TO: Director, National Institute for Occupational Safety and Health

FROM: California Fatality Assessment and Control Evaluation (FACE) Program

SUBJECT: Crane Operator Falls 30 Feet from a Crane while Working from a Freeway Overpass in California

SUMMARY
California FACE Report #95CA011

A 60-year-old male equipment operator (the victim) died after falling 30 feet from the crane he was operating on an elevated freeway. The width of the freeway where the victim was working was approximately 25 feet from concrete guardrail to concrete guardrail. Prior to the incident the victim had been using the crane to set 12" x 12" timber stringers on top of the false work on the west side of the elevated freeway. Witnesses stated that the victim had pulled in the outriggers on the east side to let a truck go by and had not extended them afterward. Co-workers stated that it was common practice for the crane operator to pull in the outriggers in order to allow trucks to go by. The victim continued to lift three more timbers and place them on the falsework on the west side of the elevated freeway. He then climbed down from the crane to meet with the foreman and a construction worker regarding the need for more timbers. After their discussion he returned to the crane and began to rotate the boom to the east side and over the rear of the crane. The boom was rotated at approximately an 80 degree angle from the horizontal position and was extended approximately 60 feet. Co-workers stated that they heard the crane making various creaking sounds at the time. One witness stated that the victim came out of the cab and shouted "get out of the way." The crane fell over quickly and the victim was thrown to the east side, struck the boom several times and then fell approximately 30 feet to the ground. The end of the boom landed on the freeway without incident. The victim was not wearing a seat belt or hard hat. The CA/FACE investigator concluded that in order to prevent similar future occurrences employers should:

· assure operators extend and set crane outriggers when the load handled exceeds the rated load (rubber chart) without the outriggers.

· require that there be a qualified signal person or oiler working with the crane operator to provide assistance to the operator.

· establish as part of their site planning a specification which does not require crane operators to retract outriggers for any type of vehicular traffic.

· require that crane operators wear seat belts at all times during operation.

In addition manufacturers and product designers should consider:

· designing cranes with control systems that prohibit or limit certain maneuvers for specific load, boom, and outrigger configurations.

INTRODUCTION

On July 11, 1995, a 60-year-old male equipment operator died after falling approximately 30 feet from the crane he was operating on an elevated freeway. The CA/FACE investigator was informed of this incident on July 12, 1995, by a California Division of Occupational Safety and Health (Cal/OSHA) safety engineer. A site visit and employer interview were conducted by the CA/FACE investigator on July 13, 1995. Photographs of the incident site were taken, although the crane and boom were no longer at the location. The CA/FACE investigator also conducted interviews with two California Department of Transportation officials who had been assigned to the site, a union representative, and a retired crane inspector. Copies of the coroner's autopsy report, the police report, the paramedic's report and the Cal/OSHA report were obtained by the CA/FACE investigator.

The employer in this incident was a heavy highway construction company which employed 400-600 workers depending on their workload. There were approximately 35 employees working at the site at the time of the incident. The victim had worked for his employer for approximately two years. A company safety representative stated that crane operators were required to have an operator certification prior to being considered for the job. This certification exam was given by the Bureau of Reclamation and the Army Corps of Engineers. A representative from the company stated that the victim did have a valid certification card at the time of the incident. In addition, foreman, supervisors and other members of the management team are required to complete one half day of training in theory, fundamental mathematics, rigging and general crane setup. The company safety manager stated that a carpenter acted as the signal person or rigger for the crane operator, but he had no documented training for that position.

The project manager was responsible for safety at the job site and devoted approximately 5% of his time to safety issues. A site survey had been conducted prior to beginning this job. A safety representative for the company stated that all employees received safety training in personal protective equipment (PPE), right to know, machinery/equipment, hazard identification, general safe work practices, and also received new employee orientation. Employees also viewed a safety video tape and were given a code of safe work practices booklet.

INVESTIGATION

On the day of the incident at approximately 1:00 p.m., the victim had been operating a 14 1/2-ton hydraulic crane, last certified on 8/29/94. He had been using the crane to set 12" x 12" timber stringers on top of the falsework on the west side of the elevated freeway. The stringers had been stockpiled on the top of the freeway adjacent to the falsework location. The crane had been facing south with the outriggers out and down on a level surface. The victim's employer stated that the victim had adjusted his position about three times as the work progressed from the north to the south. The safety manager stated that one of the carpenters acted as the signal person, but there was no documentation on the type of training this individual had for that position.

Each time the victim adjusted the crane's position he had to extend the outriggers and put them back down. The outrigger pads on the west side were approximately one foot inside the concrete guardrails (k-rails) which restricted the space available on the east side and did not allow vehicles to pass. The width of the elevated freeway was approximately 25 feet wide. The width of the crane with the outriggers fully extended was approximately 18 feet.

An apprentice carpenter who had been working approximately ten feet from the rear of the crane stated that the victim had retracted his east side outriggers to allow a truck to pass. Co-workers stated that it was a common practice for the crane operator to retract the outriggers to allow trucks to pass. After the truck went through, the victim did not re-extend the outriggers, instead placing them down in a retracted position. The victim then lifted approximately three more 12" x 12" timbers and placed them on the falsework on the west side of the elevated freeway. The last timber was too short, however, so the victim climbed down from the crane to meet with the project foreman and the apprentice carpenter. There were additional timbers located at the ground level on the east side of the elevated highway. After they met, the foreman got into his truck which was located south of the crane. He drove the truck north past the crane to the end of the elevated highway where he then proceeded down the haul road on the east side toward the work area to rig the new timber.

The apprentice carpenter stated that the victim rotated the boom from the west side over the rear of the crane. There was no load on the boom at this time other than the four part block, hook ball and a fiber sling. The boom was at approximately an 80 degree angle measured from a horizontal position and was extended out approximately 60 feet. The employer stated that the victim may not have been able to see the outriggers with the boom extended in this position. The crane was also not equipped with any internal indicators inside the cab of the crane, which would alert the operator whether or not the outriggers were extended. Co-workers stated that the crane began to make sounds which they described as "creaking","ticking or stressing," and "ticking." The victim was observed by one co-worker coming out of the door of the cab and looking around to his right, under the boom, and then back to his left. The apprentice carpenter also stated that he saw the victim stand up, step outside of the cab, and yell for help. The crane fell over very quickly after his exclamations. The victim was thrown from where he was standing on the outside of the cab towards the east side and struck the boom several times while he was falling. He fell approximately 30 feet to the ground in an area that had no vehicular traffic. The victim had not been secured by a seat belt at the time of the incident. The crane turned over but remained on the elevated freeway while the end of the boom fell onto the freeway below without further incident. City fire paramedics were summoned to the scene and upon arrival at 1:20 p.m., found the victim without a pulse or spontaneous respiration.

CAUSE OF DEATH

The Coroner's Autopsy Report stated cause of death to be craniocerebral trauma.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Employers should assure operators extend and set crane outriggers when the load handled exceeds the rated load (rubber chart) without the outriggers.

Discussion: In this incident, the outriggers had not been extended fully and set, resulting in a crane tipover and operator fatality. Under Title 8 of the CCRs section 4994(b): "Outriggers shall be used when the load to be handled at that particular radius exceeds the rated load without outriggers as given by the certified agent for the crane." It is unknown whether the operator had forgotten to extend the outriggers, had thought they were extended, or had known they were not extended and proceeded anyway. The victim had undergone extensive training in crane operations, and was certified and experienced. Periodic refresher training, visual or auditory reminders (signs, flashing lights, sirens, etc.), and progressive disciplinary actions are measures employers can use to assure full compliance with required work rules.

Recommendation #2: Employers should require that there be a qualified signal person or oiler working with the crane operator to provide assistance to the operator.

Discussion: The carpenter who acted as a signal person did not communicate to the victim that the outriggers were retracted. If the victim had been notified of the outrigger's position, he may not have made the maneuver that led to the crane tip over. Employers should insure qualifications of workers functioning as signal persons through a program of supervision and testing.

Recommendation #3: Employers should establish as part of their site planning a specification which does not require crane operators to retract outriggers for any type of vehicular traffic.

Discussion: In this incident, there were many contractors on site and work was being performed in a very congested space. Hence, it became necessary for the crane operator to retract the outriggers to allow trucks to pass by. Co-workers stated that it was common practice for this to occur. Setting up work in this manner is potentially distracting to operators and to the normal flow of work. When planning large construction projects, employers should attempt to arrange sites and work schedules so that vehicular traffic does not interfere with crane operations. This incident may have been prevented if there had been a site specification which did not require the crane operator to retract his outrigger for passing traffic.

Recommendation #4: Employers should require that crane operators wear seat belts at all times during operation.

Discussion: In this incident, the victim was not wearing a seat belt, though the crane was equipped with one. The employer also had a safety training program which specifically included seat belt training. The use of a seat belt would have kept the victim restrained and may have prevented his death. Often, there is a need for retraining and visual reminders which help operators to remember to use such equipment on a regular basis. Additionally, a strict management enforcement program, including progressive disciplinary action, should be administered when violations occur.

Recommendation #5: Manufacturers should consider designing cranes with control systems that prohibit or limit certain maneuvers for certain load/boom/outrigger configurations.
Discussion: The crane used by the decedent allowed operators to move the boom and its load at any speed and in any direction they wished, up to the physical limits of the crane, for any type of load, boom, and outrigger configuration. Although a crane may have the capacity to lift a given weight, it may roll over when moving that load, or even without any load, during certain maneuvers. Manufacturers should design systems that monitor the position of the outriggers, the weight of the load on the boom, and the position, speed and, acceleration of the load and boom. Maneuvers that would place the crane at risk for roll-over would then be limited by the system. For example, if an operator attempted to move a heavy load away from the crane by lowering the boom, the system would only allow the boom to be lowered to a given angle before it stopped.

References
Barclays Official California Code of Regulations, Vol. 9., Title 8, Industrial Relations. South San Francisco.

John Fowler
FACE Investigator

Robert Harrison, MD, MPH
FACE Project Officer

Janice Westenhouse, MPH
Research Scientist

September 25, 1996

****

FATALITY ASSESSMENT AND CONTROL EVALUATION PROGRAM

The California Department of Health Services, in cooperation with the Public Health Institute and the National Institute for Occupational Safety and Health (NIOSH), conducts investigations of work-related fatalities. The goal of this program, known as the California Fatality Assessment and Control Evaluation (CA/FACE), is to prevent fatal work injuries in the future. CA/FACE aims to achieve this goal by studying the work environment, the worker, the task the worker was performing, the tools the worker was using, the energy exchange resulting in fatal injury, and the role of management in controlling how these factors interact. NIOSH-funded, state-based FACE programs include: Alaska, California, Iowa, Kentucky, Massachusetts, Michigan, Minnesota, Nebraska, New Jersey, New York, Oklahoma, Oregon, Washington, West Virginia, and Wisconsin.

****

Additional information regarding the CA/FACE program is available from:

California FACE Program
California Department of Health Services
Occupational Health Branch
850 Marina Bay Parkway, Building P, 3rd Floor
Richmond, CA 94804