Safety of Equipment around Power Lines
Paul A. Satti

psatti@buildsafe.org 708-544-2082 x 213
Objectives

- Identify OSHA's power line safety standards.
- List the options for compliance if working in close proximity to an overhead power line.
- Prepare planning documentation that complies with OSHA's encroachment/electrocution prevention requirements.
Reasons for Listening

• Employer Accident Prevention Responsibilities
  – Initiate and maintain a safety program
  – Provide for frequent and regular inspection of job-site
  – Safe condition of equipment
  – Qualification of equipment operators

• Safety Training and Education
  – Recognition and avoidance of unsafe conditions
  – Regulations applicable to work environment
Important Terms to Know

- General Duty Clause
- OSHAct
- Multi-Employer Worksite Citation Policy
- Creating Employer
- Exposing Employer
- Correcting Employer
- Controlling Employer
- Federal Crane Standards (29 CFR 1926, Subpart CC)

- Industry Consensus Standards
- American Society of Mechanical Engineers (ASME)
- A/D Director (Assembly/Disassembly Director)
- Competent Person
- Qualified Person
- Controlling Entity
Mobile Crane Management System

• Knowledge of OSHA Standards
• Knowledge of Industry Consensus Standards
• Mobile Crane Management Policy & Accountability Plan
• General Crane Inspection Criteria
• Job-site Ground Conditions Inspection Check-list
• Assembly/Disassembly Plan & Procedures
• Job-site Specific Lift Plan
• Rigging Inspection Criteria and Inspection Records
• Power Line Safety & Pre-lift Meeting Documentation
• Personnel Qualification Requirements and Training
<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>§1926.1407</td>
<td>Power Line Safety (up to 350 kV) – assembly and disassembly</td>
</tr>
<tr>
<td>§1926.1408</td>
<td>Power Line Safety (up to 350 kV) – equipment operations</td>
</tr>
<tr>
<td>§1926.1409</td>
<td>Power Line Safety (over 350 kV)</td>
</tr>
<tr>
<td>§1926.1410</td>
<td>Power Line Safety (all voltages) – equipment operations closer than the Table A zone</td>
</tr>
<tr>
<td>§1926.1411</td>
<td>Power Line Safety – while traveling under or near power lines with no load</td>
</tr>
</tbody>
</table>
Scope: 29 CFR 1926 Subpart CC

- Power-operated equipment used in construction work that can hoist, lower and horizontally move a suspended load.
Covered under §1926 Subpart CC

- Mobile Cranes
- Tower Cranes
- Articulating (knuckle-boom) Cranes
- All Derricks (except utility work)
- Crane Attached or Crane Suspended Attachments
✓ Covered
✓ Excluded
Special Rules for Articulating/Knuckle Boom Cranes

- Equipment delivers materials by placing them on the ground without arranging them in a particular sequence for hoisting, the activity is not considered construction work and is not covered under the standard.
Additional Exclusions for Knuckle Booms

• Materials are sheet goods or packaged goods.
• Equipment uses a fork/cradle.
• Equipment is not used to hold, support or stabilize material to facilitate construction.
• Equipment is equipped with overload prevention device.
Exclusion DOES NOT Apply to:

- Delivery of prefabricated components or building sections, such as roof trusses and wall panels.
- Delivery of structural steel members or components of a systems-engineered metal building.
If Excluded, then…

• General Safety & Health Provisions
  – §1926.20(b) Accident prevention responsibilities…
  – §1926.21(b)(2) recognition and avoidance of unsafe conditions and the regulations applicable…
If Excluded, then…

• Safety-Related Work Practices (Electrical)
  – §1926.416(a)(3) Before work is begun the employer shall ascertain by inquiry or direct observation, or by instruments, whether any part of an energized electric power circuit, exposed or concealed, is so located that the performance of the work may bring any person, tool, or machine into physical or electrical contact with the electric power circuit. The employer shall post and maintain proper warning signs where such a circuit exists. The employer shall advise employees of the location of such lines, the hazards involved, and the protective measures to be taken.
If Excluded, then…

• NFPA 70E – Standard for Electrical Safety in the Workplace [Table 130.4(c)(a) Approach Boundaries]
<table>
<thead>
<tr>
<th>Nominal System Voltage Range, Phase to Phase&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Limited Approach Boundary&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Restricted Approach Boundary&lt;sup&gt;b&lt;/sup&gt;; Includes Inadvertent Movement Adder</th>
<th>Prohibited Approach Boundary&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;50 V</td>
<td>Not specified</td>
<td>Not specified</td>
<td>Not specified</td>
</tr>
<tr>
<td>50 V–300 V</td>
<td>3.0 m (10 ft 0 in.)</td>
<td>Avoid contact</td>
<td>Avoid contact</td>
</tr>
<tr>
<td>301 V–750 V</td>
<td>3.0 m (10 ft 0 in.)</td>
<td>1.0 m (3 ft 6 in.)</td>
<td>0.3 m (1 ft 0 in.)</td>
</tr>
<tr>
<td>751 V–15 kV</td>
<td>3.0 m (10 ft 0 in.)</td>
<td>1.5 m (5 ft 0 in.)</td>
<td>0.7 m (2 ft 2 in.)</td>
</tr>
<tr>
<td>15.1 kV–36 kV</td>
<td>3.0 m (10 ft 0 in.)</td>
<td>1.8 m (6 ft 0 in.)</td>
<td>0.8 m (2 ft 7 in.)</td>
</tr>
<tr>
<td>36.1 kV–46 kV</td>
<td>3.0 m (10 ft 0 in.)</td>
<td>2.5 m (8 ft 0 in.)</td>
<td>0.8 m (2 ft 9 in.)</td>
</tr>
<tr>
<td>46.1 kV–72.5 kV</td>
<td>3.0 m (10 ft 0 in.)</td>
<td>2.5 m (8 ft 0 in.)</td>
<td>1.0 m (3 ft 3 in.)</td>
</tr>
<tr>
<td>72.6 kV–121 kV</td>
<td>3.3 m (10 ft 8 in.)</td>
<td>2.5 m (8 ft 0 in.)</td>
<td>1.0 m (3 ft 4 in.)</td>
</tr>
<tr>
<td>138 kV–145 kV</td>
<td>3.4 m (11 ft 0 in.)</td>
<td>3.0 m (10 ft 0 in.)</td>
<td>1.2 m (3 ft 10 in.)</td>
</tr>
</tbody>
</table>
Crane Management Personnel

- **Assembly/Disassembly Director**
  - Competent & Qualified (or assisted by qualified person)

- **Competent Person**
  - Knowledgeable
  - Authority

- **Qualified Person**
  - Related to subject matter

- **Controlling Entity**
  - Ground conditions
  - Voltage information
Power Line Safety – DANGER!

• Prevent equipment from making electrical contact with power lines.
• Protect workers in the event that such contact occurs.
Identify the Crane’s Work Zone

Work Zones are defined as 360° Around the Equipment
20 Feet
Could You Get Within 20 Feet of Power Line?

Option #1
Deenergize & Ground

Option #2
20 Foot Clearance

Option #3
Ask Utility for Voltage and Use Table A (with minimum clearance distance)

Encroachment /Electrocution Prevention Measures

- Planning Meeting
- If tag lines used → Non-conductive
- Warning line, barricade, or line of signs.

PLUS (choose One)
- Proximity alarm, Dedicated Spotter, warning device, range limiter, or insulating link
Option 1 – Deenergize & Ground

- Must rely on the power line's owner or operator to take these steps.
- Difficult to do.
- Assume that all power lines are energized unless the utility owner/operator confirms that the power line has been and continues to be deenergized and the line is visibly grounded at the worksite.
<table>
<thead>
<tr>
<th>Voltage (nominal, kV, alternating current)</th>
<th>Minimum clearance distance (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>up to 50</td>
<td>10</td>
</tr>
<tr>
<td>over 50 to 200</td>
<td>15</td>
</tr>
<tr>
<td>over 200 to 350</td>
<td>20</td>
</tr>
<tr>
<td>over 350 to 500</td>
<td>25</td>
</tr>
<tr>
<td>over 500 to 750</td>
<td>35</td>
</tr>
<tr>
<td>over 750 to 1,000</td>
<td>45</td>
</tr>
<tr>
<td>over 1,000</td>
<td>(as established by the utility owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution).</td>
</tr>
</tbody>
</table>

NOTE: The value that follows “to” is up to and includes that value. For example, over 50 to 200 means up to and including 200kV.
Voltage Information

- Affected equipment (29 CFR 1926 Subpart CC).
- Utility must respond in two working days.

March 2014

<table>
<thead>
<tr>
<th>Sun</th>
<th>Mon</th>
<th>Tues</th>
<th>Wed</th>
<th>Thur</th>
<th>Fri</th>
<th>Sat</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>8</td>
<td>9</td>
<td>X</td>
<td>0</td>
<td>1</td>
<td>12</td>
<td>13</td>
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<td>15</td>
<td>16</td>
<td>17</td>
<td>18</td>
<td>19</td>
<td>20</td>
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<td>28</td>
</tr>
<tr>
<td>29</td>
<td>31</td>
<td>31</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Nonconductive

- Property of not becoming energized.
- High dielectric properties offering a high resistance to the passage of current under the conditions of use.
  - Polypropylene Rope
  - Clean & Dry
  - High-voltage Rated Rubber Gloves
Insulated Link Device

• Insulating device listed, labeled, or accepted by a Nationally Recognized Testing Laboratory in accordance with 29 CFR 1910.7

- Load Insulator ® -

*By Insulatus*
Dedicated Spotter

• Be equipped with a visual aid to assist in identifying the minimum clearance distance.
• Be positioned to effectively gauge the clearance distance.
• Able to communicate directly with the operator.
• Give timely information to the operator.
• Trained!
Operations below Power Lines

• Employer has confirmed deenergized and visibly grounded, or

• The highest point of the equipment's boom, even if completely extended and vertical, will be more than the required minimum distance from the power line.
Employee Training

- Information regarding the danger of simultaneously touching the equipment and ground.
- The importance to the operator's safety of remaining inside the cab.
- The safest means of evacuating from equipment that may be energized.
- The danger of the potentially energized zone around the equipment (step potential).
- The need for crew in the area to avoid approaching or touching the equipment and the load.
- Safe clearance distance from power lines.
- The limitations of an insulating link/device, proximity alarm, and range control (and similar) device, if used.
- How to properly ground equipment and the limitations of grounding.
Current can flow outward through ground in a ripple pattern from the equipment in contact with a power line.
Warning Stickers

- Two on the outside of equipment.
- One inside cab.
Precautions for Moving Equipment

- Traveling with no load.
- Follow Table T.

<table>
<thead>
<tr>
<th>Voltage (nominal, kV, alternating current)</th>
<th>While Traveling – Minimum clearance distance (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>up to 0.75</td>
<td>4</td>
</tr>
<tr>
<td>over .75 to 50</td>
<td>6</td>
</tr>
<tr>
<td>over 50 to 345</td>
<td>10</td>
</tr>
<tr>
<td>over 345 to 750</td>
<td>16</td>
</tr>
<tr>
<td>over 750 to 1,000</td>
<td>20</td>
</tr>
<tr>
<td>over 1,000</td>
<td>(as established by the utility owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution).</td>
</tr>
</tbody>
</table>
Equipment Closer than Table A

- Determine an absolute minimum clearance.
- Hold a planning meeting.
- Use protective procedures.
Equipment Closer than Table A

• Appoint a Project Director.
Equipment Closer than Table A

• Reconsider your plan!
Planning Meeting Worksheet

Job-site Description & Company Information

Address/Location of Lift: __________________________________________________________

Controlling Contractor: ________________________________________________________

Crane Owner: ________________________________________________________________

Subcontractor: ________________________________________________________________

____________________________________________________________________________
Planning Meeting Worksheet

**Description of Power Line & Activity**

- □ Assembly/Disassembly
- □ Equipment Operations
- □ Traveling Under or Near Power Line w/no Load
- □ Equipment Operations Closer than Table A*

  * Must provide infeasibility study  
  
  *(Attach infeasibility study)*

**Voltage Information Request:** [Request Date] – [Confirmed by (name of Utility Representative)]

**Utility Owner/Operator:**

- __________________________

- □ Up to 350 kV
- □ Over 350 kV
- □ Over 1000 kV*

- □ Known Voltage: *(Required if using Table A)*  
  
  _____________ kV

- * Qualified Person: ____________

**Power Line Clearance Distance:**

- □ 20 feet
- □ 50 feet
- □ Other ____________

- □ Selected from Table A ____________

- □ Selected from Table T ____________

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Planning Meeting Worksheet

**Personnel**

A/D Director: ___________________________  Operator: ___________________________

A/D Crew: ___________________________  Dedicated Spotter: ___________________________

Other Workers: ___________________________  Crane Signal Person: ___________________________
Prevention Encroachment/Electrocution

Tag Lines Nonconductive?  □ Yes □ No

Describe:

Elevated Warning Line, Barricade or Line of Signs?  □ Yes □ No

Describe:
Planning Meeting Worksheet

Additional Measures (select all that apply):

☐ Dedicated Spotter
☐ Range Control Warning Device
☐ Insulating Link/Device

☐ Proximity Alarm
☐ Range Limiting Device

Training [conducted in accordance with §1926.1408(g)]

The employer must train each operator and crew member assigned to work with the equipment on all of the following:

☑ Procedures to be following in the event of electrical contact with power line.
☑ Power lines are presumed to be energized unless the utility owner/operator or a qualified person confirms that a line is insulated.
☑ Limitations of an insulating link/device, proximity alarm, and range control device.
☑ Procedures to be followed to properly ground equipment and limitations of grounding.

Training Conducted by: ________________________________

Date: ____________

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Thank You