

ADMINISTRATIVE REPORT  
PUBLIC HEALTH SERVICE/CDC/NIOSH/DSR  
FACE-98-02

DATE: April 3, 1998

TO: Director, National Institute for Occupational Safety and Health

FROM: Division of Safety Research, NIOSH

SUBJECT: Truck Driver Dies After Crane Boom Strikes Truck Cab at Construction Site - Virginia

**SUMMARY**

On October 8, 1997, a 56-year-old truck driver (the victim) was crushed when a crane tipped over and the crane's boom landed on the cab of the truck in which he was sitting. The victim, who was hauling excavation material from a 16-story office building construction site, was sitting in the cab of the parked truck waiting to access the excavation site for loading. The mobile all-terrain crane had been set up in preparation for off-loading the components of a tower crane which was scheduled to arrive on site at a later time. The crane operator began to move materials and equipment to make room for off-loading the tower crane components. The crane operator had set up the crane with the left side outriggers fully extended and down, and the right side outriggers down only. The crane operator lifted an empty concrete bucket over the rear of the crane and swung the load around toward the front, over the right side. When the lift had progressed to the right front quarter of the adjacent truck, the crane operator began to lower the concrete bucket. When he did so, the crane began to tip. The operator attempted to lower the load to the ground to maintain stability but was unable to respond quickly enough. The crane tipped over and the boom struck the truck's cab directly over the driver's position. The victim was trapped and crushed in the cab. Workers on site notified 911 and rescue personnel responded immediately; however, rescue and first aid attempts were not possible due to the damage to the truck's cab and the crane's boom lying on top of the victim. The victim was recovered about 4 hours after the incident when other cranes were used to lift the boom from the truck cab. The victim was pronounced dead at the scene.

NIOSH investigators concluded that, to prevent similar incidents, employers should:

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

- ensure that crane set-ups are optimized with out-riggers fully extended when possible to provide the maximum lifting capacity.

## **INTRODUCTION**

On October 8, 1997, a 56-year-old truck driver (the victim) was crushed while sitting in the cab of his truck when a crane tipped over and the boom struck and crushed the truck's cab. On October 28, 1997, officials of the Virginia Occupational Safety and Health Administration (VOSH) notified the Division of Safety Research (DSR) of the incident and requested technical assistance. On November 17, 1997, a DSR safety engineer reviewed the case with the investigating compliance officer. On November 18, 1997, the safety engineer interviewed the secretary/treasurer for the victim's employer and the crane owner's safety director. The incident site and crane were examined and photographed.

The victim's employer was a truck rental company which had been in business for 20 years. The company owned 50 dump trucks and had 45 full-time employees. The company rented dump trucks and furnished drivers to construction companies. Trucks were also rented to municipalities and state highway departments for snow removal during the winter months. Safety meetings were held every 6 weeks and included shop talks, films, and lectures by law enforcement officers and insurance company safety consultants. These meetings dealt primarily with vehicle-related issues as the majority of the company's safety problems were traffic-related. This was the company's first fatality.

The crane was owned by a concrete construction company which had been in business for 50 years. The company employed 1,200 people engaged in concrete building construction. The company employed a full-time safety director and had a written safety policy. The crane operator had been employed for about 17 years, and had 26 years of operating experience, including 6 to 7 years operating all-terrain cranes. He had operated the crane involved in the incident for 1½ years.

## **INVESTIGATION**

On the day of the incident, the victim, along with other truck drivers, arrived at the construction site of a multi-story office building shortly before 7 a.m. and began to haul material from the building excavation site. The victim parked his truck parallel with the crane while waiting for his turn to enter the

excavation site for loading. The 50-ton all-terrain crane had been set up near the access road to the site and was preparing to off-load parts of a tower crane when it arrived on site. The crane operator had set up parallel to the access road and had fully extended the left outriggers of the crane. The right outriggers had been set without extending them because they would have blocked truck access to the excavation. This set-up was intended to be temporary until building materials and equipment could be moved to make more room for the crane. The crane operator began to clear the area by lifting an empty 4-yard concrete bucket over the rear of the crane. The operator swung the bucket over the right side of the crane, moving it between the victim's truck and another waiting in line. As he swung the crane's boom to the right, he also began to boom down to extend the swing radius for more clearance (i.e. lowered the crane boom to increase the distance between the load and the crane's center of rotation). When the bucket reached the area near the right front fender of the victim's dump truck, the operator began to lower it to the ground. The crane became unstable and started to tip toward the load. The operator attempted to correct the condition by lowering the load more quickly, but was unable to do so fast enough to regain stability, and the crane continued to tip. The crane's boom hit the truck cab directly over the driver's seat, pushing the roof onto the victim and crushing him forward in the seat. The incident was witnessed by the driver of a loaded truck exiting the excavation who called for assistance on his two-way radio. The local fire department and emergency medical service responded within a few minutes; however, the victim was pronounced dead on the scene. Rescuers lifted the crane boom from the cab and freed the victim about 4 hours after the incident.

#### **CAUSE OF DEATH**

The autopsy indicated that death was due to thoracic compression.

#### **RECOMMENDATIONS/DISCUSSIONS**

**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 50-ton, maximum capacity all-terrain crane equipped with a computerized load moment indicator. The load moment indicator monitors the actual operating parameters and compares them with the crane

manufacturer's recommended parameters for safe lifts entered in 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. The load being lifted consisted of an empty 4-yard concrete bucket and the crane's block and hook, for a total weight of 3,450 pounds. The crane had been set up with the left side outriggers fully out (100% extended) and down, while the right side outriggers remained in (0% extended) with the outrigger legs down. This set-up was due to the need to maintain clearance on the right side of the crane for double-lane truck traffic in and out of the excavation. Measurements taken after the incident showed that the crane boom had been extended to 62 feet at 42 degrees for swing radius of about 38 feet at the time the crane tipped over. According to the manufacturer's load chart, the capacity of the crane with the boom extended 60 feet, outriggers down but not extended, is 3,880 pounds at 35-foot swing radius and 2,370 pounds at 40-foot radius. With outriggers fully extended the capacities are 20,000 pounds at 35-foot swing radius and 16,150 pounds at 40-foot swing radius. It should be noted, however, that the load charts do not list a safe capacity when outriggers are fully extended on one side and not extended on the other, and the manufacturer does not recommend lifting from this type of set-up. According to the operator, the load was lifted with the boom extended to 60 feet and a swing radius of 30 feet (at which point the 0% extended load charts indicate a stable lifting capacity of 5970 pounds) and that he boomed down only a few feet for clearance around the truck. Evaluation suggests that he may not have realized how far he had boomed down since the bucket was only a few feet off the ground and the presence of the truck may have blocked his sight of the bucket. It is not known if the load moment indicator had been properly programmed or functioning correctly at the time of the incident. Apparently, no alarms sounded and the crane controls were not interrupted.

**Recommendation #2: Employers should ensure that crane set-ups are optimized with out-riggers fully extended when possible to provide the maximum lifting capacity.**

Discussion: When possible, cranes should be set up to provide the maximum lift capacity. In this incident, available clearances at the excavation site and the scheduling of concurrent work activities may have led to the crane being set up with outriggers fully extended on one side only. However, had the outriggers been fully extended on both sides, the load being lifted would have been well within the capacity listed for

the crane on the manufacturer's load charts and the crane would have been stable. Where job site access is limited, consideration should be given to alternating work schedules or short term interruption of work tasks to allow additional clearance for crane set-up.

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Fatality Assessment and Control Evaluation (FACE) Project

The National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR), performs Fatality Assessment and Control Evaluation (FACE) investigations when a participating State reports an occupational fatality and requests technical assistance. The goal of these evaluations is to prevent fatal work injuries in the future by studying the working 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.

States participating in this study: North Carolina, Pennsylvania, South Carolina, Tennessee, and Virginia.

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