

TO: Director, National Institute for Occupational Safety and Health

FROM: California Fatality Assessment and Control Evaluation (FACE) Program

SUBJECT: Traction Power Inspector Dies after being Electrocuted While Performing Routine Maintenance at a Traction Power Substation in California

SUMMARY

California FACE Report #94CA006

March 16, 1995

A 42-year-old Caucasian male traction power inspector (the decedent) who worked for a public transportation company was electrocuted while performing routine maintenance at a traction power substation (TPS), for an overhead-powered tram line. According to his supervisor, the decedent was a certified electrician who was familiar with the work being done when he was fatally injured. At the time of the incident, he was visually inspecting surge resistors located on the outside of the substation. He was wearing insulated non-conductive shoes as required by his employer. Two co-workers were working inside the substation when they heard the victim shout that he was burning. The decedent apparently made contact with the surge resistor and received an electrical shock. When the co-workers came to the victim's aid he was on the ground having what they described as spasms. The co-workers also stated that at the same time they heard the decedent scream they also heard the sound of electrical current flow. The feed line on the electrical panel where the decedent was working carried 17,000 volts of electricity. The CA/FACE investigator concluded that in order to prevent similar future occurrences, employers should:

- have some type of physical barrier and/or enclosure in place between employees and any electrically energized equipment.
- require that a buddy system be used when employees are working around high voltage electrical equipment.
- require use of standard operating procedures for work performed in the vicinity of high voltage electrical systems.
- have prominent, visible warning signs (High Voltage Electricity) in place as a constant reminder to employees of the potential dangers.

INTRODUCTION

On March 14, 1994, a 42-year-old traction power inspector (the decedent) was electrocuted when he made contact with a 17,000 volt electrical feed line. The CA/FACE investigator received notification of this incident by the California Occupational Safety and Health Administration's (Cal/OSHA) Bureau of Investigations (BOI) office on March 30, 1994. The CA/FACE investigator conducted an interview with the employer on April 1, 1994. A site

investigation was conducted on May 10, 1994 by the CA/FACE investigator, a California Public Health Medical Officer, and a National Institute of Occupational Safety and Health (NIOSH) investigator. The supervisor was interviewed with regard to the incident and photographs were taken of the site. The Cal/OSHA Report and the Medical Examiner's Report were obtained by the CA/FACE investigator.

The employer in this incident was a public transportation company. Approximately 10,000 employees worked for the employer and 30 have the same job description as the decedent. The decedent had worked for his employer for 15 months. The employer had been in business under the current name for 1 year and another name for an additional 25 years. The employer had a safety officer on staff and this individual dedicated between 75-100% of his time to safety issues. The employer had a written Illness and Injury Prevention Program (IIPP) and written safety rules. Employees received safety training by various means including on-the-job, classroom instruction, manuals, and videos. Employees were also provided American Red Cross Cardiopulmonary Resuscitation (CPR) and First Aid training. The decedent was not wearing nor was he required to wear any type of PPE for the work being performed at the time of the incident.

INVESTIGATION

On the day of the incident, the decedent and two of his co-workers were inspecting a TPS. According to his supervisor, this was a job the decedent had performed on numerous occasions and for which he was qualified. Just prior to the incident, the decedent moved from inside the substation where he and his co-workers had been working on de-energized equipment to the outside front of the substation. The surge resistors are located behind locked doors in this area (See Exhibit 1A). There was a small, faded warning sign on the outside of the doors which was not visible when the doors were opened for inspection.

Surge resistors are inspected for cracks in the insulation and excess dust buildup or "tracing" (dust patterns representing insulator breakdown). If dust or cracks are found, the power line to the substation must be de-energized before any work can be performed. De-energizing this line causes an interruption in the transportation system and the local power grid. Installation of a switch between the power grid and the surge resistors to allow de-energization of the resistors without shutdown of the local power grid is prohibited under Title 8, Section 2725b of the California Code of Regulations (CCRs). According to the decedent's supervisor, the inspectors had been instructed to only visually inspect the surge resistors.

The most likely sequence of events, using information from co-workers and the site investigation, is that the decedent reached out to the surge resistors to brush away some dust. The evidence for this was the appearance of finger tracks on the surface of the surge resistor and soot on the decedent's fingertips (**see Exhibit 1**). The supervisor pointed out that since he had been most recently working on de-energized equipment, he momentarily may have forgotten that the equipment on which he was subsequently working was not de-energized.

At approximately 6:00 pm, the co-workers stated that they heard the decedent scream and, at the same time, they heard the sound of electrical current flow. The co-workers ran out of the substation and found the victim on the ground in front of the resistor having what they described as spasms. CPR and First Aid were not administered by co-workers since the victim

remained conscious until the time he was loaded into the ambulance. At that time, his heart began to beat irregularly. The paramedics began stabilizing procedures and transported the victim to a local hospital. He lost consciousness in the ambulance and was pronounced dead at 6:51 p.m.

CAUSE OF DEATH

The Coroner's Autopsy Report stated the cause of death as being high voltage electrocution.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Employers should have some type of physical barrier and/or enclosure in place between employees and any electrically energized equipment or should require lockout of the equipment prior to any service work.

Discussion: This incident may have been prevented if there had been a barrier and/or enclosure in place between the employee and the energized electrical equipment. It might also have been prevented if the surge resistors had been de-energized during a lockout procedure. A lockout could not be easily accomplished because this entails an interruption of the public transportation system. In work settings such as this, where lockout is impractical, physical barriers are key to preventing employee injuries.

Recommendation #2: Employers should require that a buddy system be used when employees are working around high voltage electrical systems.

Discussion: Under Title 8 of the California Code of Regulations (CCRs) section 2940 (d) (Observers), during the time work is being done on any exposed conductors or exposed parts of equipment connected to high-voltage electrical systems, a qualified electrical worker or an employee in training, shall be in close proximity at each work location to: 1) act primarily as an observer for the purpose of preventing an accident, and 2) render immediate assistance in the event of an accident. In this incident although co-workers were present inside the electrical substation, the decedent was working by himself on energized equipment outside the substation. The presence of an observer could have prevented the momentary lapse of attention or judgement that led to the decedent being electrocuted.

Recommendation #3: Employers should require use of standard operating procedures for work performed in the vicinity of high voltage electrical systems.

In this case, it is assumed the incident occurred because of a momentary lapse of concentration on the part of the victim whereby he reached out and touched the surge resistor. Had the victim been following a standard operating procedure, possible using a checklist system, this may have been enough of a reminder to prevent him from making contact with the resistor.

Recommendation #4: Employers should have prominent, visible warning signs (High Voltage Electricity) in place as a constant reminder for employees.

Discussion: Warning signs or labels may have helped as a reminder in this situation with regard to the hazards of working with high voltage electrical equipment. Although there was a warning sign present, it was small, faded, and not visible once the doors were opened. A more prominent sign may have reminded the decedent of the dangers posed by this situation.

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FATALITY ASSESSMENT AND CONTROL EVALUATION PROGRAM

The California Department of Health Services, in cooperation with the Public Health Institute and the National Institute for Occupational Safety and Health (NIOSH), conducts investigations of work-related fatalities. The goal of this program, known as the California Fatality Assessment and Control Evaluation (CA/FACE), is to prevent fatal work injuries in the future. CA/FACE aims to achieve this goal by studying the work 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. NIOSH-funded, state-based FACE programs include: Alaska, California, Iowa, Kentucky, Massachusetts, Michigan, Minnesota, Nebraska, New Jersey, New York, Oklahoma, Oregon, Washington, West Virginia, and Wisconsin.

Additional information regarding the CA/FACE program is available from:

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