



The National Institute for Occupational Safety and Health (NIOSH)

Promoting productive workplaces
through safety and health research



Electrocution in a Fast Food Restaurant

FACE 84-17

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) Study. By scientifically collecting data from a sample of similar fatal accidents, this study will identify and rank factors which increase the risk of fatal injury for selected employees.

On June 30, 1984 at approximately 1:05 a.m., an 18-year-old employee with 15 months' experience at a fast food restaurant was electrocuted while plugging a portable electric toaster into a 110 volt/20 amp receptacle.

Contacts/Activities

On July 9, 1984, NIOSH received a request for technical assistance from the Deputy Chief Medical Examiner.

On July 26, 1984, a research team, consisting of an epidemiologist, occupational health nurse, industrial hygienist and consulting engineer, conducted a site survey and interviewed employees (including the restaurant manager). A visit was also made to the city police department where copies of witness statements and electrician reports were obtained.

Synopsis of Events

After closing the restaurant on June 30, 1984, four employees and an assistant manager were cleaning and preparing the facility for opening by the morning shift. The routine for clean-up included moving portable equipment, sweeping and damp mopping. By approximately 1 a.m., this had nearly been completed and the employees were preparing to leave. Three of the employees were finished and were waiting up front. The assistant manager was in his office and the victim was replacing the portable equipment. Although not an official policy, workers often plugged the equipment back in so that it was ready for the morning shift. After damp mopping the floor approximately five to ten minutes earlier, the victim was in the process of plugging the toaster into a floor outlet (containing three 110v receptacles and one 220v receptacle) when he received what resulted in a fatal shock.

The assistant manager heard a noise and went up front to tell the employees to "cut the horseplay." When they denied this and he noticed that the victim wasn't present, he went to look for him. The victim was found with one hand on the plug, the other hand wrapped around the receptacle box and with his face on top of the outlet. He was still in contact with the current and convulsing when found. An employee attempted to take his pulse but was shocked. The assistant manager then went to the breaker box and attempted to open the breaker for that circuit. Unable to locate the specific breaker, the

assistant manager then called the emergency squad. He then returned to the breaker box and found the appropriate breaker. The electric current was turned off after the victim had been in contact with it for approximately three to eight minutes. The employee checked for a pulse again and found a very rapid radial pulse. The employee and assistant manager then went to the front of the store to unlock the doors for the rescue squad. Another call to the rescue squad was placed. The employee then checked his carotid pulse and found none.

A store employee who lived nearby then arrived and started CPR. Upon arrival, the emergency squad continued CPR. Altogether, CPR was administered for approximately one and one-half hours. The victim was pronounced DOA at the emergency room of the local hospital.

Later that morning, the restaurant had two different electricians check and evaluate the circuits in the outlet. Both electricians concluded that the voltages of the circuits were correct, no grounds or shorts were found, and no broken insulation was observed. They did conclude that two of the 120v receptacles were worn and loose, and the 120v plug of the portable toaster had a crack. These receptacles and plug were replaced.

After the accident, the preventive strategy adopted by the restaurant is to have employees go to the breaker box and open the appropriate circuits before plugging or unplugging equipment.

General Conclusions and Recommendations

Based upon available information, it is surmised that, while holding the plug, the victim's right hand slipped forward to make contact through the index finger to the energized prong. With his left hand holding the spring-loaded receptacle cover open, a current path through the arms, chest and heart would be established from energized prong to ground. Numerous factors contributed to the occurrence of this fatal accident. Some of these factors include:

1. The location of the receptacle outlet: By being on the floor, it restricted vision of and access to receptacle(s) and increased exposure to water from mopping.
2. The design of the receptacle outlet: With spring-loaded cover caps mounted above rather than below the receptacles, a two-handed operation is required for insertion or removal of the plug (see photograph).
3. The design of the 110v receptacle: Direct observation showed that the plug's prongs became energized before the plug had been completely inserted and twisted (a gap of 3/8" existed).
4. The design of the plug: No barrier (sleeve or flange) enclosed the prongs in order to prevent unintentional human contact.
5. The absence of Ground Fault Circuit Interrupter Breaker(s) (GFCI): During the site survey, no GFCIs for the electrical system could be found. If a GFCI had been on the circuit used for the portable toaster, it would have sensed the flow of current through the victim's body and interrupted the circuit before sufficient current passed to cause physical damage to the body.
6. Recent mopping of the floor: Water present on the floor and possibly the receptacle outlet may have increased the possibility of the electric current grounding through the victim's body.
7. Action of the victim: Being that the incident occurred early in the morning and at the end of the shift, possible fatigue and/or hurriedness of victim may have contributed to his right hand slipping and making contact with the energized prong.
8. Emergency response: If CPR had been initiated when an unstable pulse was first detected rather than later when no pulse could be found, the chances of reviving the victim might have increased.

The elimination of one or more of these factors may have prevented this electrocution. Of all the possible prevention strategies, the installation of GFCI's probably represents an easy and most comprehensive approach.

The employer's preventive strategy of employee access to the breaker box is not recommended. The use of circuit breakers for primary switching is not advisable for three reasons: (1) it represents an active rather than passive preventive strategy which is completely dependent upon totally correct human behavior; (2) the expected life cycle of a breaker may be reduced when continually operated as a primary switch; and (3) circuit breaker panels should not be accessible to everyone, because it permits one not familiar with the panel board electrical system to energize and de-energize critical circuits.

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