The National Institute for Occupational Safety and Health (NIOSH)

Promoting productive workplaces through safety and health research

Laborer Electrocuted in Ohio

FACE 87-22

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. The purpose of the FACE program is to identify and rank factors that influence the risk of fatal injuries for selected employees.

On November 14, 1986, a laborer was electrocuted while attempting to repair and install a faulty, eight foot long fluorescent light fixture.

Contacts/Activities:

Officials of the Industrial Commission of Ohio notified DSR concerning this fatality and requested technical assistance. This case has been included in the FACE Project. On January 21, 1987, a DSR safety specialist conducted a site visit, met with employer representatives, and interviewed comparison workers. The incident was discussed with members of the Industrial Commission of Ohio and the county coroner's office. The Industrial Commission of Ohio provided photographic documentation of the accident site.

Overview of Employer's Safety Program:

The victim was employed in a facility that housed two completely independent shops that have operated under the same management for 28 years. The victim was one of three men employed at a custom mold making shop that produced steel molds for thermoplastic material. The adjoining shop utilized these molds to produce thermoplastic products.

No written safety policy or safety program existed at either operation. The president of the operations managed the safety function on a collateral-duty basis. The victim was a mold maker apprentice enrolled in a four-year apprenticeship program governed by the State of Ohio. This training program consisted of 8000 hours of on-the-job training and four hours of schooling, one day a week. The victim had just begun his third year in the program.

Synopsis of Events:

On the day of the incident, production at the facility was slow. The foreman instructed a group of men to install a used eight foot fluorescent light fixture on the facility ceiling above two metal lathes. The light fixture was to be suspended approximately two feet below the 14 foot ceiling with two sections of furnace chain. The workers were going to cut the chains to the proper length once the fixture was permanently installed. The excess chain was draped, over the pipes of the sprinkler system, which were located below the ceiling. A co-worker lifted one end of the fixture while standing on a forklift platform and the victim lifted the other end of the fixture into place while standing on a two and a half foot tall metal stool. After the light fixture was secured, it was plugged into a 110 volt receptacle on the ceiling. The facility had a two-wire electrical system that provided no grounding protection for the receptacle. Additionally, the ground prong on the light cord had been removed. When the light fixture was energized, an orange glow was visible at the ends of the fluorescent bulbs. The workers noticed the orange glow, unplugged the fixture, and lowered it to check the wiring for a short.

The workers did not summon the employee that normally performed electrical work for both shops, because they did not feel that a serious problem existed. The fixture was raised back to the ceiling and plugged in again. The same orange glow appeared. This procedure was repeated several times. The men decided to check the light one final time. The light was unplugged, lowered, and laid upside down. Then, using an extension cord, the fixture was plugged into a 110 volt receptacle in an adjacent room. The bulbs lit properly. Without unplugging the fixture the victim turned the fixture over, held it under his arm, and began to climb the stool. Co-workers heard a scream and saw the victim fall to the floor. The co-worker, who had his arms resting on the pipes of the sprinkler system, was knocked backward by the electric current that traveled up the lengths of chain and through the pipes.

Cardiopulmonary resuscitation (CPR) was begun immediately by the co-workers. The rescue squad was summoned and arrived within ten minutes. After advanced cardiac life support procedures were performed at the scene, the victim was transported to a local hospital where he was later pronounced dead.

Investigations conducted by the Industrial Commission of Ohio, Division of Safety and Hygiene, and NIOSH discovered factors that may have contributed to the severity of this incident. A short existed in the internal wiring of the light fixture (possibly a bare conductor in contact with the fixture frame). Reverse polarity existed in the receptacle into which the fixture was plugged at the time of the incident. Jolting the light fixture by laying it upside down cleared the short and allowed the bulbs to light properly. When the victim held the light fixture under his arm and began to climb the stool (again jolting the fixture) the short reappeared, energizing the light fixture, and causing the victim’s electrocution.

Cause of Death:

The coroner’s office determined the cause of death to be electrocution.

Recommendations/Discussion:

Recommendation #1: Industrial electrical systems should be periodically inspected and upgraded to comply with applicable sections of the National Electrical Code.

Discussion: The electrical system in this facility did not adhere to several articles of the National Electrical Code (i.e., Article 100, reverse polarity; Article 250-24(b), ungrounded systems; Article 250-81, bonding jumpers; Article 252-92(a), grounding electrode systems; Article 410-180, grounding of light fixtures in ungrounded systems). The electrical system of this facility should be inspected and upgraded to comply with all applicable sections of the National Electrical Code. This would greatly reduce the risk of serious injury due to electrical energy.

Recommendation #2: A comprehensive safety program outlining proper safe work procedures for tasks being performed by workers should be developed and implemented.

Discussion: A comprehensive safety program that would clearly outline proper procedures and techniques to be used in the performance of tasks should be developed. The workers should then be instructed in the proper procedures and techniques to perform their everyday duties. Once this safety program is developed, management should ensure that it is implemented.

Recommendation #3: Employees should receive training in hazard awareness and recognition.

Discussion: Employees should be made aware of any existing hazards that they may encounter during the performance of their duties. Additionally, employees should be trained to recognize and report to the proper people any hazard that might present itself in the workplace. In this instance, once it was determined that a problem existed with the light fixture the person at the facility responsible for electrical maintenance should have been immediately summoned before any additional work was performed on the light fixture.

Recommendation #4: Proper work platforms should be provided and used for elevated work surfaces.

Discussion: Working off of the forklift platform is an unsafe work practice. Ladders and approved work platforms with hand rails and other safety features should be used when working above floor level. When the co-worker was knocked backward by the electric current, he could easily have fallen off the platform and a serious injury could have resulted.

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Last Reviewed: November 18, 2015