Crane and Construction Accidents**


This report is based on statistics from Occupational Safety and Health Administration (OSHA) case files for crane related fatalities from 1997 through 2003. Proximal cause, physical contributing factor, victim’s occupation, work site by end-use, construction operation, employer’s safety and health program, union representation, type of crane, and prior OSHA citations were evaluated for 125 cases. Results show that 84% of fatalities involved a mobile crane. The seven recommendations (p. 4) resulting from the study are: 1) A system should be put in place to assess an individual worksite’s potential crane hazards. 2) Crane operator certification and/or qualification should be required. 3) Non-crane operators such as riggers and/or laborers should be “trained in the hazards of working near cranes.” 4) All lifting operations should be supervised by a “diligent competent person”. 5) “OSHA should consider modifying its list of major crane-related fatality causes to match those observed in this study.” 6) Workers not involved in day to day crane-related work should pay special attention to training and awareness. 7) “OSHA should continue to improve its system of collecting information during fatality investigations.”


The construction boom in Las Vegas in the first decade of the 21st century also saw the deaths of 12 construction workers in 18 months. Berzon’s investigation of the accidents, including over a dozen crane incidents, revealed round-the-clock construction activities on over-crowded sites including the largest private commercial development in the United States. Problems she reported include lack of fall protections (safety steps such as temporary decks or netting), Nevada OSHA’s reduction or withdrawal of fines following citations and meetings with contractors, and a lack of union involvement. The articles led to a walk-out by construction workers after a co-worker’s death in June, 2008 and hearings by the U.S. House and Senate. Most importantly revised safety procedures were put into effect that prevented more worker deaths. For her reporting and for the Sun’s associated editorials, the Pulitzer Prize committee awarded Berzon and the Sun the Journalism Public Service prize for 2009: “For the exposure of
the high death rate among construction workers on the Las Vegas Strip amid lax enforcement of regulations, leading to changes in policy and improved safety conditions. “ [Pulitzer Prize web site]

http://www.ig.state.ny.us/pdfs/Investigation%20of%20Improprieties%20in%20the%20Issuance%20of%20Crane%20Operators%20Certifications%20by%20NYS%20DOL.pdf

Among the findings of an investigation by Hamann, the State Inspector General, were: 1) New York’s Department of Labor did not have written policies or regulations regarding the required examination for obtaining crane operator’s certification, which gave the appearance of bias in favor of union members; 2) DOL lacks sufficient administrative controls over the testing process. “Specifically, tests are graded inconsistently and the same board members who grade tests also decide appeals of their own decisions” [Press release]; and 3) one Department of Labor employee improperly issued certification to more than 200 applicants. New York City, which has its own licensing process, was not part of the investigation. The report includes the response from the Department of Labor with its plan for corrective action.


This CRS Report gives an overview of crane safety in the United States since the OSHA Cranes, Derricks, Hoists, Elevators and Escalators safety standard 29 CFR 1926 Subpart N went into effect in 1971. Statistics on recent construction fatalities with an emphasis on crane related fatalities are provided, followed by a brief history and current status of the OSHA standard. The OSHA safety standards were minimally revised in 1988 and 1993, leaving them “virtually unchanged” since 1971. OSHA appointed the Crane and Derrick Negotiated Rulemaking Advisory Committee (C-DAC) in 2003. In 2004, the committee voted for an extensive revision of the standard with an emphasis on crane operator certification. A proposed draft rule was presented to a panel composed of staff from Office of Management and Budget (OMB), the Small Business Administration (SBA), and OSHA, which made recommendations for revisions. OSHA’s Advisory Committee on Construction Safety and Health (ACCSH) approved the draft in October, 2006. In 2008, meetings were held with OMB and various labor representatives and a public hearing was held to discuss the rule. Portions of the proposed rule are described and regional oversite is discussed, including application to states with and without their own safety and health programs.


Three major crane incidents in New York City and Miami caused the deaths of six construction workers and one bystander and prompted this report from the Center. The authors examined data from the Bureau of Labor Statistics’ Census of Fatal Occupational Injuries for the period 1992--2002 to establish trends and make recommendations. The report identified the main causes of death, the types of cranes involved, the trades of those who died, and the size of the employer with the largest number of fatalities. Of the 323 crane-related construction worker fatalities 216
involved mobile or truck cranes. As to cause of death, 102 (32%) were caused by overhead power line electrocutions, 68 (21%) by crane collapses, and 59 (18%) by being struck by a crane boom or job. Construction laborers accounted for the largest number of deaths (96 or 30%) followed by heavy equipment operators (74 deaths or 23%). A large proportion (1/3) of the total deaths occurred to employees of small contractors. The report’s eight recommendations include: 1) certification by a nationally accredited testing organizations for crane operators, riggers, signalpersons and inspectors, 2) inspection of cranes after assembly or modification by trained workers under qualified supervision in addition to other mandatory inspections, 3) prevention of crane loads passing over street traffic, and 4) more complete reporting and investigation of incidents. In connection with the Las Vegas incidents, as part of the Memorandum of Understanding between the general contractor Perini and the Southern Nevada Building Trades Council, CPWR conducted a safety worksite assessment of two of the building projects and presented findings in four reports. [http://www.cpwr.com/research-sitereport.html]. Their four key recommendations were: 1) demonstrate a commitment to safety and willingness to solve problems; 2) involve senior and midlevel management in safety; 3) encourage “positive and constructive attitudes and actions” in foremen; and 4) encourage workers to be actively involved in safety.


This article is the first in a series intended to develop quantitative methods for assessing crane safety on individual sites. The authors identified an initial list of factors affecting crane safety by analyzing the literature, observing construction sites, and conducting open conversations with on site personnel. Information gathered from the preliminary investigation was then presented to an expert panel for final analysis. The study identified 21 safety factors in the following four categories: project conditions, environment, human factor, and safety management.


In the second article, the authors called upon industry experts to assess the rank and weight of the factors identified in the first article. The top five factors found to affect tower crane safety were: site-level safety management, operator proficiency, wind, superintendent character, and maintenance management. Results were further divided into an heirarchical chart using the four categories identified in the January 1st article to assess the weight of the categories themselves. The relative weight of these categories with respect to one another was: project conditions 0.213, environment(winds) 0.095, human factor 0.338, safety management 0.305.


The third article focused on developing quantitative methods and scales for measuring the risk associated with factors found at the individual site level. The authors chose two factors identified in the previous studies as having relatively high influence on site safety: overlapping cranes and operator performance. Possible geometric configurations for overlapping cranes were studied
and an equation was developed to compute the risk associated with a particular configuration on a scale of 0 – 10 with 10 being high risk. Metrics were also developed to measure the risk associated given an operator’s level of experience.


To aid in analyzing and preventing crane accidents, which constitute approximately 25-33% of all construction casualties, 10-12% of construction fatalities worldwide, the authors organized 500 incidents of OSHA-reported crane fatalities from 1985-1995 into groups by “forms of damaging energy involved” (electrical energy, gravitational energy, etc.). Their taxonomy is limited because the proportion of crane-related fatalities investigated by OSHA is unknown and the pattern in the US construction industry may vary from other western countries; the basis is fatalities and does not take into account non-fatal, permanent injuries. Keeping these limitations in mind, the authors point to the need for preventative measures such as the use of fall protection equipment, the installation of insulated links on crane cables, training and education of employees, and procedures for maintaining safe distances from electrical lines.


The Committee heard testimony concerning recently publicized construction fatalities, the need for OSHA to issue a revised crane and derrick safety standard, the questionable federal Compliance Directives that allowed use of an alternate steel erection safety standard, the resources and enforcement tools OSHA needs to carry out inspections, and the role cities could play in improving construction site safety. Committee Chairman, George Miller, concluded the hearing by saying that fines levied after construction injuries and deaths seem to be considered a cost of doing business, that their reduction or waiver during informal meetings between OSHA and company officials without subsequent correction of dangerous or negligent practices raises questions about State enforcement and Federal authority under current law. In testimony before the Committee on October 29, 2009, Jordan Barab, Acting Assistant Secretary for OSHA, referring to a recent study [Special Review of the Nevada Occupational Safety and Health Program, October 20, 2009, http://www.osha.gov/desp/final-nevada-report.html], said that “the results of the study have convinced me that significant changes must be made in how Federal OSHA conducts oversight over the state plan programs.”

*Prepared by Willow Dressel, Assistant Engineering Librarian, and Linda Oppenheim, Industrial Relations Librarian.

** URLs are correct as of the date of publication. For additional sources of information, see the Industrial Relations Research Guide: Construction Safety [http://libguides.princeton.edu/content.php?pid=90497&sid=0](http://libguides.princeton.edu/content.php?pid=90497&sid=0).