The National Institute for Occupational Safety and Health (NIOSH)

Promoting productive workplaces through safety and health research

Electrician Dies in Ohio

FACE 8652

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 August 21, 1986, an electrician died as a result of injuries he received in an electrical explosion that occurred while he was wiring around a circuit breaker with blown fuses in a transformer room. Note: Although electrical discharge would more accurately describe what actually occurred, the more common term electrical explosion will be used in this report.

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 September 10, 1986, a DSR research safety specialist conducted a site visit, met with company representatives and engineering consultants, interviewed comparison workers and a surrogate for the victim, and discussed the incident with the representative of the Industrial Commission.

Overview of Employer's Safety Program:

The employer is an electrical contractor specializing in commercial and residential wiring. Thirteen electricians are employed by the firm. There is no written safety program or safety policy at the firm, and no management of the safety function. The only training provided is on-the-job training. The employer will pay one-half the tuition for workers taking night school courses in the field of electricity or electronics.

Synopsis of Events:

On the day of the accident the victim and his helper were to install branch circuit conductors to an existing 20 amp 277 volt circuit breaker in a 480V-277V electrical panelbox. This circuit breaker was to control the power to an above ceiling, water-cooled air conditioning unit. The panelbox was located in the transformer room of a high-rise office building. As the victim was trying to enter the #12 copper wire from the air conditioning unit into the top of the panelbox, the fishtape with which he was guiding the wire accidentally entered the rear of a meter base located at the top of the panelbox. This damaged the meter base and created a dead short that caused the three fuses in a current limiting circuit breaker located in an adjacent

electrical panel to open. At this point the victim removed the meter from the meter socket and checked the continuity of the phases with a flashlight-type continuity tester. The continuity tester (rated at three volts) could not detect the dead short in the high voltage (480 V) phases. The victim then re-installed the meter into the meter socket.

The circuit breaker that had opened controlled the ceiling lights in the building tenant's computer room. Since the victim did not have the correct replacement fuses, he went to a local electrical supply warehouse to obtain them. The warehouse did not have replacement fuses in stock, but would have them delivered by the following morning. The victim then returned to the building where he found the office staff collecting table lamps to illuminate the computer room. The victim told the staff that the lights wouldn't be necessary, that he would be able to bypass the circuit breaker with the blown fuses and supply power to the overhead lights. He said he was going to connect the three fuse terminals to the "live" buss terminals on an adjacent 480 V circuit breaker buss using jumper wires. This would bypass the blown fuses and provide light to the computer room.

The victim connected a jumper wire to each of the three fuse terminals. (The three jumper wires and their phases back to the meter socket will be referred to as Phases A, B, and C.) The victim then connected the first jumper on Phase A to one of the energized buss terminals on the 480 V circuit breaker. Phase A was now energized from the meter socket to the fuse terminals. However, because of the dead short in the meter socket, Phase B was also energized back to the fuse terminal and jumper. The victim then prepared to connect Phase B to the energized buss. The energized tip of Phase B touched the energized buss connection and the 480 V circuit breaker arced.

Several office workers standing in the hall outside the transformer room were burnt by the explosion. One stated that shortly after the blast the helper, who was holding a flashlight for the victim, staggered out of the transformer room with his clothes on fire. The office worker extinguished the helper's burning clothes and the Emergency Medical Squad (EMS) was summoned. Fifteen people were taken to the hospital for treatment (most for smoke inhalation); however, five were admitted to the hospital's burn unit. The victim died later that evening. The helper remains in the hospital in critical condition at the time of this report.

Cause of Death:

The cause of death was listed as massive electrical burns. The victim was burned over 95% of his body.

Recommendations/Discussion:

Recommendation #1: Electrical safety devices should never be bypassed.

Discussion: Electrical safety devices (i.e. fuses, circuit breakers, etc.) are incorporated into an electrical system to alert the user of an existing problem. By bypassing safety devices one eliminates safety features designed into an electrical system. This may result in electrical explosions, fires, or injuries. In this case, although an inconvenience was created by the outage of the overhead lights, the computer room could have and should have been lighted by an alternative means until the proper fuses could be obtained.

Recommendation #2: Electrical systems should be de-energized prior to any work being performed on them.

Discussion: The incoming power to the circuitry being worked on was not de-energized before the "repair work" was attempted. The circuitry was not de-energized because it would have caused a power outage to portions of the office building. A job of this type should be scheduled at a time (a weekend or before or after hours) when the incoming power could be de-energized without disrupting operations. The employer has no written safety program or job procedures. Specific job procedures should be developed for tasks that are performed by employees, including de-energizing circuits before beginning to work on them. These procedures should detail the various safety hazards associated with these tasks. once these specific procedures have been developed, the employer should assure that they are implemented and enforced by a qualified person at each job site.

Recommendation #3: Employers should assure that employees are trained in the use of proper electrical testing device.

Discussion: The victim used the incorrect testing device when checking the phases in the meter, thus the short went undetected. Had the victim used the proper testing device the short would have been detected and the accident might have been prevented. Additionally, the victim could have tested the exposed ends of the jumper wires with a volt meter before making the connections. This would have alerted the victim to the presence of electrical energy.

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