Understanding Crane Accident Failures:
A report on causes of deaths in crane-related accidents

Michael McCann, PhD, CIH
Presented at
2010 Crane & Rigging Conference
May 27, 2010
Overview

- Analysis of crane related deaths and injuries in the U.S. construction industry
- Description of selected incidents
- Sources of data
  - Bureau of Labor statistics CFOI Research File
  - CraneAccidents.com
  - OSHA Underground
  - Cranes Today
  - Weekly Toll
  - Google
  - News articles
- Descriptive statistics on deaths and injuries
- Recommendations/ Operation and Inspections
- Status of Regulation
Background:
Selected Fatal Crane Incidents 2008*

3/15/08  New York, NY. Tower crane collapsed while being jumped, damaging several buildings.

6 construction workers and 1 bystander died
13 construction workers and 11 first responders injured

3/25/08  Miami, FL. 20-foot section crane fell 30 stories while jumping the crane. Miami, FL.

2 construction workers died
5 construction workers injured

* Source: Google, newspaper reports
<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>Incident Description</th>
<th>Casualties</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/30/08</td>
<td>New York, NY.</td>
<td>Crane cab, boom and chain deck separate from tower mast and fell to street.</td>
<td>2 construction workers died, 1 construction worker and 1 bystander injured</td>
</tr>
<tr>
<td>7/18/08</td>
<td>Houston, TX.</td>
<td>Mobile crane fell on tent.</td>
<td>4 construction workers died, 7 construction workers injured</td>
</tr>
<tr>
<td>7/24/08</td>
<td>Oklahoma City, OK.</td>
<td>Mobile crane putting steeple on church collapses on car.</td>
<td>1 bystander died, 1 bystander injured</td>
</tr>
<tr>
<td>10/10/08</td>
<td>China.</td>
<td>Tower crane collapses on kindergarten.</td>
<td>5 children dead, 3 injured</td>
</tr>
</tbody>
</table>
### Summary of Construction Crane-Related Deaths & Injuries, January to December, 2008*

<table>
<thead>
<tr>
<th></th>
<th>Deaths</th>
<th>Injuries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction workers</td>
<td>54</td>
<td>100</td>
</tr>
<tr>
<td>Bystanders</td>
<td>4</td>
<td>15</td>
</tr>
<tr>
<td>Rescue workers</td>
<td>--</td>
<td>11</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>58</td>
<td>126</td>
</tr>
</tbody>
</table>

*Involves incidents involving 88 mobile cranes, 7 tower cranes, 1 gantry crane and 1 crawler crane.

**Sources:** CraneAccidents.com, Google, News articles, OSHA Underground, Cranes Today, The Weekly Toll
<table>
<thead>
<tr>
<th>Cause</th>
<th># Incidents (%)</th>
<th>Deaths</th>
<th>Injuries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crane collapses</td>
<td>34   (39%)</td>
<td>25</td>
<td>59</td>
</tr>
<tr>
<td>Overhead power line contacts</td>
<td>12   (14%)</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>Struck by crane load</td>
<td>12   (14%)</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Struck by other crane parts</td>
<td>10   (11%)</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Other causes*</td>
<td>20   (23%)</td>
<td>7</td>
<td>16</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>88</strong></td>
<td><strong>54</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

* Includes 7 highway incidents, 6 falls, 3 caught in/between, 3 struck by non-crane falling objects, and 1 struck by lightning incident
Causes of Bystander and Other Crane-Related Deaths & Injuries, Jan.1 to Dec. 31, 2008

<table>
<thead>
<tr>
<th>Cause</th>
<th>Incidents</th>
<th>Deaths</th>
<th>Injuries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highway collisions</td>
<td>6 (40%)</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Crane collapses</td>
<td>4 (27%)</td>
<td>3</td>
<td>14*</td>
</tr>
<tr>
<td>Other causes**</td>
<td>5 (33%)</td>
<td>-</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>15</td>
<td>4</td>
<td>26</td>
</tr>
</tbody>
</table>

* Includes 11 first responder injuries in 3/15 New York tower crane collapse
** Includes 2 work zone intrusions, 1 struck by crane load, 1 struck by falling crane boom, and 1 overhead power line contact.
Crane-Related Deaths & Injuries by State, Jan. 1 to Dec. 31, 2008

**Summary:**
- 35 states had 97 crane incidents involving 57 deaths and 127 injuries

**States with the most incidents:**
- Fl: 13 (13%) with 3 deaths and 19 injuries
- TX: 9 (9%) with 9 deaths and 20 injuries
- NY: 7 (7%) with 11 deaths and 35 injuries

*These 3 states had 40% of deaths and 58% of injuries*
Crane-Related Deaths in Construction, 1992-2006

632 crane-related deaths from 610 incidents in construction from 1992-2006
- An average of 42 deaths/year

Includes 18 multiple-death incidents involving a total of 40 deaths

Crane-Related Deaths in Construction by Year, 1992-2006

Causes of Crane-Related Deaths in Construction, 1992-2006

- Overhead power line electrocutions: 157 deaths (25%)
- Struck by crane loads: 132 deaths (21%)
- Crane collapses: 89 deaths (14%)
- Struck by crane booms/jibs*: 78 deaths (13%)
- Falls**: 56 deaths (9%)
- Struck by cranes or crane parts: 47 deaths (8%)
- Caught in/between: 30 deaths (5%)
- Other causes***: 43 deaths (7%)

Total deaths: 632

* Included 64 struck by falling booms/jibs
** Included 21 falls from cranes, 9 falls from crane baskets, 8 from crane loads.
***Other causes included 9 highway incidents.

Types of Cranes Involved in Fatalities

- Mobile cranes
- Tower cranes
- Floating or barge cranes
- Overhead cranes
Types of Cranes Involved:

Mobile Cranes

At least 71% of all crane-related incidents involved mobile cranes

Mobile cranes were involved in:

- 80 of 95 (84%) of overhead power line incidents
- 37 of 59 (63%) of crane collapses
- 35 of 59 (60%) of struck by boom/jib incidents
Tower Cranes

Tower cranes were involved in:

- 16 of 306 (5%) of all crane related incidents
- 5 of 24 (21%) of struck by crane load incidents
- 5 of 59 (8%) of struck by boom/jib deaths
Other/unspecified cranes were involved in 24% of all crane related incidents, including:

- 13 floating or barge crane incidents
- 12 overhead crane incidents
- 49 unspecified cranes (16% of incidents)
Main Causes of Worker Deaths, by Frequency

- Electrocutions – from overhead power lines
- Struck by crane load
- Crane collapse
- Struck by falling boom/jib
Overhead Power Line Electrocutions

1992 - 2006
Number of Deaths: 157

Why Workers Died:

- 52% Worker on foot touching/ guiding load cables
- 25% Operating crane
- 13% Worker on foot touching crane
- 10% Other

Source: U.S. Bureau of Labor Statistics
Census of Fatal Occupational Injuries Research File
Why Workers Died:
Struck By Crane Loads

1992 - 2006
Number of Deaths: 132

Source: U.S. Bureau of Labor Statistics
Census of Fatal Occupational Injuries Research File
Why Workers Died:

Crane Collapses

1992 - 2006
Number of Collapses: 81
Number of Deaths: 89

Source: U.S. Bureau of Labor Statistics
Census of Fatal Occupational Injuries Research File
Why Workers Died:
Struck by Falling Booms/Jibs

1992 - 2006
Number of Deaths: 64

Source: U.S. Bureau of Labor Statistics
Census of Fatal Occupational Injuries Research File
Trades of Workers Who Died
Crane-Related Deaths in Construction, 1992-2006

- Construction laborers: 191 deaths
- Heavy equipment operators*: 101 deaths
- Supervisors/Managers/Admin: 86 deaths
- Ironworkers: 42 deaths
- Mechanics: 41 deaths
- Other trades**: 171 deaths

Total: 632 deaths

* Includes 62 crane and tower operators, 21 operating engineers and other construction equipment operators, and 7 hoist and winch operators.

** Includes 24 welders and cutters, 22 electrical workers, 21 mechanics, 17 sheet metal workers, 14 truck drivers, and 73 others.

Recommendations

- Crane operators should be certified.
  - Presently only 15 states and a few cities (including New York City and Chicago) require certification.

- Crane riggers and signalpersons should be adequately trained.

- Crane inspectors should be qualified persons.
  - OSHA only requires that they be competent persons.
Recommendations (cont.)

- Cranes should be inspected before being assembled or modified.
- Only trained workers under the supervision of a qualified person and competent person should assemble, modify or disassemble cranes.
- Crane loads should not be allowed to pass over street traffic.
Recommendations (cont.)

- OSHA should conduct more thorough investigations of crane-related fatalities and capture more complete data in its reporting system.
- OSHA should take immediately action on the proposed consensus crane and derrick standard for construction.
On July 9, 2004, the Federal Advisory Committee on cranes and derricks (C-DAC) reached a consensus for a new crane and derricks standard.

On October 9, 2008, OSHA published a proposed rule on Cranes and Derricks in Construction in the Federal Register. The deadline for comments was January 22, 2009 and a hearing held March 17. Final rule is due in July, 2010.
For Further Information

- Mike McCann: mmccann@cpwr.com
- Electronic Library of Construction Safety and Health (eLCOSH): www.elcosh.org
- CPWR – The Center for Construction Research and Training: www.cpwr.com

CPWR – The Center for Construction Research and Training – is the research arm of the Building and Construction Trades Department, AFL-CIO. This research was funded as part of a grant with CPWR from the National Institute for occupational Safety and Health, NIOSH (NIOSH Grant 1 U54OH008307). The research is solely the responsibility of the authors and does not necessarily represent the official views of NIOSH.