MISSOURI OCCUPATIONAL FATALITY ASSESSMENT AND CONTROL EVALUATION (MO FACE)

Equipment Operator Dies Following Crane Overturn Incident

MO FACE Investigation #99MO090
Date: September 2, 2005
Type: Machinery Overturn

SUMMARY

On August 25, 1999, a 60-year-old certified crane operator was killed after attempting to jump clear from a 14.5-ton overturning crane. The operator was lifting bundles of steel roof joists from a trailer and over a 30-foot concrete wall. The crane became unsteady as it rotated the load from the back of the crane to the side. The crane tipped up onto the outriggers twice before overturning completely onto its side. The operator tried to escape from the tipping crane but became pinned by the crane as it tipped to its side. Workers used two other near-by cranes and EMS used inflatable pillows to lift the overturned crane off of the operator. He was taken to a local trauma center where he died a short time later.

The MO FACE investigator concluded that, to prevent similar occurrences, all employers should:

- **ensure that cranes are operated within their limits of stability as determined by the manufacturer-supplied capacity charts;**
- **ensure that the weights of objects lifted by a crane be determined by a competent person, as defined by OSHA, and the weight be posted clearly and visibly on the object prior to being lifted;**
- **develop, implement, and enforce a comprehensive written safety program which includes, but is not limited to, strict conformance with the equipment manufacturer's recommended safe operating procedures for crane set-up and lift configurations:**
- **ensure that all cranes are equipped with load moment indicators and maintain those indicators according to the manufacturer's specifications.**

Additionally, manufacturers of steel building components should:

- **consider clearly and visibly identifying each steel building component with its corresponding weight.**

INTRODUCTION

On August 25, 1999, at approximately 8:05 a.m., a 60-year-old crane operator (victim) was struck-by an overturning 14.5-ton crane at a warehouse construction site. The victim was pronounced dead at a local hospital at 10:08 the same day. The MO FACE investigator was notified at 11:07 a.m. the same day of the occupational fatality. The MO FACE investigator met with a company representative, and the OSHA compliance officer assigned to the incident on the morning of August 27, 1999. The crane had been dismantled and removed from the incident site and towed to a heavy equipment dealership yard. Here the crane was photographed and information about the make, model and size was obtained. The company representative was interviewed as well as individuals of the heavy equipment company who were responsible for removing and towing the crane to this site. On September 10, 1999, the MO FACE investigator met the company representatives and the OSHA investigator at the incident site. Measurements were taken from the center pin of the crane's location to the street where the materials were being off-loaded, and the weight for the load being lifted was obtained.

The employer is a crane service company who has been in business for approximately 12 years and, at the time of the incident, employed 15 employees, nine of which had the same job title as the victim. The company is a subsidiary of a steel erection firm. The company had a safety consultant and relied on the local union to provide safety training to their union machine operators. The union has a safety and health committee, and training did address the hazards associated with this incident. The company did not have written safety rules and procedures in place. This was the company's first fatality incident.

The victim was a 60-year-old certified union crane operator and was the only employee of the crane service company onsite. He was assisted by a four-man crew from the steel erection company on the day of the incident. He was a frequent employee of this company and this was the victim's first day at this site.

INVESTIGATION

The crane service company had contracted to unload and set structural steel at a warehouse construction site. The crane operator (victim) drove the crane to the site the morning of the incident, arriving at the site at approximately 6:30 a.m. The steel erector company workers met the operator there. The workers initially had some difficulty driving the crane onto the concrete slab of the warehouse due to the grade of the unfinished driveway. The crane was positioned on the slab parallel with the driveway and perpendicular to the street. The operator fully extended all four outriggers and raised the machine off of the tires. The steel building materials for the warehouse had arrived on semi-truck flatbed trailers. The trailers were positioned on the street approximately 58 feet from the center pin on the crane. The crane boom was fully extended and was equipped with a 26-foot jib extension bringing the total boom length to 106 feet. The operator was lifting the steel from the trailers and lifting it up and over a 30-foot concrete wall. The crane was ready to start unloading from the trailer by 7:30 a.m. The operator and the steelworkers started by unloading several bundles of roof decking weighing approximately 4,000 pounds. At approximately 8:00 a.m. the workers

began unloading roof joists from the trailer. The first lift was two joists bundled together weighing 3,600 and 3,800 pounds each. The crane picked the load off of the back of the crane raising it high enough to clear the 30-foot concrete wall. The crane then rotated the load to the right and to the side of the crane. At this point the crane became unstable and began tipping up onto its outriggers. According to the workers the crane tipped up onto its outriggers and returned to the ground at least twice before tipping all the way over. At some point the operator tried to escape the tipping crane but was struck and pinned beneath. Emergency services were immediately notified. The workers obtained two smaller cranes from a nearby crane service company. Using these cranes, as well as rubber inflating pillows from local EMS, the victim was removed from under the tipped crane approximately one hour later and taken to a local hospital. The victim was taken into emergency surgery where he died a short time later.

CAUSE OF DEATH

Blunt Chest Trauma

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Employers should ensure that cranes are operated within their limits of stability as determined by the manufacturer-supplied capacity charts.

Discussion: The crane in this incident was a 14.5-ton, maximum capacity crane. It was not equipped with a load moment indicator. The load being lifted consisted of the headache ball, rigging and two roof girders bundled together weighing 3,600 and 3,800 pounds each or 7,400 pounds total. The crane had been set up with all four outriggers fully extended and was lifted off of the tires. Measurements taken after the incident indicated that the crane boom was extended to 106 feet at approximately 50 degrees for swing radius of 60 feet at the time the crane tipped over. According to the manufacturer's load chart, the capacity of the crane with the boom extended 80 feet with a 26-foot boom extension, outriggers down and 100 percent extended, is 4,960 pounds over-the-rear of the crane. The capacity for over-the-side lifts with the same specifications was 4,040 pounds. In this instance the safe lifting capacity of the crane was exceeded by approximately 2,440 pounds over-the-rear and 3,360 pounds over-the-side, not including the weight of the headache ball and rigging.

Recommendation #2 Employers should ensure that the weights of objects lifted by a crane be determined by a competent person, as defined by OSHA, and the weight be posted clearly and visibly on the object prior to being lifted.

Discussion: In this instance the individual weights of the roof joists were not posted nor did the crane operator know them. Apparently the operator felt the weight of the two joists together were within the lifting capacity of the crane. Had the weights been posted or determined prior to the lift the operator could have prevented the hazardous circumstances. The manufacturer could have been contacted before the lifts began to assist in determining the weights of these joists. The weight could also have been

determined by measuring the length and thickness of the steel components of the girders and calculating the corresponding weights. In this instance the manufacturer was able to provide the weights to the employer after the incident occurred.

Recommendation #3 Employers should ensure that all cranes be equipped with load moment indicators and maintain those indicators according to the manufacturer's specifications.

Discussion: The load moment indicator monitors the cranes actual operating parameters and compares them with the crane manufacturer's recommended parameters for safe lifts as entered into the computer by the crane operator during start-up procedures. When correctly programmed, the indicator sounds an audible warning and interrupts crane control functions before the lift geometry becomes unstable. Had this crane been retrofitted with this device it would have given early warning to the operator that he was exceeding the lift capacities of the crane and would have prohibited the machine from continuing through the lift. Load moment indicators are a useful tool for prevention, though these devices should not be relied upon to replace lift preplanning and weight determination prior to the lifts. These devices should be properly maintained according to the manufacturer's specifications.

Recommendation #4: Employers should develop, implement, and enforce a comprehensive written safety program which includes, but is not limited to, strict conformance with equipment manufacturer's recommended safe operating procedures for crane set-up and lift configurations.

Discussion: The employer in this incident indicated they did not have written company safety rules and policies for the tasks performed by their employees. Employers should develop and enforce safety rules and these rules should reflect, but not be limited to OSHA, regulation 29 CFR, 1926.550, Cranes and Derricks and ANSI B30.511-1999, Safety Code for Crawler, Locomotive, and Truck Cranes. The regulation requires that the manufacturer's specifications and limitations applicable to the operation of any and all cranes and derricks be followed. The manufacturer of the crane in this incident recommends that the crane be leveled on a firm-supporting surface. Depending on the nature of the supporting surface, it may be necessary to have structural supports of sufficient strength under the outrigger floats or tires to spread the load to a larger bearing surface.

Recommendation #5: Manufacturers of steel building components should consider clearly and visibly identifying each steel building component with its corresponding weight.

Discussion: Employers should request and manufacturers should provide weight measurements of steel building components they produce. If items are bundled together (i.e. roof decking) the entire weight of the bundle, as well as the weight of the individual pieces, should be indicated as well. Doing so eliminates the need for lifting machine operators to estimate loads they might be lifting. Additionally, it can help

ensure that cranes are operated within their limits of stability as determined by the manufacturer-supplied capacity charts.

REFERENCES

Code of Federal Regulations 29 CFR 1926.550, 1997 edition. U. S. Government Printing Office, Office of the Federal Register, Washington, DC.
ANSI B30.511-1999, Safety Code for Crawler, Locomotive, and Truck Cranes, American National Standards Institute, New York, NY 10018

The Missouri Department of Health, in co-operation with the National Institute for Occupational Safety and Health (NIOSH), is conducting a research project on work-related fatalities in Missouri. The goal of this project, known as the Missouri Occupational Fatality Assessment and Control Evaluation Program (MO FACE), is to show a measurable reduction in traumatic occupational fatalities in the state of Missouri. This goal is being met by identifying causal and risk factors that contribute to work-related fatalities. Identifying these factors will enable more effective intervention strategies to be developed and implemented by employers and employees. This project does not determine fault or legal liability associated with a fatal incident or with current regulations. All MO FACE data will be reported to NIOSH for trend analysis on a national basis. This will help NIOSH provide employers with effective recommendations for injury prevention. All personal and company identifiers are removed from all reports sent to NIOSH to protect the confidentiality of those who voluntarily participate with the program.

SIGNATURES:

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MO FACE Dissemination List

NIOSH	NIOSH FACE Program
Alaska Department of Health and Social Services	AK FACE Program
California Public Health Foundation	CA FACE Program
University of Iowa	IA FACE Program
Kentucky Injury Prevention and Research Center	KY FACE Program
Massachusetts Department of Public Health	MA FACE Program
Maryland Division of Labor & Industry	MD FACE Program
Minnesota Department of Health	MN FACE Program
Nebraska Department of Labor	NE FACE Program
State of New Jersey Department of Health	NJ FACE Program
Ohio Department of Health	OH FACE Program
Oklahoma State Department of Health	OK FACE Program
Texas Worker's Compensation Commission	TX FACE Program
Washington Department of Labor & Industries	WA FACE Program
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Wyoming Department of Health
Missouri Southern State College
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St. Joseph Safety Council
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St. Louis County Medical Examiner Office
AMEC
Missouri Police Chiefs Association
Children's Mercy Hospital
St. Louis City Medical Examiner Office
St. Charles Police Department
Grundy Electric Company
Jackson County, Office of the Medical Examiner
Shelter Insurance Companies
Missouri Hospital Association
Safety Council of Greater St. Louis
MO Department of Elementary & Secondary Education
Missouri Farm Bureau
Missouri State Labor Council
Empire District Electric Company
Mine Safety and Health Administration
Safety Council of the Ozarks
Missouri Department of Mental Health
Missouri Department of Labor and Industrial Relations
Empire District Electric Company
North Central Missouri Safety Council
Safety and Health Council of Western Missouri & Kansas