The National Institute for Occupational Safety and Health (NIOSH)

Promoting productive workplaces through safety and health research

Steelworker Electrocuted when He Contacts Fan with Damaged Power Cord

FACE 89-01

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 those 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 September 30, 1988, a 33-year-old male lead steel mill adjuster was electrocuted when he contacted a ventilation fan with a damaged power cord.

Contacts/Activities:

Officials of the state Occupational Safety and Health Program notified DSR of this fatality and requested technical assistance. On October 13, 1988, a DSR safety specialist conducted a site evaluation, interviewed company officials, and photographed the incident site.

Overview of Employer's Safety Program:

The facility at which the incident occurred was a steel manufacturing plant employing 534 workers. The plant has a comprehensive safety program and a written safety policy. Training for all work-related tasks is on the job.

Synopsis of Events:

On the day of the incident the victim, a lead steel mill adjuster, had just finished adjusting the shear machine. (The shear machine cuts the finished steel product to size and had been adjusted to change the length of the finished product.) The victim then walked toward an enclosed pulpit located adjacent to the shear machine and approximately 6 feet above floor level. An operator monitored the shear machine controls that were housed inside the pulpit. The victim walked around the back side of the pulpit on a metal grid walkway, acknowledged the pulpit operator, and then descended metal steps to the floor in front of the pulpit.

A large steel-based, 480-volt ventilation fan (5 feet high) was located on the floor 1-1/2 feet from the handrails for the stairs. Four metal hooks had been attached to the wire-mesh front cover of the fan. Samples of the steel were hung from these hooks to cool.

When the pulpit operator looked toward the fan he noticed the victim standing immediately in front of the fan with a startled look on his face. The pulpit operator thought the victim was joking, but when he looked over a short time later and noticed the victim in the same position he realized the victim was in trouble. The pulpit operator immediately ran to the rear of the pulpit and opened (de-energized) the circuit for the fan.

The victim seemed unconscious but was still in a standing position. The pulpit operator, thinking the fan was still energized, pulled on the power cord and ripped it from the entrance box on the fan. The victim then fell to the ground. The pulpit operator later stated that he had contacted the victim while pulling on the power cord but had not received a shock. It is possible that the victim's clothing had caught on one of the metal hooks, momentarily holding the victim in an upright position.

Cardiopulmonary resuscitation (CPR) was begun immediately by the pulpit operator and continued until the emergency medical service personnel arrived. The victim was transported to the local hospital where he was pronounced dead on arrival.

An inspection revealed that the power cord of the fan was underneath, and had been damaged by the steel base of the fan. The damaged insulation on the conductors allowed the bare conductors to contact the steel base of the fan, energizing the entire frame. Also, when the electrical system for this part of the steel mill had been installed, a continuous ground connection was not established. The fault current present on the frame of the fan had no path to ground until the victim leaned against the fan and simultaneously contacted the handrails for the metal steps which were at ground potential. The current could then pass through the victim down the handrail to ground, causing the victim's electrocution.

Cause of Death:

The county coroner listed accidental electrocution as the cause of death.

Recommendations/Discussion

Recommendation #1: Electrical systems should be installed in accordance with existing applicable articles of the National Electrical Code.

Discussion: Article 250-5(b)(2) states that alternating current circuits and systems of 50 to 1,000 volts shall be grounded. Because of the improper installation of the receptacles, a continuous ground path for this system was not in place. If this system had been installed in compliance with the National Electrical Code, this fatality may not have occurred.

Recommendation #2: Employers should initiate preventive maintenance programs for electrical systems in their facilities and ensure the implementation of these programs.

Discussion: Employers should inititate preventive maintenance programs including inspections of the electrical systems by a qualified electrician. These inspections should include, but not be limited to:

1) testing of the system components to ensure electrical continuity (i.e., proper wiring) and proper grounding

2) visual inspection of cord and plug-connected equipment for physical damage to components

3) visual inspection of machinery to ensure that all live conductors are properly guarded.

These inspections should be documented and any identified problems or hazards should be immediately corrected. Also, all workers should be instructed to visually inspect their work areas for possible hazards on a daily basis. A visible inspection in this instance may have identified the damaged cord, thus reducing the possibility of a serious electrical incident.

Since the incident, the employer has corrected the electrical system in the plant addition. Additionally, new power cords have been installed on the cord and plug equipment in the entire plant in an effort to eliminate excess slack in the cords. This reduces the chance that the power cords would be caught underneath portable equipment and damaged.

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Last Reviewed: November 18, 2015