The National Institute for Occupational Safety and Health (NIOSH)

Promoting productive workplaces through safety and health research

Maintenance Supervisor Electrocuted

FACE 88-11

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 February 25, 1988, a 33-year-old male maintenance supervisor was fatally injured when he inadvertently contacted an energized conductor (22,000 volts) in a high-voltage control cabinet. On February 28, 1988, state Occupational Safety and Health Administration officials notified NIOSH of this fatality and requested technical assistance.

Contacts/Activities:

On March 17, 1988, NIOSH met with a representative of the employer, discussed the incident with the OSHA compliance officer, photographed the incident site, and interviewed a paramedic and a witness who were at the scene of the incident.

Overview of Employer's Safety Program:

The victim's employer has 50 employees. The company, which has been in operation for 9 years, uses laser equipment for precision cutting, drilling, and welding. Safety orientation is provided to new employees, but a written comprehensive safety program does not exist. In 1986, the victim received safety training from the laser manufacturer, including instruction in high-voltage safety procedures.

Synopsis of Events:

On the afternoon of February 25, 1988, a laser operator reported an electrical output problem with the laser he was using. The problem was referred to the maintenance supervisor (the victim) . The victim and his assistant arrived at the work area and told the operator to stop the operation, but not to shut down (de-energize) the equipment. The victim stated that the problem would be visible once he opened the high-voltage control cabinet. The high-voltage cabinet contains rectifiers, step-up transformers, capacitors, and other equipment that converts alternating current (AC) into direct current (DC), and increases voltage to supply 22,000 volts to the ultraviolet laser. The assistant questioned the victim about safety

procedures to be used in opening the cabinet. With the laser, the manufacturer had included an 11-step safety procedure calling for de-energizing the cabinet prior to performing repairs. Although the victim had received specific training from the manufacturer on the procedure, he failed to follow these guidelines.

The victim opened the cabinet door and slid out a drawer containing conductors. The drawer was designed to be held in place by four screws and a cover panel, also held in place by four screws. An installed safety device (interlock) was designed to automatically de-energize the equipment when the screws and cover panel were removed. However, the screws and cover panel had been previously removed and the safety device had been made inoperable during previous maintenance work. As a result, the victim was exposed to energized conductors in the open drawer.

The victim removed a metal precision screwdriver from his pocket to point out the problem area to the assistant. As he pointed, he inadvertently contacted an energized conductor with the screwdriver and created a path to ground for the electrical current. The current entered the victim's right thumb and index finger, passed through his chest, and exited through his left foot. The victim suffered cardiac arrest due to electrocution, and fell to the floor.

A local emergency medical service (EMS) was notified. In the interim, an employee who worked for another company in the same building, administered cardiopulmonary resuscitation (CPR). When the EMS personnel arrived 6 minutes after being called, they found the victim unresponsive, and without a pulse. Basic life support was started, defibrillation was attempted, and the victim was transported to the hospital (5 minutes driving distance) where he was later pronounced dead.

Cause of Death:

The coroner reported the cause of death as electrocution.

Recommendations/Discussion

Recommendation #1: Employers should require that employees follow standard written operating procedures, particularly procedures provided by manufacturers of potentially dangerous equipment.

Discussion: The danger of high-voltage equipment appears to be obvious; the high-voltage control cabinet had signs mounted which included the following phrase: "WARNING! HIGH VOLTAGE – DANGER TO LIFE." Additionally, the manufacturer of the high-voltage laser equipment had provided an 11-step safety procedure, including steps to de-energize the control cabinet when access to the high-voltage control cabinet was necessary. Although the victim had received instructions on the safety procedure from the manufacturer, he failed to follow the procedures. This suggests that passive communication of hazard awareness and safe operating procedures may be ineffective. Management's commitment to safety should include, but not be limited to, a written comprehensive safety program which is instituted, practiced, and enforced.

Recommendation #2: Electrical safety devices should never be altered.

Discussion: An internal safety device securing the drawer containing the energized conductors had been altered and made ineffective prior to the victim's entry. Employers should provide electrical maintenance personnel with instruction in the location, operation, and purpose of all interlock safety devices. This training should emphasize that these devices should not be removed nor altered in any way because they are designed to passively protect workers from the release of hazardous energy. Workers may be tempted to remove or bypass any equipment perceived as non-functional or inconvenient unless management adopts a policy of explaining and enforcing strict adherence to written safety procedures. An inspection/repair program should be instituted by the employer to identify and correct any other safety hazards within the company.

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