



The National Institute for Occupational Safety and Health (NIOSH)

Promoting productive workplaces
through safety and health research



Iron Worker Electrocuted in Indiana

FACE 85-47

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 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.

An apprentice ironworker was being transported in a truck-mounted aerial bucket from his 65 foot high workstation to the floor. As the aerial bucket retracted, the victim reached out to push away a ceiling light. The light fixture provided a path to ground and the worker was electrocuted. The source of electricity apparently was a short located at a receptacle in the aerial bucket.

Contacts/Activities:

Officials of the Indiana Occupational Safety and Health Administration (IOSHA) notified DSR concerning this fatality and requested technical assistance. This case has been included in the FACE Project. During the week of September 9, 1985, a safety specialist from DSR met with representatives of IOSHA, witnesses, employer representatives, contractor representatives, and the coroner's office. As part of this field evaluation, the evaluator conducted a site visit, interviewed comparison workers, and discussed the incident with the next of kin.

Overview of Employer's Safety Program:

The company was founded in 1961 as a general contractor of commercial, industrial, and institutional construction. Employment levels vary from as many as sixty during peak periods to as few as fifteen during slower periods. The contractor had no recordable injuries in 1985 and had only one lost time injury during the past three years. The job supervisor provides job progress reports to the president of the company. In addition to scheduling and cost, injuries are part of this report. The president of the company was aware that IOSHA provides free consultative services, but the contractor has not used this service.

The company provides each new employee with a sixteen-page safety booklet. Some of the topics covered in the safety booklet are housekeeping, personal protection, hand tools, machinery and equipment, electricity, and cranes and hoisting equipment. Because most iron workers are hired from the union hall, very little training is provided by the contractor. The

contractor provides goggles and safety belts. The workers provide all other protective equipment including boots, gloves, and helmets. The workers also provide non-powered hand tools. The employer does not approve or check the equipment furnished by the union workers.

Synopsis of Events:

On July 21, 1985, the 18-year-old victim was hired as an apprentice ironworker. He was assigned to work with his father, the job supervisor. In the six weeks the victim worked as an apprentice ironworker he received no formal training. He was scheduled to enroll in a union-sponsored three year ironworker training program in October, 1985. On September 4, 1985, the victim reported to work at 7:00 a.m. On this job he was working with four journeyman ironworkers. At the time of the incident the workers were installing a vertical wind screen (20') in the gable end of an airport hanger (65' high). The job was approximately 40% completed. The twenty gage sheet metal used to construct the screen was 3 feet by 30 feet and weighed 200 pounds. An iron worker on the ground would cut the sheets in half and would hoist the sheet (using a rope and pulley) up to the work crews. Two two-man crews would screw the sheet metal to the metal roof trusses. One crew, which consisted of the victim and a journeyman ironworker, worked from a two-point suspended scaffold. The second crew, which consisted of two journeymen iron workers, worked out of a truck-mounted aerial bucket. This aerial bucket was not designed for use around electrical power lines and had caution labels attached to the boom and the truck.

At 2:00 p.m. the workers began to take a 15 minute work break. As was customary for the past three weeks, the operator of the aerial bucket would swing over to the scaffold, take the two workers on board, and all four workers would be lowered to the ground. As the aerial bucket was descending through the roof trusses, it approached a metal light fixture dangling from the roof. The light was attached to the ceiling by a twenty foot long linked chain. To prevent the aerial bucket from striking the metal light shade, the victim reached out and grabbed the chain. When the victim grabbed the chain, he was electrocuted. A co-worker pulled the victim away from the chain and the victim slumped to the floor of the aerial bucket.

The operator lowered the aerial bucket to the floor and the victim was removed. While the father administered CPR, other workers summoned medical assistance. The EMS arrived within five minutes and transported the victim to a hospital where he was pronounced dead on arrival.

The electrical equipment being used by the contractor was generally in poor condition. Extension cords had poor splices, no grounds, and reversed polarity. One of the two hand drills being used was not grounded and the other drill did not have a safety plate. The receptacle in the aerial bucket had reversed polarity. Additionally, this receptacle had the cover removed. Electricians, who evaluated the accident scene shortly after the accident, stated that the light fixture and chain served as a path to ground and that there was no power to the fixture at the time of the accident. (The circuit breaker would not remain on for more than 10 seconds because of a short in the secondary of the ballast.) The large number of deviations from good electrical practices makes it difficult to determine the precise cause of the short at the receptacle. However, insurance investigators stated that the short could have resulted from contact between the hot lead of the drill and a screw that protruded from the receptacle. Although re-creating a short similar to this was difficult, it was done by evaluators at the scene of the accident and could have resulted from the crowded conditions in the aerial bucket at the time of the accident. Due to the large amount of electrical hazards cited, several other scenarios could also have resulted in creating the short.

Cause of Death:

According to preliminary medical reports, the immediate cause of death was cardiac arrest due to electrocution, as a result of contact with 110 volts.

Recommendations:

Recommendation #1: The employer should enforce existing regulations concerning the use of electrical equipment.

Discussion: Existing OSHA construction standards (1926.400(h)) requires that employees on construction sites be protected by ground-fault circuit interrupters (GFCI) or have an assured equipment grounding conductor program. This requirement includes tools, extension cords, receptacles that are not a part of the permanent wiring of the building, and other equipment connected by cord and plug that is available for use by employees. This would include the receptacle in the aerial bucket. The receptacle in question was not protected by a GFCI and the employer did not have an assured equipment grounding conductor program.

Recommendation #2: Field modification of equipment should be performed by a competent person and all recognized electrical hazards should be corrected.

Discussion: The plug on the electric screw driver was not making a good contact with the receptacle in the aerial bucket. As a result of the poor contact, the job supervisor removed the thick receptacle cover and replaced it with a thin cork cover. A protruding metal screw securing the cork cover created a hazard when coupled with the electric screw driver plug that did not have a safety plate.

Recommendation #3: Electrical equipment should be maintained in proper working condition.

Discussion: The large amounts of faulty electrical equipment that were being used by the employees made it only a matter of time before an accident occurred. Electrical equipment should periodically be inspected and maintained as necessary.

Recommendation #4: Electrical faults should be corrected immediately.

Discussion: The electrical light fixture had been identified as being faulty for at least five months before the accident. The 20 amp breaker serving the light fixture would not remain on more than ten seconds. Electrical equipment that is not functioning properly should be immediately repaired or replaced.

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