The National Institute for Occupational Safety and Health (NIOSH)

Promoting productive workplaces through safety and health research

Machine Operator Electrocuted when Crane Contacts Overhead Power Line

FACE 89-10

Introduction:

The National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR), performs Fatal Accident Circumstances and Epidemiology (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.

On December 5, 1988, a 24-year-old male boring machine operator was electrocuted when the crane moving the pipe he was guiding contacted an overhead power line.

Contacts/Activities:

State officials contacted DSR about this fatality and requested technical assistance. On January 4, 1989, a research safety specialist and an occupational health nurse met with employer representatives, and photographed the incident site.

Overview of Employer's Safety Program:

The employer is a small company engaged in horizontal boring operations. The company has been in business for 7 years and employs on average 15 individuals, most of whom are boring machine operators. The company has neither a written safety policy nor standard operating procedures for any of the tasks performed by employees. All employees are trained on the job. The victim had been employed by this company as a boring machine operator for 2 years.

Synopsis of Events:

On the day of the incident a three-man crew consisting of a foreman and two boring machine operators were working at an excavation pit 7 feet deep, 5 feet wide and 34 feet long. The pit had been dug to allow a boring machine to be positioned to drill under an existing roadway. A 12,000-volt power line, suspended 20 feet above grade, was directly adjacent and parallel to the pit. The employer had made no attempt to contact the power company to have the power line de-energized or isolated. The boring machine was installed on a 30-foot-long track in the pit.

The foreman, who had been with the company 4 years, was operating the truck-mounted, 8-ton-capacity crane. He parked it perpendicular to the pit facing down a slight incline. He extended the boom to about half its length (30 feet) to pick up a 10-foot-long by 16-inch-diameter, 1/4-inch-wall steel pipe (approximate weight 1000 pounds). The crane lifted the pipe via a sling, and the two boring machine operators, standing in the pit on the track that the boring machine was mounted on, attempted to guide the pipe into position in the pit. When the pipe became lodged due to misalignment in the pit and the victim attempted to free it by pulling the pipe toward him with one hand, the boom moved slightly causing it to make momentary contact with the overhead power line. The boom, cable, and pipe became energized, and the victim was electrocuted when he formed a “path to ground” as current passed from the pipe through his hand, arm, chest, and legs. He fell clear of the pipe. (The other worker, although not directly in contact with the pipe, received an electric shock.) Cardiopulmonary resuscitation (CPR) was performed by paramedics who arrived at the scene in 10 minutes. The victim was transported by a medical helicopter but was pronounced dead on arrival at the hospital emergency room.

Cause of Death:

The medical examiner listed the cause of death as electrocution.

Recommendations/Discussion

Recommendation #1: Employers should ensure that adequate clearance is maintained between cranes and nearby overhead power lines.

Discussion: 29 CFR 1926.550(a)(15) requires that a minimum clearance of 10 feet be maintained between cranes and power lines of 50,000 volts or less. In addition, this standard calls for an observer to be posted to give warning whenever it is difficult for the operator to maintain the required clearance by visual means. None of these actions were taken in the above case.

Recommendation #2: When a job requires working in proximity to power lines, employers should ask the local electrical utility company to de-energize and ground such lines, and verify that they have, in fact, been de-energized. (29 CFR 1926.550(a)(15))

Discussion: According to the employer, the workers were aware of the presence of the power line and discussed it prior to going to the site on the day of the incident. However, they did not take any of the required precautions or attempt to contact the utility company to have the lines de-energized. Their failure to do so was a primary factor in this incident.

Recommendation #3: Non-conductive tag lines (lines used by workmen to snub or control the load) should be used to aid in guiding and stabilizing the load.

Discussion: The use of non-conductive tag lines could help prevent exposure of the worker to electrical current in the event the crane touched the power line. Although all ropes will conduct electricity, dry polypropylene rope provides better insulating properties than most other types of commercially-available rope.

Recommendation #4: Employees who work around electrical circuits and equipment should be trained in the use of cardiopulmonary resuscitation (CPR).

Discussion: CPR begun within four minutes (in accordance with American Heart Association guidelines) is more likely to be successful. To meet this criteria employees should be certified in CPR to initiate resuscitation attempts until trained medical personnel arrive. None of the workers at the site were trained in CPR and, therefore, emergency care was not initiated in a timely manner.

Recommendation #5: All employers should develop and implement a safety program to protect their employees as required by 29 CFR 1926.20.

Discussion: This employer had no formal safety program. There were no standard operating procedures for any of the tasks performed. In addition, no provision was made for any formal training or verification of the ability of employees to perform the tasks to which they were assigned. The essential reason for developing a safety program is to protect workers. A logical first step is to identify all potential hazards. One way is by analyzing the sequential steps in routine operations to identify potential hazards, and attempting to develop procedures or other control measures which effectively eliminate or reduce the hazards. This type of analysis is known as job hazard analysis. Additionally, each specific job involves hazards particular to that job or the working environment. Therefore, employers should conduct a job site survey, identifying all hazards and implementing appropriate control measures, prior to starting any job.

Although the workers in this case were aware of the overhead power line, they apparently did not understand the nature of the hazard. The presence of the power lines should have prompted the workers to consider the control options outlined in the preceding recommendations and implement appropriate protective measures.

Both job hazard analysis and pre-job survey techniques can be effectively used to train workers in hazard identification and appropriate control measures.

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