The National Institute for Occupational Safety and Health (NIOSH)

Promoting productive workplaces through safety and health research

Two Pipefitters Electrocuted

FACE 88-22

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 March 26, 1988, a 51-year-old male pipefitter/welder and a 36-year-old male pipe welder died when a crane they were using to move a metal building contacted an energized overhead power line.

Contacts/Activities:

State Occupational Safety and Health Administration officials notified the National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR) of this fatality and requested technical assistance. On March 27, 1988 a research safety specialist met with state officials and company officials. Witnesses to the incident were interviewed and the incident site was photographed.

Overview of Employer's Safety Program:

The victim's employer was a plumbing/pipefitting contractor with 32 employees. Although the employer has been in business for 9 years, the company has no formal safety program. Instead, the employer relies upon the large corporations for which they work to provide safety training for employees. The employer had never before had a serious incident.

Synopsis of Events:

On the day of the incident, a five man crew was working at a large multi-national chemical corporation plant. The crew was using a rented 58-foot, 7 1/2 ton crane to move various tanks and other equipment within the chemical company compound. The victims were new employees, having only worked for the employer for 4 days. The other three crew members all had several years of experience with the employer and had worked at the chemical plant numerous times in the past. Because they had previously worked at this plant, the experienced men were all familiar with the overhead power lines in the area where they were working.

At the time of the incident the crew was moving a 30 foot by 10 foot by 8 foot high welding shed. This shed consisted of a pipe and angle iron frame supporting a corrugated metal roof. The structure was open, with welding “tarps” forming the sides of the building. Just prior to the incident, the building had been moved approximately 100 feet to its location beneath the power lines.

The building had been set down in a north-south orientation; the final position was to be east-west. Placing the structure in an east-west orientation required lifting the building and then rotating it manually. A 12.4-kilovolt (kV), three-phase power line was suspended 27 feet above the ground at this point, with a ground wire and a telephone wire suspended 16 1/2 feet below the energized power lines. Approximately 20 feet behind these lines ran an additional series of utility poles containing numerous service lines.

To prepare for the final lift, the building was disconnected from the crane, the boom on the crane was extended between the ground/telephone wires and the power lines, and one member of the crew climbed onto the roof of the shed to reconnect the crane’s hoist cable to the chains being used to lift the building. At this time, the distance between the end of the crane’s boom and the “ball” on the hoist cable at the top of the hook was approximately 8 feet.

The crew then took up positions for turning the building 90 degrees, with the foreman at the northeast corner, one worker (victim) at the southeast corner, another worker (victim) at the southwest corner, and a third worker on the west side approximately 5 feet north of the southwest corner. The foreman and the victims were holding the steel pipes forming the corners, while the worker on the west side was grasping a piece of 6 inch angle iron which served as a lower brace for the building.

The foreman was holding the corner post through the “tarp”, which he had pulled back for visibility. He was wearing work boots with thick rubber soles and was standing on asphalt. One of the two victims was wearing cloth work gloves, while the other had unprotected hands. Both victims were wearing neoprene soled work boots and were standing in grass. The worker at the side of the building was wearing leather gloves and work boots with thick rubber soles, and was standing on asphalt. The crane operator, another pipefitter, was standing on the control platform near the front of the crane.

When the foreman gave the order to lift the building, the crane operator elevated the boom instead of operating the winch. The building rose approximately 4 feet and the boom contacted an energized overhead line, establishing a “path to ground” (7200 volts phase to ground). The foreman felt a “tingling” and saw the victims “smoking.” He cried out to the crane operator who began to retract the boom. By this time, the overhead line had burned in half and fallen to the ground.

The victims collapsed to the ground. Both men suffered extensive burns. Chemical company personnel attempted to revive the victims by administering cardiopulmonary resuscitation (CPR), but were unsuccessful.

The worker standing at the side of the building suffered a dime sized burn on the middle finger of his left hand (through his leather work glove) and numerous burns on the outside of his right foot (through a heavy white work sock and the leather uppers of his boot). He was released from the hospital 2 days after the incident, still experiencing some problems with cardiac arrhythmia.

The foreman and the crane operator were uninjured.

Cause of Death:

The medical examiner’s report specified electrocution as the cause of death for both victims.

Recommendations/Discussion

Recommendation #1: Cranes and other boomed vehicles should not be operated in the proximity of energized power lines.

Discussion: 29 CFR 1926.550 (a)(15)(i) prohibits the operation of cranes within 10 feet of energized power lines of less than 50 kV. Had this requirement been followed, this incident would not have occurred.

Recommendation #2: Only trained and experienced operators should be permitted to operate powered equipment.

Discussion: The operator in this incident was a pipefitter and had no formal training in the operation of cranes. A more experienced operator could possibly have foreseen the danger posed by the lines and may have used different techniques to move the building. For example, in the above case the building could have been moved into the required position with the boom of the crane actually below the telephone/ground line. Training for operators of all types of equipment is required by 29 CFR 1926.20 (b)(4). If this training had been given, this fatality might not have occurred.

Recommendation #3: Employers should ensure that their employees receive training addressing the hazards in their work environments, and that these employees fully understand the potential consequences of underestimating or otherwise failing to control such hazards.

Discussion: This employer had no formal safety program. Instead, employees were expected to abide by the programs in place at the various facilities where they were performing their jobs. The employer's responsibility in this area is clearly defined in 29 CFR 1926.21(b)(2).

Recommendation #4: 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. (See 29 CFR 1926.550(a)(15)).

Discussion: Moving the shed required working near the power lines, however, the lines were not de-energized. The employees working in the area, while aware of the presence of the lines, were unaware of the danger they posed. In interviews after the incident one of the surviving workers said they "knew it was a ground wire because it was not insulated." In actuality, all of the wires on the pole, both "ground" and "live" were uninsulated, as are most high voltage lines.

Return to In-house FACE reports

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