OHS Emerging Issues 2022: Overhead power-line contact with excavators

Alberta Occupational Health and Safety

November 21, 2022

Issue: Overhead power-line contact with excavators

- Through weekly potentially serious incident (PSI)) trending, OHS Surveillance identified:
  - Within a year, **five** PSIs among **four employers** were reported where excavator booms contacted overhead power lines.

- All in the mobile equipment operations industry (40604).

- Occurred in the spring and summer months

- ***OHS Code*** - Part 17 – Overhead power lines s.225, 226, 227

- Workers or equipment operating within **seven metres** of overhead power lines must contact utilities company

- Employers don't always get clearance approval paperwork from utility company

How serious is this issue?

Research (USA data)

- 2011-2020:
  - Almost half of all fatal and nearly a quarter of work-related nonfatal electrical injuries occurred in construction, even though the industry employs only 7% of the U.S. workforce.
  - More than one-third of fatal electrical injuries were caused by direct exposure to voltage greater than 220 volts (ex. overhead power lines & industrial transformers
- 1997–2003, the use of mobile cranes represented over 84% of crane/derrick fatalities.
  - “Electrocutions” ranked second as a proximal cause of fatalities, all involved mobile cranes and were the result of a crane’s boom and/or wire rope getting extremely close to or touching high voltage lines.
- 1992 to 2007, 43% of all occupational electrical fatalities can be attributed to contact with overhead power lines.
  - Worker contact with overhead power lines was involved in only 2% of nonfatal electrical accidents; accidents involving power lines are far more likely to kill rather than injure the worker.

How serious is this issue?

Alberta Surveillance

- Workers' Compensation Board (WCB) data:
  - No injury claims (2017-2021) or fatality claims (1990-2021)
- PSIs (2019-2022):
  - 24 PSIs
    - 12% of all PSIs in this industry
    - 11 (46%) involved contact by an industrial vehicle (powered)
    - 2 workers injured
- DASH data*:
  - Serious incidents (2011-2022)
    - 1 (<1%) fatal incident contact with a metal pole from a work platform
    - 1 hospitalization
    - 3 explosions
    - 14 PSI follow-up inspections
  - Immediate dangers (2012-2022)
    - 7 (2%) immediate danger complaints included overhead power lines as a topic
  - Orders (2012-2022)
    - 21 (1%) orders in the industry were for Part 17: Overhead Power Lines
    - 8 stop work orders under OHS Code s.225: Safe limit of approach distances
  - Complaints (2012-2022)
    - 21 (<2%) complaints included overhead power lines as a topic

* Data and statistics hub - Alberta OHS compliance information management system

Who is affected?

Research (USA data)

- Occupations involved in electrical fatalities:
  - 44% Construction and Extraction
  - 20% Installation, Maintenance, and Repair
  - 13% Building and Grounds Cleaning and Maintenance
  - **6% Transportations and Material Moving**
  - 5% Management
  - 3% Farming, Fishing, and Forestry
- In 2020 in USA, there were 2,220 non-fatal electrical injuries involving days away from work.
  - This was a 17% increase over 2019 and a return to the same levels as 2017.
  - This was 0.19% of all nonfatal injuries involving days away from work.

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- PSIs (2019-2022):
  - Top employer industries with contact with overhead power lines

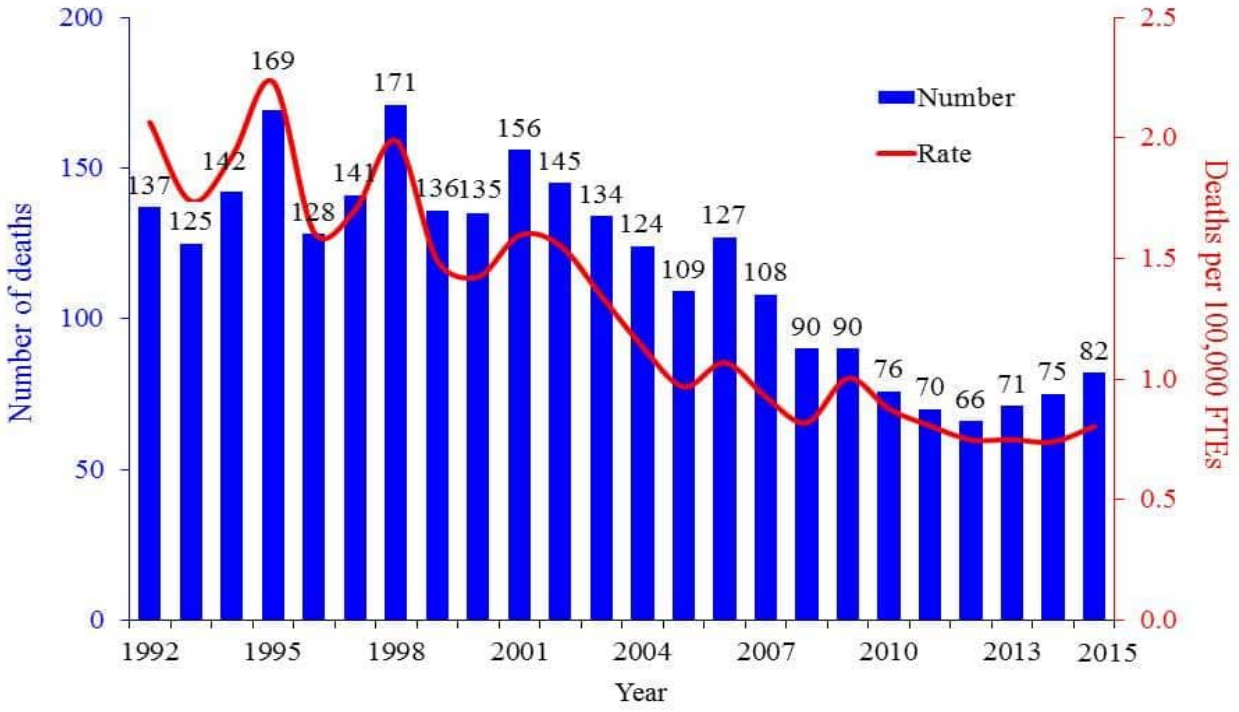
Industry	Count	%
Mobile equipment operation	21	30
Cities	4	6
Utilities - electric and natural gas	4	6
Trucking service - general	3	4
Trucking service - oilfield	3	4

  - Small number of workers injured
    - 2 workers injured
- Mostly medium and large employers

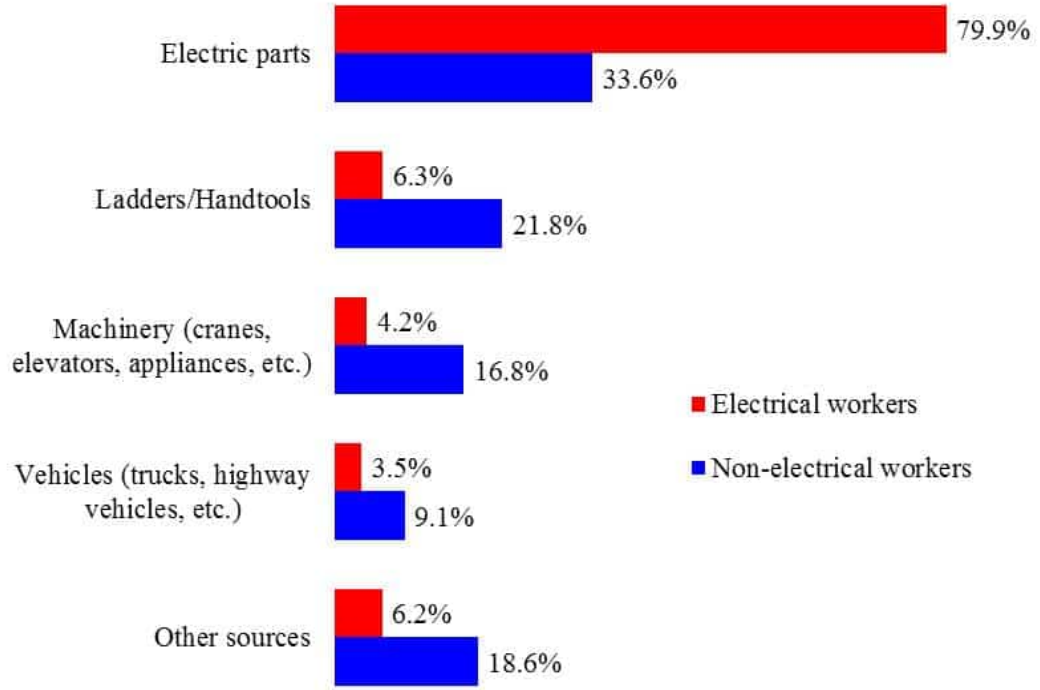
Who is affected?

Research (USA data)

46a. Number and rate of electrocution deaths in construction, 1992-2015



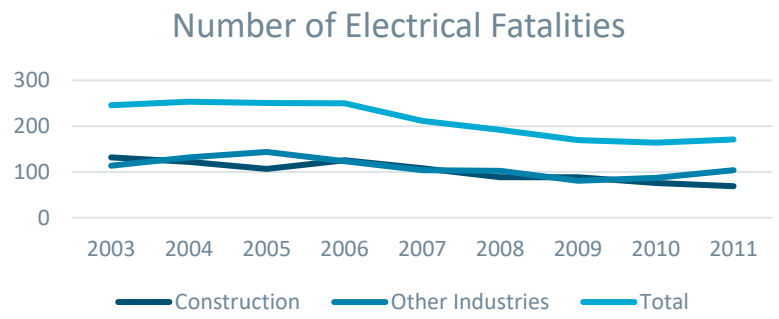
46c. Primary source of electrocution deaths in construction, electrical workers versus non-electrical workers, 2011-2015 total



How are industries affected?

Research

- US data:
  - The **mining** industry had the highest rate of **fatal electrical injuries** (0.8 / 100,000) followed by the **construction** industry (0.6 / 100,000) in 2020. All industries had 0.1 fatalities per 100,000 workers.
  - Industries with the leading number of nonfatal electrical injuries:
    - Construction: 20%
    - Accommodation and Food Services: 22%
    - Wholesale Trade: 17%
    - Manufacturing: 14%



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- DASH assignment topics identified as:
  - **Overhead power lines**
    - Mobile equipment operation industry
      - 51 employers
    - All other industries
      - 73 industries
      - 280 employers
  - Both **Overhead power lines** and **powered mobile equipment**
    - Mobile equipment operation industry
      - 10 employers
    - All other industries
      - 32 industries
      - 67 employers

What are the risk factors?

Research

- MSHA accident data for overhead line contacts in the mining industry from 1980 to 1997 reveal that in 57% of the cases, personnel were unaware of the line contact until after one or more workers touched either the equipment or a hoisted load and were injured.

- A survey in the USA construction industry in 1993:
  - Training employees is the most common method contractors use to prevent worker/equipment contact with overhead power lines.
  - When contractors were asked about how they would address a situation where power lines crossed a portion of the site, the most common preferred method was installing line warning devices to the power lines such as tapes, flags, and orange balls.

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PSI records show**:**

- Top sources associated with contact with overhead power lines for all industries (n=89)

Sources of incident	Count	%
Industrial vehicle - powered	28	31
Motor vehicle	10	11
Crane-mobile, truck, rail mounted	10	11
Construction, log, mine machinery	9	10

- Contributed factors from investigation findings (PSIs and serious incidents):
  - **Procedures not followed** when moving excavator to site.
  - Lack of contact with **utility** company prior to starting work.
  - **Inadequately trained** spotter walked equipment to location.
  - **No spotter** when parking equipment.
  - Spotter did not notify the operator of proximity to overhead power line.
  - No overhead power line **warning signs or lack of signage**.
  - **Mechanical failure** of equipment.

What are hazard mitigations?

- Identify overhead power lines by consulting the utility company
- Maintain minimum distance from energized overhead power lines.
- De-energize lines.
- Use and train an observer (spotter) to warn the operator of impending contact.
- Use of warning signs for presence of overhead power lines.
- Use barriers to prevent physical contact with an energized line.
- Use proximity warning devices (mount onto machines to detect electric fields that surround an overhead power line).
  - Despite being available for many years, these devices have found limited acceptance, due to technical and operational limitations.
- Use drones to monitor between cranes and lines.
- Use of an insulating load link in the hoisting line of a crane, providing electrical insulation between the load and the crane, including the hoist rope.
  - High cost
  - Surface contamination and moisture can reduce a load link's insulation resistance.
  - Workers in contact with parts of the crane other than the isolated load would be unprotected by a load link.

Risk assessment

- Several industries affected (mobile equipment operations, utilities, construction, trucking, oil and gas, and cities have reported incidents with overhead power line contact)
- No WCB claims or fatalities within mobile equipment operations. One serious incident fatality in 2021.
- Severity of injury/illness is high
  - Serious incidents – two resulted in injuries; one fatality
  - One PSI – two injured workers
- Potential for injury/illness is high
  - Electrocution
  - Shock
  - Burns
- Frequency of hazard and exposure is moderate
  - Average of 3 PSIs reported per year
- Risk factors are known and well documented
- Controls are identified and effective (engineering and policy)

OHS Resources

- A handbook for Alberta employers and workers: Hazard Assessment and Control
- Guide to OHS: Workers

Questions or comments?

Contact the OHS Surveillance program:

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