The National Institute for Occupational Safety and Health (NIOSH)

Promoting productive workplaces through safety and health research

Two Construction Workers Electrocuted When Crane Contacts One Phase of a 13.4 KV System in Tennessee

FACE 85-29

Introduction:

The National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR), is currently conducting the Fatal Accident Circumstances and Epidemiology (FACE) Project, which is focusing primarily upon selected electrical-related, excavation-related, and confined space-related fatalities. By scientifically collecting data from a sample of fatal accidents, it will be possible to identify and rank factors that influence the risk of fatal injuries for selected employees.

Contacts/Activities:

Officials of the Occupational Safety and Health Program for the State of Tennessee notified DSR concerning this fatality and requested technical assistance. This case has been included in the FACE Project. On July 8-11, 1985, the DSR research team, which consisted of a mechanical engineer and a safety specialist, met with employer representatives, conducted a site visit, interviewed comparison workers, discussed the incident with the State OSHA Compliance Officer, and photographed the accident site.

Overview of Employers Safety Program:

The victims were employed by a construction, engineering, and development firm that has been in operation for approximately 74 years. The firm competitively bids on various construction projects. The company has the capability to provide in-house architectural design or will construct according to design specifications provided by the customer. On the day of the incident, the firm employed approximately 350 workers with approximately 30 working at the accident site.

The company employs a collateral-duty safety director and utilizes payroll inserts and weekly safety meetings to promote safety awareness. Each new employee is issued a safety manual for maintenance and general construction and participates in a safety orientation program prior to their first day of work. A safety inspector, present at each job site, fills out a daily report that includes two safety related checklists. (One checklist addresses personal protective equipment, the second addresses the condition of equipment.)

Synopsis of Events:

Since February, the firm has been the general contractor responsible for the construction of a department store. At the same construction site, the city's utility company was simultaneously installing a three-phase 13.4 kV distribution line that would service an adjacent mall and the department store.

On June 26, 1985, three workers ware in the process of pouring a concrete "footer" in a drainage ditch (approximately 8 feet deep and 30 feet wide). A concrete box culvert was to be erected on the footer. A rubber-tired, rough-terrain crane supporting a two yard (capacity) steel bucket was used to supply concrete for pouring the footer. The crane operator was instructed to exercise caution when working in the vicinity of the overhead power lines in order to prevent damage to the power lines. The bottom phase of the line was 31' above the ground and was parallel to the drainage ditch (above the work area). The presence of electrical energy was never considered. Since there was no immediate need for electricity at the work site and the workmen had not been notified that the power line had been energized by the city utility, the construction workers were unaware that the power lines presented a hazard. (Officials of the firm later learned that the lines had been energized on June 19, 1985.) The process of pouring the concrete "footer" involved filling the two yard (capacity) steel bucket with concrete, raising and swinging the bucket into position, then lowering it until signaled to stop by one of the workers in the ditch. Two workers would hold the suspended bucket in position while a third worker pushed down on the bucket's door handle to dump the concrete. By approximately 3:30 p.m. the workers had successfully dumped two buckets of concrete and the crane operator had lowered a third bucket into the ditch. The crane operator then set the crane. Two workers (laborers) were holding the loaded bucket in position while the third worker (a concrete finisher) had just grasped the bucket's release handle, when the crane and power line came into contact. Upon hearing a 'loud pop' and 'crackling noises', the crane operator looked down and saw the three workers lying in the ditch. He immediately raised the bucket and swung the crane away from the overhead lines. He then entered the ditch along with other workers to render first aid to the three injured workers. CPR was administered and local ambulances were summoned.

An ambulance arrived on the scene within ten minutes and transported the workers to a local hospital where the two laborers were later pronounced dead by attending physicians. The concrete finisher, who had been wearing rubber boots, received severe electrical burns to his right hand, which was in contact with the bucket's release handle, and to his right foot. Eyewitness accounts state arcing was visible between the crane boom and the bottom phase of the distribution line. Photographs taken by state OSHA officials revealed corresponding burn marks on a metal plate covering the end of the crane boom and on the bottom phase of the distribution line. This suggests momentary contact could have been made and that arcing was initiated when contact of the surfaces was broken. It is possible that the excessive weight of the loaded bucket may have momentarily pulled the extended crane boom into the power line, when the downward momentum of the bucket was halted by the crane operator.

Recommendations/Discussion:

Recommendation #1: Employers should enforce existing regulations -concerning crane operations in the vicinity of overhead power lines.

Discussion: OSHA standards 1926.550(a)(15) and 1910.180(j) require that the minimum clearance between electrical lines rated 50 kV or below and any part of the crane or load shall be ten feet, unless the electrical lines have been "de-energized and visibly grounded" at the point of work or physical contact between the lines, equipment, or machines is "prevented" by the erection of insulating barriers, which cannot be part of the crane. Standard 29 CFR 1926.550(a)(15)(iv) requires that a person be designated to observe clearance of the equipment and to give timely warning for "all" operations where it is difficult for the operator to maintain desired clearances by visual means. Additionally, 1926.550(a)(15)(vi) requires that any overhead line shall be considered to be an energized line unless and until the person owning such line or the electrical utility authorities indicate that it is not an energized line and it has been visibly grounded. The accident may have been prevented had these requirements been satisfied.

Recommendation #2: Utilities should notify property owners or contractors, who may be affected by the energization of a newly installed distribution system, that the system has been energized.

Discussion: This incident occurred because crane-related operations were being performed too close to overhead power lines. However, it is unlikely that these workers would have attempted to perform this work in close proximity to overhead power lines had they known the lines were energized. Utilities should notify property owners or contractors, whose safety might be endangered, before energizing power lines (particularly newly installed distribution systems).

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