TO: Division of Safety Research
National Institute for Occupational Safety and Health
Morgantown, West Virginia 26505

FROM: Fatal Accident Circumstances and Epidemiology (FACE) Project
New Jersey Department of Health (NJDOH)

SUBJECT: Face Investigation #NJ9106
Electrician's Helper Electrocuted After Contacting 480 Volt Bus Wires for an Overhead Crane

DATE: October 25, 1991

SUMMARY

On June 17, 1991, a 21-year-old electrician's helper was electrocuted after contacting the exposed 480 volt bus wires that supply power to a movable overhead crane. The incident occurred while the worker was running cables for surveillance cameras at a factory which produces foundry equipment. While a co-worker was passing the coaxial cables over an I-beam supporting the bus wires, the victim contacted the energized wires and was electrocuted. NJDOH FACE investigators concluded that, in order to prevent similar incidents in the future, the following safety guidelines should be followed:

o Employers must insure that employees de-energize electrical systems prior to any work being performed near them. Employers should also insure that employees implement lockout/tagout procedures and test the system to verify that it has been de-energized before beginning work.

o Employers should provide and enforce the use of personal protective equipment to protect employees from electrical hazards. Guarding and shielding should also be used to prevent contact with energized conductors.

o Employers should develop, implement, and enforce a comprehensive safety program which includes worker training in avoiding electrical and other safety hazards.

o Employers of electrical workers should insure that all workers are trained in basic cardio-pulmonary resuscitation (CPR).

INTRODUCTION

On June 18, 1991, NJDOH FACE personnel were notified by the area OSHA office of a work-related electrocution that occurred the previous day. On the same day, a FACE investigator visited the site with an OSHA compliance officer to interview the factory manager and photograph the scene. Other information was derived from the employer and co-worker, the OSHA compliance officer, police report, and medical examiner's report.

The employer is a small electrical contractor who has been in business since 1970. The company employed 4 people at the time of the incident, including the owner, two electrical helpers, and an office worker. The victim was a 21-year-old male who had been employed by the company for eight months. He had completed his apprenticeship and had previous experience as an electrician's helper.

INVESTIGATION

The incident occurred inside a large factory that manufactures heavy equipment for foundries. The factory had hired the electrical contractor to install video surveillance cameras in different areas of the plant. On the day of the incident, the first day of the contracted work at the factory, the owner of the contracting company walked with his two helpers (the victim and his co-worker) through the plant to explain the job. The owner states that he does this at each job in order to point out the locations of important equipment (such as breaker boxes) and to identify any safety hazards. During the walk he showed his helpers the bus wires for the overhead cranes, explaining that the wire voltage was 480 volts and that they should be careful with them. After walking through the job, he left them to do the work.

The job required the victim and his co-worker to wire coaxial cable (the cable that carries the video signal) over and around the ceiling supports of the factory. To reach the ceiling, the factory provided a "scissor lift", an electrically driven lift that vertically raises a large platform equipped with a safety railing. The workers would raise the platform, pull the cables over the supports, and move the lift forward as needed. The job also required wiring the cables over three overhead cranes. These cranes are designed to move approximately 15 feet overhead along rails, drawing power from the exposed three-phase 480 volt bus wire system. As the crane moves forward, brushes on the crane make contact with the exposed wires, supplying power to the crane. The bus wires are mounted to the side of a large steel I-beam that also serves to support the crane.

Throughout the day, the two electrical helpers labored to wire over the supports and overhead cranes. When they reached the first two cranes, they ran the cables over the energized bus bars without incident. At about 4:30 p.m., they reached the third crane and positioned the scissor lift directly under the I-beam supporting the bus wires. After raising the lift up to the I-beam, the helpers stood at opposite ends of the lift platform to wire over the beam. As they ran the cables, the victim warned his co-worker about the 480 volts they were working near. Due to the differing heights of the roof on each side of the beam, the two were unable to see each other as they worked (see attached diagram). The co-worker stated that he was attempting to pass the cables over the I-beam to the victim when he heard a bang (the bang was apparently caused by the victim contacting the bus wires). The co-worker then called to the victim two or three times before he saw him fall flat on his back onto the lift platform. At this point the lift was lowered and the emergency medical service (EMS) was notified. The police arrived a few minutes later and attended to the victim with the assistance of factory first-aid personnel. The victim, who was breathing and had a weak pulse, went into cardiac arrest at the scene. The police immediately began CPR on the victim until the EMS arrived. The EMS continued CPR and transported the victim to the local hospital emergency room where he was declared dead.

Due to the differing heights of the roof, it appears that the victim apparently climbed onto the safety railing of the platform in order to reach

over the I-beam. Burn marks on his chest and elbow indicate that he may have leaned or fell onto the bus wires while reaching for the coaxial cables.

CAUSE OF DEATH

The cause of death was attributed to electrocution. The medical examiner's report stated that there were electrical burns on the chest and right elbow of the victim's body.

RECOMMENDATIONS AND DISCUSSION

Recommendation #1: Employers must insure that employees de-energize electrical systems prior to any work being performed near them. Employers should also insure that employees implement lockout/tagout procedures and test the system to verify that it has been de-energized before beginning work.

Discussion: In this incident, the helper was electrocuted after taking the unnecessary risk of working near energized wires. This is a violation of the federal OSHA standard 29 CFR 1926.416(a)(1) which prohibits employees from working in the proximity of energized power circuits unless the circuit is de-energized or guarded. It is imperative that employers identify all potential electrical hazards and, if possible, de-energize circuits before working on or near them. After de-energizing, a lockout/tagout procedure should be used by the workers to insure that electrical systems are not inadvertently re-energized while working on it. Finally, all circuits should be tested to verify that they are de-energized.

Recommendation #2: Employers should provide and enforce the use of personal protective equipment to protect employees from electrical hazards. Guarding and shielding should also be used to prevent contact with energized conductors.

Discussion: In this case, the helpers were not issued or used any type of electrical personal protective equipment (PPE). In situations where workers may potentially come in contact with energized conductors, the employer should require the use of PPE such as insulating gloves, aprons, and sleeves.

Guarding and shielding equipment (such as insulating blankets and line hoses) may also prevent inadvertent contact with energized circuits.

Recommendation #3: Employers should develop, implement, and enforce a comprehensive safety program which includes worker training in avoiding electrical and other safety hazards.

Discussion: Although the cranes had been identified as a hazard, it appears that the helpers become complacent after wiring over the first two cranes, leading them to become careless with the third. In addition, it appears that the victim misused the lift by climbing up onto the safety railings in order to reach over the beam. The employer should institute a comprehensive safety training program in order to reinforce proper work practices. This program should also include training for the proper use of special equipment, such as the scissor lift which was provided by the site owner.

Recommendation #4: Employers of electrical workers should insure that all workers are trained in basic cardio-pulmonary resuscitation (CPR).

Discussion: One of the most dangerous effects of electric shock is disruption of the natural heart rhythms which may lead to cardiac arrest and death. It is generally recommended that the employers of electrical workers should train their employees in CPR. The timely use of CPR is the only effective first-aid treatment for cardiac and respiratory arrest pending the arrival of advanced life-support personnel.

REFERENCES

Code of Federal Regulations 29 CFR 1926, 1989 edition. U.S. Government Printing Office, Office of the Federal Register, Washington DC. pg 162

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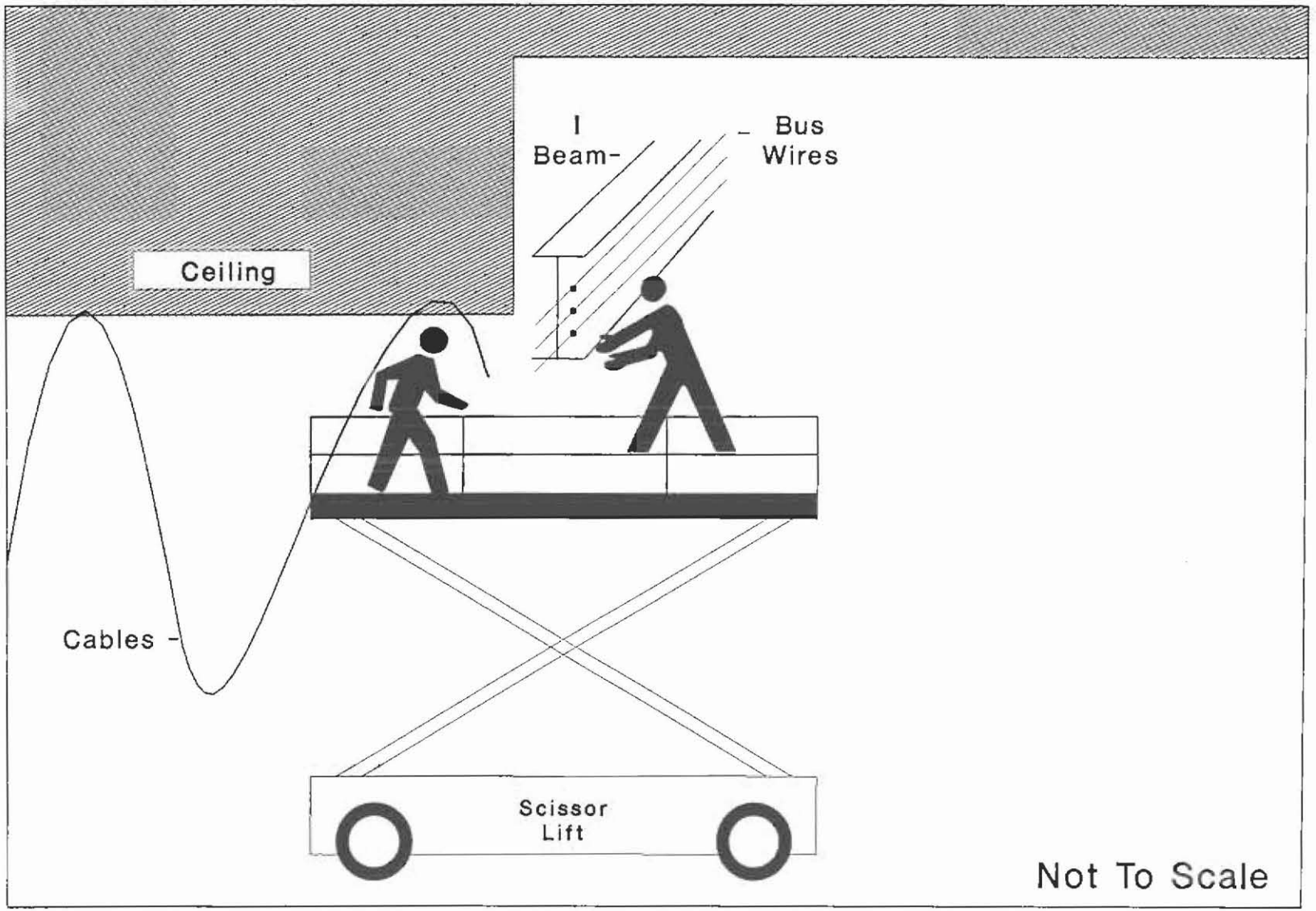

FATAL ACCIDENT CIRCUMSTANCES AND EPIDEMIOLOGY (FACE) PROJECT

Staff members of the FACE project of the New Jersey Department of Health, Occupational Health Service, perform FACE investigations when there is a work-related fatal fall or electrocution reported. The goal of these investigations 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.

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