the contact point with an underground cable will be energized with a high voltage that slowly dissipates further away from the point of contact. A worker on the ground with their legs apart, including walking, could be subject to “step potential” where the voltage difference in the ground between their legs is large enough to allow harmful current to flow through their body.

The operator shall try to remove the machine from contact in the best possible manner, without causing further damage such as pulling power lines to the ground. For overhead contacts, this can typically be accomplished by moving the boom of the machine clear of the line. For underground contacts, attempt to remove the bucket from the ground. Once the machine has been removed from the contact, ensure all personnel stay clear of any downed lines or open excavations and notify the electric utility owner immediately.

If the machine cannot be moved from contact, the operator shall stay on the machine; this is the safest place to be as there is no way to be sure that the line is no longer energized. Warn others in the vicinity to stay clear of the machine and ask someone to notify the Electric Utility immediately. Workers on the ground should move at least 10 meters away from the machine or point of contact either by hopping

carefully keeping both feet together, or shuffling heel to toe keeping feet and legs in contact with each other.

The operator should leave the machine only as a last resort if another hazard more urgent exists such as if the machine is on fire. If the operator must leave a machine that is in contact with an electrical conductor, the operator must carefully jump clear landing with their feet together.

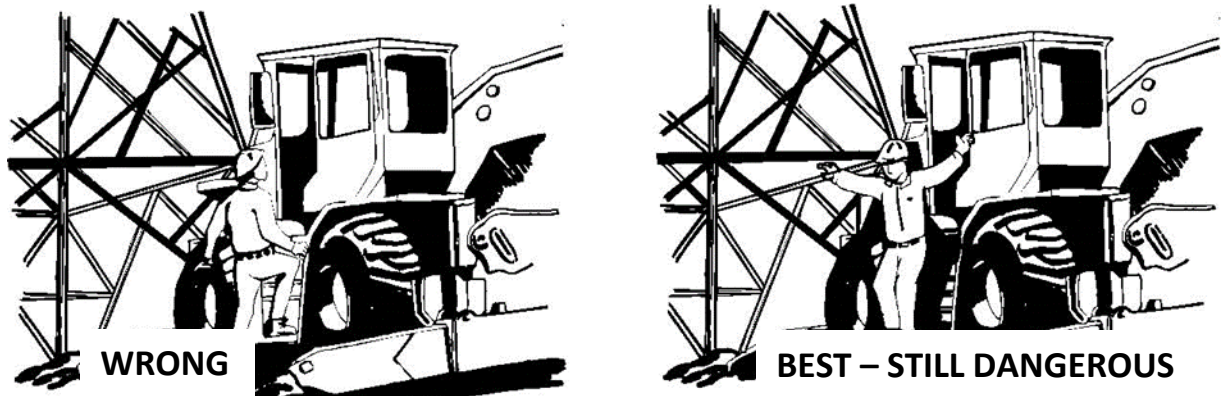


Figure 2

NEVER, under any circumstances, step down and allow part of the body to be in contact with the machine and the ground while exiting. Making contact with the ground and the machine at the same time will expose a worker to hazardous voltages, severe injury, or death.

The operator must jump clear making every attempt to land with his feet together and maintain balance. Once clear of the machine move at least 10 meters away from the machine or point of contact either by hopping carefully keeping both feet together, or shuffling heel to toe keeping feet and legs in contact with each other to avoid the risk of “step potential”. Once safely away from the machine, downed conductors, or point of contact with a buried cable, the operator has the following responsibilities:

- Secure the work site and protect others by warning them and ensuring that nobody approaches the incident area
- Ensure that the electric utility owner has been contacted and is coming to shut off the electric power
- Notify any other required services such as emergency services, police, local authorities that may be required to attend.

Moving or Lifting Wires

High voltage wires and other equipment such as transformers and switches can be handled safely only by a person who has been properly trained and has the special equipment and tools designed for high voltage work. There is no safe way for non-utility personnel to guarantee that a line is not energized. Never attempt to move or raise an electrical conductor with a board or stick. Never approach or touch an electrical conductor that is laying on the ground, it may still be energized, or may become energized automatically as the utility system attempts to clear a fault. Stay 10 metres away at all times, and if possible, the area should be barricaded or guarded to prevent injury to personnel or bystanders.

Rescue

If there is any chance that a worker or bystander has contacted or been injured by an energized power line, buried cable, or piece of equipment call 911 immediately and ensure that emergency medical services are on their way to your location.

Do not attempt to move a downed wire off of an injured person, or attempt to move an injured person away from a downed wire. This also applies to a person who has dropped to the ground within a 10 metre radius of the energized line or equipment. They may have suffered an electric shock due to “step potential”. Never allow yourself to become a second victim. Consider any power line, buried cable, or other utility equipment to be energized until the electric utility operator has informed you that the power has been turned off. Only at that point should you approach an injured person and begin first aid.

FIRST AID

While waiting for notification from the utility operator that the power has been turned off, and after you know that emergency services have been contacted, prepare to provide first aid by having someone retrieve the first aid supplies including first aid kit, automatic external defibrillator (AED), blankets, etc.

Once the utility operator has informed you that the power has been turned off it is safe for you to approach the victim and assess the situation. Follow standard first aid procedures including the following:

- Check for open airway, breathing, and circulation (pulse). If the victim is not breathing and/or has no pulse, begin CPR immediately. Electric shock injuries can stop the heart or send it into ventricular fibrillation. Every second counts in order to save a life.
- Use of an AED is strongly recommended. More and more businesses and public facilities are providing AEDs for emergency use and AED practice is now included in first aid training. Follow the instructions and listen to the audible prompts.

Only once breathing and circulation have been restored do you move on to secondary injuries:

- If the victim has visible burns avoid handling the affected area or removing burnt clothing. Don't cover burns with gauze or any material that is likely to stick to the wound.
- Watch for signs of shock such as cold or clammy skin, weak or shallow breathing, and rapid pulse. Loosen clothing if possible without affecting other injuries and keep the victim horizontal and warm until emergency services arrive. Electric shock victims will often go into shock. Keep this in mind when transporting victim for medical attention. Cover with a blanket if one is available.

Electrical burns occur under the skin and the extent of the damage or injury may not always be visible right away. Electric shock injuries will often be more severe than they appear at first.

A person who has received an electric shock should always be seen by a physician as there may be unseen damage to internal organs.