



The National Institute for Occupational Safety and Health (NIOSH)

Promoting productive workplaces  
through safety and health research



## Electrician Dies in North Carolina

FACE 8644

### 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 July 27, 1986, an electrician died as a result of burns he received when an explosion occurred while he was making a live wire connection on a circuit breaker located in a six breaker panelboard.

### Contacts/Activities:

Officials of the Occupational Safety and Health Administration for the State of North Carolina notified DSR concerning this fatality and requested technical assistance. This case has been included in the FACE Project. On August 27, 1986, the DSR research team (consisting of a supervisory safety engineer, an epidemiologist, and two safety specialists) conducted a site visit, met with employer representatives, interviewed comparison workers and an eye witness, conducted a next-of-kin interview, and photographed the accident site.

### Overview of Employer's Safety Program:

The victim was employed by a light-duty (residential and commercial) electrical contractor. The firm employs 130 people. The safety function is managed by the firm's two project managers on a collateral-duty basis. The firm has no written safety policy or established safety program. The only training provided is on-the-job training. The project managers meet with the foremen monthly to discuss safety issues.

### Synopsis of Events:

On the day of the accident the victim and his helper were to install three circuit breakers in a six breaker panelboard cabinet that supplied power to various parts of a building in an industrial park complex. The panelboard was located in a service room inside the building. Three circuit breakers had previously been installed in the panelboard cabinet and supplied power to the occupied portion of the building. The three circuit breakers to be installed the day of accident would control the HVAC system of the unoccupied portion of the building and were located on the right side of the panelboard cabinet in a vertical fashion. Prior to beginning the job the victim was instructed by the crew foreman to install the top breaker first and

the bottom breaker last. The victim said he had done this type of job so many times he could "do it in his sleep". Although the victim had worked for the firm only four days, he had approximately 16 years of experience as an electrician with various employers.

The victim did not follow the foreman's instructions. He secured the three breakers in the panelboard cabinet, then began to wire the bottom breaker first. The victim removed the cover from the breaker and placed it on the top of a 300 kV transformer case located in the service room. The insulated wires to be connected to the breakers were fed through conduit in the bottom of the panelboard cabinet. The insulated wires then had to be fed to the upper portion of the panelboard cabinet in order to make the connections. These wires were energized. To de-energize them the power would have to be cut to the occupied portion of the facility. The line side of the bottom breaker became energized when the connections were completed. The victim then began to make the connections on the middle breaker without replacing the cover on the bottom- breaker. This allowed the energized line side connection points to remain exposed. The victim then began to feed the wires to be used for the connections on the middle breaker through the upper portion of the panelboard cabinet. The victim had successfully fed four of the six insulated wires needed to make the connections to the upper portion of the panelboard cabinet. As the fifth wire was being fed into the upper portion of the panelboard cabinet its uninsulated tip contacted one of the exposed energized connection points. This conductor was grounded on the other end. The contact caused an arc and the bottom breaker exploded. The victim was standing immediately in front of the breaker when it exploded. His clothes caught fire and he received massive burns from the explosion to the upper portion of his body.

A helper was working to the side of the panelboard cabinet. When he heard the explosion he ran out the service room door. As he was running away, a second explosion occurred. The helper received second and third degree burns to his left shoulder and back and to the back of his left arm.

The crew foreman was walking toward the service room when he heard the explosions. He arrived at the service room and found the victim lying on the floor of the service room with his clothes on fire. The foreman pulled the victim outside of the service room and extinguished the victim's burning clothes with his hands, receiving second and third degree burns to his hands. The victim was conscious and talking at this time. The emergency rescue transported the victim to the hospital. He was transferred to a burn center where he died the following morning.

## Cause of Death:

The cause of death was attributed to massive burns to twenty-five percent of the victim's upper body. The victim received burns to eighty percent of his body.

## Recommendations/Discussion:

### **Recommendation #1: Power distribution within a panelboard should remain consistent.**

**Discussion:** The design of the panelboard should be re-evaluated. When the middle and bottom breakers were installed in the panelboard, their line side (incoming power) was on the right and their load side (outgoing power) was on the left. The line and load sides of the other four circuit breakers in the panelboard were reversed. The inconsistency of the location of the line and load sides of the breakers might lead to confusion that would lead to an electrical accident. This might occur during installation of the breakers or at a later date when maintenance was being performed on the panelboard.

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

**Discussion:** The power on the incoming wires should have been de-energized before the installation of the circuit breakers was attempted. The incoming wires were not de-energized because it would have interfered with the power in the occupied portion of the building. This job should have been scheduled at a time (a weekend or after hours) when the incoming power could be de-energized without disrupting operations.

### **Recommendation #3: Safe work procedures should be followed when working in the presence of electrical energy.**

Discussion: The victim did not follow the foreman's instructions to install the top breaker first and the bottom breaker last. The victim then began to make the connections on the second circuit breaker without replacing the protective cover on the bottom breaker. These two actions were both unsafe work habits. Had the victim followed the foreman's orders or replaced the protective cover the accident might have been prevented.

**Recommendation #4: The work habits and training of new employees should be closely monitored.**

Discussion: Though the victim was said to have 16 years experience as an electrician, he had been working for this employer for only four days and his work habits should have been more closely monitored. Employers should assure that new employees have adequate training and understand the proper procedures to perform their assigned tasks.

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