

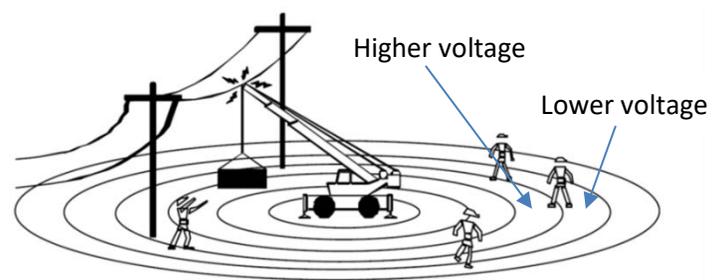


## MICHIGAN STATE UNIVERSITY: Prevention of work-related injuries & illnesses through research & investigation

### LOOK UP FOR OVERHEAD POWER LINES

Hazard Alert: Overhead Power Lines 4/3/20

Overhead power lines carry voltage that is potentially fatal. An individual will receive an electrical shock if any part of their body completes an electrical circuit by directly contacting a live wire, touching an energized conductor (e.g., machine in contact with an overhead wire, rigging) or contacting different voltages (voltage gradient) emanating from electrified equipment or an electrical ground (step potential). Figure 1 shows individuals standing within two different voltage gradients which could cause them to be electrocuted.



Current can flow outward through the ground in a ripple pattern from the equipment in contact with a power line.

Figure 1

**Since 2001, there have been 98 work-related electrocutions in Michigan;** 52 deaths occurred in the Construction industry. Eleven deaths occurred in Administrative and Support and Waste Management and Remediation Services industry (seven landscape workers), nine in Agriculture, seven in Manufacturing and six in Utilities. **Forty-nine (50%) of the 98 deaths involved energized overhead power lines;** 25 of these 49 deaths occurred in the Construction industry.

### EXAMPLES OF WORK-RELATED FATALITIES FROM CONTACT WITH AN OVERHEAD LINE IN MICHIGAN

- A church volunteer in his mid-teens was electrocuted moving an aluminum extension ladder extended more than 29 feet. The ladder contacted an overhead power line of unknown voltage.
- A laborer in his 20s was electrocuted when the boom of a stake truck modified to paint Christmas trees contacted an energized overhead 7,200-volt power line while he held an aluminum paint gun connected to the boom by a metal-reinforced hose.
- A concrete finisher in his 30s was electrocuted when the handle of the 29-foot-long metal bull float he was using contacted an energized 7,200-volt power line.
- A concrete poured wall company owner in his 40s was electrocuted while attempting to extinguish his truck's tire fire. The truck's 18-foot long boom had been improperly stowed and secured. The boom snagged a cable TV line and caused the power pole carrying a 7,200-volt overhead line to snap and fall to the truck behind the truck's crane. The decedent backed the truck attempting to disentangle the boom. The high voltage line blew out two truck tires and initiated a fire. The decedent, apparently unaware that the boom was still in contact with the overhead line, jumped out of the cab on the driver's side with a fire extinguisher. The driver's side had a dry gravel surface. He ran with a fire extinguisher in hand to the passenger side, which had wet, dewy grass. It is unknown whether the decedent made direct contact with the energized truck or if he came into contact with the voltage gradient caused by the downed line.
- A lineman in his 50s was electrocuted when he contacted a 4,800-volt overhead electrical line during the replacement of an antiquated cross arm with associated dowel pins and insulators.
- A tree trimming service foreman in his 30s was electrocuted when he picked up an energized 4,800-volt power line that had fallen to the ground in a windstorm. The decedent and his coworker were dispatched to clear a downed tree to create a path for the electric company to perform repairs. The 4,800-volt line and its neutral were on the ground. After assessing the area but before starting the job, a job briefing was conducted. The decedent used a chain saw to cut up the tree. The workers pulled the neutral from under the tree and rolled it up next to a nearby pole. The decedent thought the primary line was dead and grabbed the line with his bare hands.

## PREVENTING FATALITIES FROM WORK-RELATED ELECTROCUTIONS FROM OVERHEAD LINE CONTACT

- **LOOK UP! Survey the area. Locate all power lines and other electrical hazards on the job site** before starting work.
  - **Consider** possible metal fencing in area which may be a hazard.
- **Develop a written plan** to eliminate inadvertent power line contacts. The plan should address the following (See Work Zone Safety Clearinghouse URL or [PDF](#)):
  - The power line hazards on the jobsite.
  - Which activities and equipment will be at risk of power line contact
  - Methods to eliminate or control power line hazards. For example:
    - ✓ Utility company : a) de-energize and visibly ground the line, b) move the power line a safe distance from the work, c) install an insulative sleeve on the power line (physical barrier), d) install warning spheres on the line.
    - ✓ Dedicated spotters
    - ✓ Flagged warning lines to mark horizontal and vertical power line clearance distances
    - ✓ Barricades and barriers
    - ✓ Personal protective equipment (PPE), e.g. rubber insulating gloves, hoods, sleeves, matting, blankets, line hose, and helmets
  - Worker training (content and verification)
  - Assignment of responsibility for certain activities (e.g. observer for a crane near line)
  - Communication between contractors about power line hazards and control methods
  - Emergency response
- **Don't assume that:**
  - Overhead wires are telephone or cable lines
  - Overhead lines are insulated. Any covering you see may be weatherproofing.
- **Establish Minimum Approach Distance. Required Distances** vary by equipment and activity:
  - **Cranes:** maintain a minimum of **20 feet** clearance from energized electrical power lines ≤ 350KV electrical power lines and **50 feet** if > 350KV. If the power line voltage is verified by the utility owner, the minimum clearance distances may be reduced to 10 feet or as stipulated in Table A. (Part 10, Lifting and Digging Equipment)
  - **Excavators:** maintain a minimum clearance of **10 feet** or as stipulated in Table A. (Part 10, Lifting and Digging Equipment)
  - **Aerial Work Platforms:** maintain a minimum clearance distance of **10 feet**. (Part 32, Aerial Work Platforms)
  - **Metal Ladders:** No part of the person's body or the metal ladder can be closer than **20 feet** to power lines. (Part 11, Portable and Fixed Ladders)
  - **Scaffolds:** minimum clearance distance for uninsulated electrical lines is **10 feet**. For insulated lines up to 300 volts, the minimum clearance distance is **3 feet**. (Part 12, Scaffolds and Scaffold Platforms)
  - **Other Tools, Material and Mobile Equipment** – e.g., paint rollers, long-handled cement finishing floats, metal framing, metal roofing materials, gutters forklifts, dumb trucks, concrete pump truck booms and loaders are required to maintain a minimum clearance of **10 feet** from power lines. If the voltage is **greater than 50kV**, the **clearance shall be increased 4 in. (10 cm) for every 10kV** over that voltage. **Check height of load and power line** before you travel under it.
    - ✓ **Look up before raising long-handled tools and equipment. Always carry them horizontally.**
- **Work only in good weather (exception-restoring power).** Thunderstorms, rain, winds and damp or icy ground can cause you to lose control and contact the power lines
- **Determine which employees will be deemed "qualified" or "unqualified"** to perform work (including line clearance work) in areas containing unguarded, uninsulated energized lines or parts of equipment operating at 50 volts or more.
- **Provide safety-related work practices, safety procedures, and other safety required training (and re-training as necessary) for each designation** in accordance with MIOSHA Part 86. **Establish employee competency and proficiency** in the work practices.
  - **Only qualified employees may work in areas** containing unguarded, uninsulated energized lines or parts of equipment operating at 50 volts or more.
    - ✓ If working around parts, equipment or lines or if using mechanical equipment (other than insulated aerial lifts) that are **energized at more than 600 volts. Two employees must be present** (exception: use of live-line tools when the employee's position is not within reach of nor otherwise exposed to contact with energized parts and emergency repairs to safeguard the general public).

- **Determine employee compliance** with the safety-related work practices through regular supervision and through inspections conducted on at least an annual basis
- **Ensure no employee approaches or takes any conductive object closer to exposed energized parts than the established minimum approach distance.** For exceptions, consult MIOSHA Part 86.
- **Use only non-conductive tag lines** when securing load movement.
- **Properly stow boom-mounted truck cranes and lower dump boxes** prior to truck movement.
- **Use American National Standards Institute (ANSI) approved ladders** for work near energized power lines. **DO NOT use metal (including aluminum) ladders near power lines.** Fiberglass ladders are preferred over wooden ladders. Ensure all ladders, especially wood ladders, are clean and dry. Wood ladders should not be preserved with an oil finish as the finish can conduct electricity.
  - **Lower ladder and carry horizontally** when moving it. **Ask for help** to set up and carry long ladders.
- **Develop and train workers on emergency procedures in case of power line contact**
  - Stay calm. Call 911.
  - Warn all personnel to stay away (at least 35 feet) from the energized equipment. **Don't touch a piece of equipment or a person in contact with a piece of equipment** when the equipment is in contact with the power line.
  - Try to remove the equipment from contact by moving it in the reverse direction from that which caused the contact.
  - Stay in the cab if cannot move the equipment away from the contact until the lines have been de-energized.
  - If must leave the equipment because of a more immediate hazard (e.g., fire or smoke), jump clear and hop with feet together or shuffle feet in small steps when moving away from the equipment.

### DID YOU KNOW?

- Less than one ampere of electricity can burn, severely injure or cause death.
- Electricity travels down a piece of conductive equipment at the speed of light.
- Non-metallic materials, such as trees and ropes can conduct electricity depending upon moisture content and surface contamination
- An electrical current passing through the body, will “tingle” at 0.5 to 1.0 milliamps (mA). At levels between 11 and 16 mA, an individual can't let go.
- Currents greater than 75 mA can cause ventricular fibrillation (rapid ineffective heartbeat) and death in a few minutes unless a defibrillator is used.
- A small power drill can use as much as 2,250 mA.

### Resources

- **MSU Occupational & Environmental Medicine:** [www.oem.msu.edu](http://www.oem.msu.edu)
- **MIOSHA**
  - GI Safety & Health Standard, [Part 40 Safety Related Work Practices](#)
  - GI Safety & Health Standard, [Part 86 Electric Power Generation Transmission & Distribution](#)
  - [Power Line Clearance Fact Sheet](#)
  - [Contractor's Directory to Overhead Power Line Safety](#)
- **NIOSH Workplace Solutions:** [Preventing Worker Deaths & Injuries from Contacting Overhead Power Lines with Metal Ladders](#)
- **Electrical Safety Foundation international (ESFi)** <https://www.esfi.org/overhead-power-line-safety>
- **eLCOSH:** [Power Line Resource Page](#)
- **National Work Zone Safety Information Clearinghouse** <https://www.workzonesafety.org/?s=power+line>
- **MISS DIG 811:** <https://www.missdig.org/programs/overhead-assist.html>