



GUIDELINES FOR WORKING IN CLOSE PROXIMITY TO ELECTRICAL EQUIPMENT

EPCOR Distribution & Transmission Inc.

SEPTEMBER 2021

EPCOR

Electrical Contact:

Fire /Threat to life call 911

Otherwise call EPCOR Trouble at
780-412-4500

Limits of Approach:

EPCOR's Safety Codes Officer
780-412-4450
safetycodes@epcor.com

EPCOR Customer Service:

Edmonton (toll-free): 310-4300 or 1-800-667-2345

epcor.com

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Please refer to **epcor.com** for the most
up-to-date information.

Disclaimer

EPCOR Distribution & Transmission Inc. (EPCOR) is responsible for the delivery of electricity to customers in Edmonton and surrounding areas, while being fully committed to the protection of the environment and the health and safety of our employees and customers.

This Guide provides information to employers and contractors regarding safe work practices in relation to EPCOR power facilities. Employers and contractors have responsibilities under the Alberta Occupational Health and Safety (Alberta OHS) Act, Code, and Regulation. When there is a conflict between this document and any bylaws, legislation, or regulation, the relevant law prevails.

Any reliance placed on this information is strictly at your own risk. EPCOR does not assume any responsibility or liability for any action, loss or damage that arises out of, or is in connection with the information contained in this Guide.

For more information:

[Alberta Occupational Health and Safety Code \(2009\), especially Parts 17 and 32](#)

[WheresTheLine.ca - Joint Utility Safety Team](#)

[Edmonton Area Pipeline and Utility Operators' Committee's Guidelines for Working Near Buried Facilities](#)

Alberta safety legislation assigns responsibilities to the utility owner, the contractor, the employer, and the worker, to ensure that work is carried out in a safe manner. All work-related hazards must be identified by the employer to the workers. Only competent workers are allowed to work without direct supervision. All work shall be carried out in accordance with applicable legislation.

Limits of Approach

Limits of Approach are the safe distances that people or equipment must maintain from energized power lines or equipment, which vary depending on system voltage and the training and experience of the individual.

Where work is planned near energized high-voltage electrical conductors, Alberta OHS Code (Part 17, Overhead Power Lines) specifies the safe limits of approach that must be maintained by any worker, tool, machine, equipment or material.

If the Voltage is unknown and has not been verified by an EPCOR Safety Codes Officer, then maintain a clearance of at least 7 m.

Workers and equipment should adhere to the following guidelines:

- Know the limits of approach for equipment and workers.
- Mark the location of all overhead power lines and/or exposed underground cables on plans and drawings.
- If your project might result in workers or equipment encroaching on minimum distances, you must contact EPCOR before beginning any work.
- **Email EPCOR at safetycodes@epcor.com** for clearance requirements specific to your area and the job.

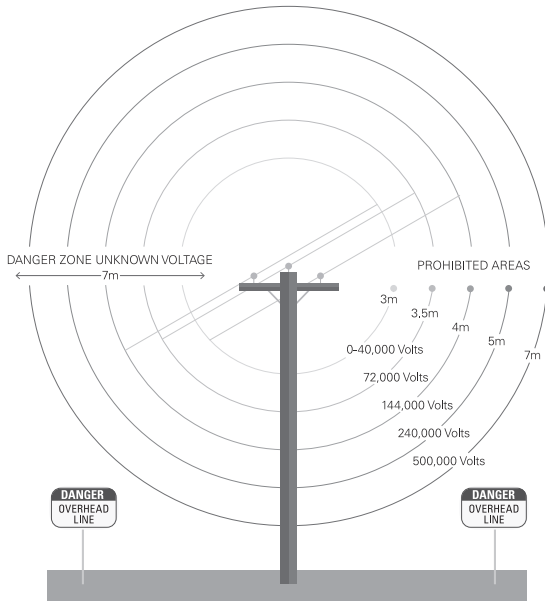
SAFE LIMIT OF APPROACH IF VOLTAGE IS KNOWN

Operating voltage of overhead power line between line conductors unless otherwise specified	Safe limit of approach distance for persons and equipment
0-750 V insulated or polyethylene covered conductors ⁽¹⁾	300 mm
0 – 750 V bare, uninsulated	1.0 m
Above 750 V insulated conductors ^{(1), (2)}	1.0 m
0.75 kV – 40 kV	3.0 m
69 kV, 72 kV	3.5 m
138 kV, 144 kV	4.0 m
230 kV, 260 kV	5.0 m
500 kV	7.0 m
500 kV DC Pole-Ground	7.0 m

(1) Conductors must be insulated throughout their entire length to comply with these groups.

(2) Conductors must be manufactured to rated and tested insulation levels

SAFE LIMIT OF APPROACH IF VOLTAGE IS KNOWN



Safe Work Planning

Employers and contractors should consult the Alberta OHS Act, Regulation, and Code for more information on safe work planning as this is an overview and does not provide all the requirements.

A site visit is required to assess the hazards. Always consider electrical utilities to be live with the potential of causing serious injury or death. Legislation requires that all work related hazards be identified and that unsupervised work be performed by those workers deemed competent.

According to Alberta OHS Code, Part 1, Definitions and General Application (Edmonton, Alberta: Alberta Queen's Printer, 2009. Print.), "Competent in relation to a person, means adequately qualified, suitably trained and with sufficient experience to safely perform without supervision or with only a minimal degree of supervision."

For more information:

Alberta Occupational Health and Safety Code: Part 2 Hazard Assessment, Elimination, and Control

7 (1) An employer must assess a work site and identify existing and potential hazards before work begins at the work site or prior to the construction of a new work site.



7 (2) *An employer must prepare a report of the results of a hazard assessment and the methods used to control or eliminate the hazards identified.*

7 (3) *An employer must ensure that the date on which the hazard assessment is prepared or revised is recorded on it.*

Formal Hazard Assessment

The documented safe work plan must identify and evaluate occupational health and safety hazards, and identify the controls used to mitigate those hazards. Hazard assessments must be reviewed and updated on a regular basis to ensure that existing controls are effective.

Field Level Hazard Assessments

A field level hazard assessment is site specific. The employee in charge at the site will ensure a safe work plan is developed. All employees on site must assist in hazard identification and mitigation. Employees must constantly assess the hazards, and if required, stop the work and revise the safe work plan identifying new hazards and controls for those hazards. Additional workers or visitors to the site should review and sign off on the primary safe work plan.

Electrical Hazards

Employers are required to ensure that employees, tools, materials, equipment, and mobile equipment used in work do not come within **7 m** of overhead power lines. In developing a safe work plan, consider electrical factors that include, but are not limited to:

- Ground disturbance including utility locating and excavating.
- Height and reach of the equipment in proximity to energized overhead electrical equipment.
- Equipment placement.
- Use of conducting materials.
- Need to notify and/or seek assistance from the electric utility owner.

For more information:

*Alberta Occupational Health and Safety Code,
Part 17 Overhead Power Lines*

225 (1) An employer must contact the power line operator before work is done or equipment is operated within 7.0 metres of an energized overhead power line.

Locates

Call or Click Before You Dig
1-800-242-3447
utilityafety.ca

The Alberta Occupational Health and Safety Code, the Alberta Electrical Utility Code, and the Alberta Pipeline Regulation require that the locations of all buried utilities be marked before a ground disturbance begins. Utilities and homeowners (e.g. security lighting) that are not members of Utility Safety Partners must be contacted directly for locates. All locates must be current and on site throughout the excavation.

All cables must be treated as energized throughout the excavation process.

Important Notes:

- **In the City of Edmonton, EPCOR's locate contractor will only locate primary power lines up to the primary metering point, and secondary power lines located on public property and single-family residential lots.**

Secondary power lines located on private property in multi-family, commercial or industrial lots, as well as primary power lines located past the primary metering point, will need to be located by the facility owner or through private locates.

- If you are working adjacent to transmission facilities (**72 kV** and **240 kV** underground lines), your utility locate ticket will indicate that you must first receive clearance from EPCOR prior to excavation.

EPCOR will locate these facilities on site or contact you to provide you with clearance after you receive your utility locate ticket.

You are not cleared to excavate until this clearance is provided

- Multiple cables can be present in the same alignment. EPCOR's locate contractor will mark separate cables where separation exists or will indicate the presence of multiple power lines on your ticket.

EPCOR power lines may be direct buried or be installed inside a conduit. In three phase areas, there are three power cables for every circuit which may be separated by up to **1 m**. EPCOR can provide additional information on the number of cables.

Underground Electrical Equipment

For the purpose of this document, the protection of buried facilities, and the safety of workers and the public, a ground disturbance is any movement of earth. Examples of buried facilities include, but are not limited to: ducts and conduits, manholes and vaults, line and wires, etc. These facilities may contain: electrical energy, oil and petroleum, chemicals and other substances. Working near buried electrical equipment is any activity that disturbs the ground:

- **Power Distribution facilities** - within **1 m** on either side of a distribution facility and within **2 m** of transformers or cubicles.
- **Power Transmission facilities** - cannot be disturbed within **5 m**.

Caution:

Ground wires and rods cannot be located and are buried below the final grade. They are adjacent to EPCOR transformers and cubicles. Ground grids can be located up to 1 m away from these facilities. Contact may damage the structure, the system, and may cause injury including death.

For more information:

*Alberta Occupational Health and Safety Code,
Part 32 Excavating and Tunnelling*

441 For the purpose of this Part, ground is disturbed if a work operation or activity on or under the existing surface results in a disturbance or displacement of the soil, but not if the disturbance or displacement is a result only of

(a) routine, minor road maintenance,

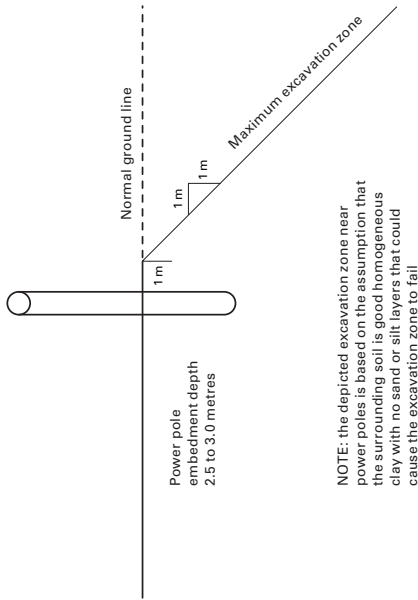
*(b) agricultural cultivation to a depth of less than **450 mm** below the ground surface over a pipeline, or*

*(c) hand-digging to a depth of no more than **300 mm** below the ground surface, so long as it does not permanently remove cover over a buried facility.*

*Alberta Electrical Utility Code: Section 2-018
Moving Equipment or Buildings*

*CAN/ULC S801-10 Exposing Underground
Distribution Cables*

EXCAVATION NEAR POWER POLES



The area must be barricaded to avoid accidental contact with the digging equipment by other workers or the public. Employees must not stand or place anything directly on top of cables in the excavation when using excavation equipment (e.g. Hydrovac and Backhoe). At no time should anyone be closer than **1 m** to electrical equipment.

In excavation planning, overhead 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:

- Excavations near the base of a power pole (within **1 m** diameter) shall not be disturbed without consulting EPCOR – refer to illustration on page 11 for requirements. Depending on soil conditions and tensions on the line, **1 m** will not be sufficient. A pole may need to be supported if the excavation is too close and/or too deep.
- Spoil piles should not be located under power lines as this reduces the overhead clearances.
- If power lines are contacted or torn down, stay clear at least **10 m**, and call 911 or EPCOR for help.

Excavating Near Underground Electrical Facilities

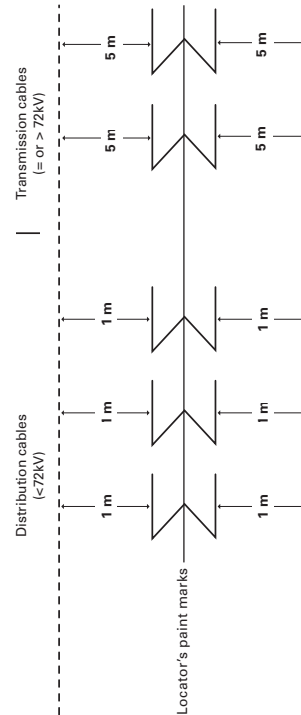
A qualified utility employee of EPCOR must be present on site when working within **5 m** of transmission voltages of greater than or equal to **72 kV**. It is the obligation of the contractor to contact EPCOR in this situation.

The depth and alignment of the cables must be confirmed before mechanical excavation equipment is allowed to move any soil. All cables in the proposed excavation area must be exposed to sight by hand digging and/or hydro excavation [Source: Alberta's OHS Code 2009, Sections 448(2) and 448(1)].

All workers must be equipped with and be wearing the following Personal Protective Equipment while exposing buried EPCOR facilities:

- Protective head wear: CSA Standard CAN/CSA-Z94.1-05 / ANSI Standard Z89.1-2003.
- Protective eye wear: CSA Standard Z94.3-07.
- Protective footwear: CSA Standard Z195-02 / ASTM Standard F2413-05.
- Arc rated clothing (minimum protection rating of 8 cal/cm²): ASTM Standard F1506, ASTM Standard F2302, Canadian General Standards Board (CGSB) Standard CAN/CGSB 155.20, and CSA Standard Z96.
- Any additional equipment as required by Alberta Occupational Health and Safety Code Part 18, Personal Protective Equipment.

NON-DESTRUCTIVE ZONE



NOTE: ground disturbance within 1 metre of locate marks must be done by hand digging

Hand Digging

Never probe for buried facilities with pointed tools such as pick axes or pointed bars. A shovel with a dry, nonconductive handle must be used to remove materials away from cables.

- Do not use full body weight on the shovel when digging.
- Use a prying (rather than striking) motion to loosen hard dirt.
- Dig on an angle and from the side.
- Excessive prying, pulling, or bending when moving cables must be avoided.

Hydro Excavation

Hydrovac Operating Specifications:

- The water pressure and temperature settings must not exceed **1,500 psi** and **38°C**. Any hydrovacating over these maximums can only be done on de-energized cables.
- The wand tip must be equipped with a high pressure nozzle single jet oscillating head.
- The end of the water wand and vacuum hose must have a urethane or equivalent cover to prevent mechanical damage.
- Signs indicating 'Danger' must be a minimum of **1.2 m** from the job site.

The following safe work methods must be followed when hydrovacating:

- The water wand must be in a constant circular motion, avoid moving the wand parallel to the buried facility (jabbing motions are to be avoided).
- The water wand must never be left unattended with the pressure on and water flowing.
- The excavation should begin beside the locate mark(s) and go to a depth below the expected depth of the buried facility. At that point, soil covering the buried facility can be removed.
- Once the buried facility has been exposed, a distance of at least **175 mm (7 in.)** should be maintained between it and the oscillating head of the water wand.

Under a fault condition, the water, wand, and vacuum may become energized.

“Spotting” or **“pilot”** holes must be large enough and suitably spaced to confirm the depth and alignment of the cables: cable depth is consistent = **3 m** intervals, and if cable depth varies or is unclear = **1.5 m** intervals.

In situations where large volumes of soil need to be hydro excavated, additional slot trenches must be cut once the expected buried facilities have been exposed. This will help confirm that no unmarked buried facilities are present. The slot trenches must:

- Be at right angles from the exposed facilities.
- Go outwards from the exposed buried facilities to the full width of the excavation.
- Be cut down to the full depth of the exposed facilities / proposed excavation / depth. determined through on-site assessment of conditions by a competent worker.

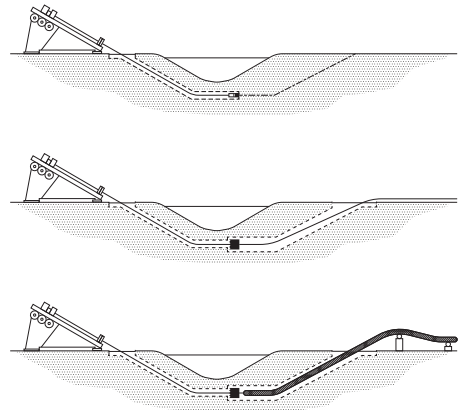
Once the cables are visible through the “spotting” or “pilot” holes, the soil in the hand exposed zone can be removed using mechanical excavation equipment. An undisturbed layer of soil immediately above the cables at least **150 mm to 300 mm thick (6 in. to 12 in.)** must remain. This layer of soil must be removed by hand digging, and checked with a probe to confirm the location of all buried facilities.

When removing soil with a bucket, the bucket must not scrape more than **2 m** of soil horizontally at a time along the cable route.

Directional Drilling

To prevent accidental contact:

- Ensure directional drill equipment is calibrated as per the manufacturer’s specifications.
- Visually confirm the drill/reamer has proper clearance and separation when crossing gullies and facilities.
- Adequately spot parallel facilities to confirm utility alignment.



Green Tape Cable Splice Located

If a green tape splice is located while excavating, all excavation work must stop within **1 m** of the splice location and EPCOR must be contacted. Moving an energized splice must only be done by a qualified EPCOR tradesperson.

Damaged Facility

If a power cable or facility is damaged or severed during the digging process, all digging must stop immediately and all work activities must be shut down. The employee-in-charge must notify **EPCOR Trouble at 780-412-4500** to have the power shut off. Digging can only resume once the cable is inspected, assessed, and deemed safe by EPCOR. Repairs may be required before work can resume.

Shoring and Cutting Back

The employee-in-charge must ensure that the excavation is properly shored or cut back. Before the crew leaves the excavation at the end of the work day, the employee-in-charge must ensure that the excavation is appropriately secured with signage, barriers, barricades, etc.

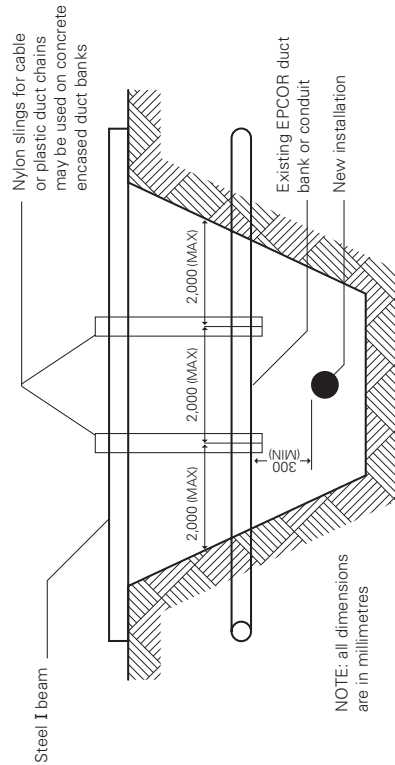
EPCOR Structure Support - Duct Banks and Conduit

For any excavation that results in a duct bank or conduit to be exposed more than **2 m**, the contractor must contact **EPCOR's Safety Codes Officer at safetycodes@epcor.com or call 780-412-4500** to request a Safety Codes Consult.

DO NOT ATTEMPT TO HANDLE POWER CABLES.

Concrete encased duct banks must be supported as determined by a civil engineer.

EXAMPLE OF DUCT BANK SUPPORT



Securing Excavations

The work site must not be left unattended at any time unless all open excavations on the work site have been properly secured:

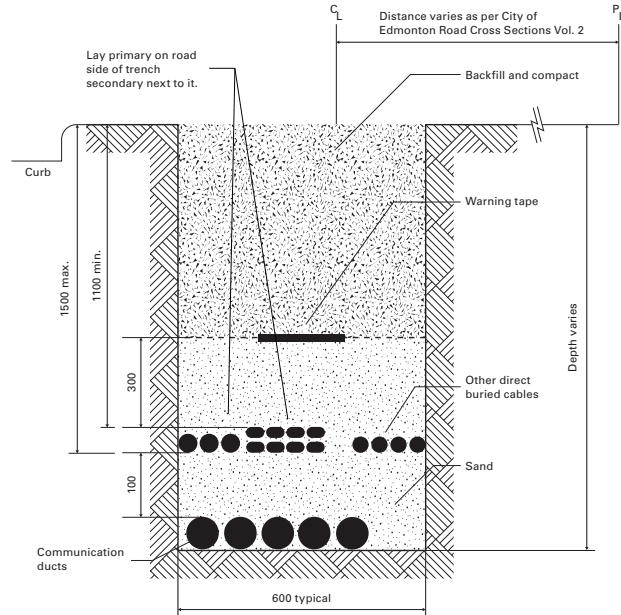
- Place plywood over the cables, and secure by placing soil bags on the plywood (minimum **300 mm** cover of sand/soil).
- Where excavations are too large to cover, the excavation must be secured with barricades (at least one must have a contact phone number), snow fence, and barrier tape.

In situations where an excavated site will be left overnight with energized cables and it is not practical to secure the cables, site security personnel will be retained by the contractor to ensure public safety.

Excavation Backfill

Notify EPCOR's Land Services Inspection team during business hours at 780-412-4591 prior to any backfilling.

BACKFILL REQUIREMENTS FOR CABLES AND DUCTS



Distribution Facilities

All excavations must be backfilled with sand (free of stones and items with sharp edges), and be placed in uniform lifts not exceeding **300 mm (12 in.)** and compacted to the City of Edmonton Design and Construction Standards, Volume 2 (epcor.com / edmonton.ca) – Roadways. Soil with high thermal resistivity that contains large amounts of organics, peat, black loam, sod, hardened clay, stones, straw, snow, or frozen material is not acceptable.

Transmission Facilities

All excavations around transmission cables must be backfilled using thermal backfill for the full length of cable that was uncovered during excavation. Place the thermal backfill around cable in the following quantities:

- **0.4 m** below cable.
- **0.5 m** on each side of cable.
- **1.3 m** above cable.

If you require specific instruction from EPCOR for backfill requirements contact EPCOR's Underground Transmission Foreman at 780-412-7819.

Overhead Electrical Equipment

The first step to working safely around power lines is to call the utility to determine voltages of all power lines in the project area. Working safely around power lines takes planning and safe work practices:

- Overhead power lines are dangerous and not insulated. If you contact an overhead line, you or your equipment can be badly damaged as electricity can use you or the equipment you are operating as a pathway to the ground.
- Contact EPCOR's Safety Codes Officer at safetycodes@epcor.com; they will determine the required limits of approach based on the voltage of the power line. No work can encroach on this distance. If the voltage is unknown, no work is permitted within **7 m** of energized electrical equipment.
- Use caution when moving equipment or tools around overhead lines. This includes cranes, backhoes, scaffolding, long lengths of pipe, etc. If a large piece of equipment runs the risk of encroaching the safe limit of approach distance, a designated signaler whose only job is to maintain a safe zone must be assigned.
- EPCOR may be able to install "line identification". This is a PVC pipe not used for protecting lines, but to make them easier to see. Lines may sometimes be temporarily moved or protected. Contact EPCOR for assistance.

- A power pole may need to be supported if the excavation is too close and too deep.
- **If overhead power lines are contacted or laying on the ground, stay clear at least 10 m and call 911 or EPCOR Trouble at 780-412-4500. Refer to pg. 40 of this guide for more information about Accidental Contact with power lines.**

In Edmonton, our utility poles are used to support overhead power lines and various other public utilities, such as cable, fibre optic cable, and related equipment such as transformers and street lights. The higher the line is on the pole, the more dangerous it is.

For more information:

Alberta Occupational Health and Safety Code: Part 6 Cranes, Hoists, and Lifting Devices, Part 17 Overhead Power Lines

Alberta Electrical Utility Code: Rule 2-016, Table 5 Minimum Vertical Design Clearances Above Ground or Rails, Division H, Tree Work Near Energized Electrical Equipment or Lines Performed by Utility Tree Trimmers, Utility Tree Workers or Other Workers

CSA 22.3 No. 1-15 Overhead Systems, 4.1.4 Climbing Space, 4.1.7 Vegetation Management, 5.3 Vertical Design Clearances and Separations, 5.3.1 Vertical Design Clearances of Wires and Conductors Above Ground or Rails, 5.3.1.1 Basic Clearances

Distribution Power Line



Communication Lines

The communication cable lines are maintained by local cable/telephone providers. If there is an issue with these lines, please contact the local cable/telephone provider.

Power Service Lines

Service lines run from the main power pole to the home or business. These lines are also maintained by EPCOR and carry lower voltage. The insulation on these lines may become damaged or worn over time, and contact should be avoided! Minimum distance = **1 m**.

Secondary Lines

Secondary overhead lines are the wires that run from pole to pole. They are typically located directly below the primary lines in the middle of the pole. These lines are maintained by EPCOR and carry lower voltage. The insulation on these lines may become damaged or worn over time, and contact should be avoided! Minimum distance = **7 m**.

Primary Lines

Primary lines are the main wires that run from pole to pole and bring electricity to the neighbourhood. They are typically located at the top of the pole and do not run to the home or business. These lines are maintained by EPCOR and carry high voltage, which is extremely dangerous. Minimum distance = **7 m**.

Transmission Power Lines

Transmission lines can be located on steel towers and on wooden poles that also have distribution lines on them. They carry electricity to substations from generation plants. **They are extremely dangerous.** Permissions from EPCOR are required before doing any work on a transmission line. Permission must be received even if the line is on your property. This is to ensure your safety as well as service continuity.



Tree Trimming by EPCOR

In order for EPCOR to properly maintain its power lines all trees and shrubs must be trimmed to provide at least **1 m** clearance from power poles and **3 m** from power lines.

We will trim tree limbs in the following categories at no cost to customers (call EPCOR at 780-412-4500 in emergency situations):

- Interfere with or have the potential to interfere with existing primary and secondary lines.
- Obstruct the route of new primary and secondary lines.

Tree Trimming by Contractor or Homeowner

Pole-to-house power service lines are the responsibility of the homeowner. EPCOR will, at no cost to the customer, temporarily disconnect power service lines for customers wishing to trim trees safely. Ensure adherence and knowledge of the Limits of Approach as outlined in this document.

Moving or Lifting Overhead Wires

Never attempt to move or raise an electrical conductor with a board or stick. Never approach or touch an electrical conductor that is lying on the ground; it may be energized or become energized. If possible, the area should be barricaded or guarded to prevent injury.

High Loads – Oversized Loads

EPCOR provides oversized-load escorts throughout the City of Edmonton, assisting transporters in planning their route and adjusting the necessary infrastructure to allow them to arrive at their destination safely and on time. Anything over **4.15 m (13.6 ft.)** is 'over height' and requires a permit for transport on public roads and highways from Alberta Infrastructure and Transportation.

Alberta Transportation:

1-800-662-7138

1-403-342-7138

City of Edmonton:

Permits call 311

It may be necessary to involve other utilities including cable, telephone or other electric utilities. It is the mover's responsibility to ensure all affected utilities have been contacted to escort the load safely.

Due to operational requirements, we cannot guarantee the move will occur on the date requested, so please provide as much advance notice as possible. Related costs are dependent on the distance and requirements of the move such as power outages, equipment, and labour. Note: If your move is scheduled at a time when there is a power emergency, EPCOR's priority will always be to restore power, which can result in your move being delayed.

Cranes, Excavators and Equipment

Whenever machinery is being used near electrical equipment, all workers in the vicinity shall be instructed to remain clear and avoid contact with the frame of the equipment, hoisting lines, the hoisted load, and anything else contacting the equipment. Power lines can hang as low as **4 m** from the ground.

When working near electrical equipment, "Keep clear - working near electrical lines and apparatus" signs must 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 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 peripheral devices fully extended shall be posted in view of the operator of the machine.

A signaller shall direct the moving of equipment near overhead power lines or other electrical equipment. The signaller shall be identified by a bright traffic vest and/or cuff. The designated signaller shall not be assigned any other duties during the times when the equipment is near the limits of approach. The operator and the signaller should know all 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 emergency, stay calm and think before you act. If you try to pull the victim clear, you will also become a path for electricity. The passage of electricity through the body is called “shock” and may not be enough to kill or injure. Small amounts of electrical current can cause involuntary muscle contractions and will prevent the victim from letting go of a conductor or calling for help.

The effects of an electrical contact are determined by:

- How much current is flowing through the body.
- The path of the electricity - where it enters and exits the body.
- Duration (amount of time) of exposure to the electrical energy.

If equipment makes accidental contact with an electrical conductor, the operator shall try to remove the machine from contact in the best possible manner, without causing further damage. In most cases, this can be accomplished by moving the boom of the machine.

If the machine cannot be moved, the operator shall stay on the machine, warn others in the vicinity to stay at least **10 m** clear of the equipment, keep out of the excavation area, do not touch the cables, and notify **EPCOR Trouble at 780-412-4500**.

If the operator has to leave equipment that is in contact with an electrical conductor, the operator must jump clear and land with feet together — they must **NOT**, under any circumstances, step down and allow part of their body to be in contact with the ground while any other part of their body is touching the machine.

Fight the urge to run. The safest way to move away from a downed line is to shuffle with your feet together on the ground (at least **10 m** away). When a live wire touches the ground, electricity travels in all directions. Voltage decreases as it travels from the source and electricity could come up one leg and go out the other resulting in an electrical shock.

Electrical Contact:

Fire /Threat to life call 911

Otherwise call EPCOR Trouble at
780-412-4500

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