

**TO:** Director, National Institute for Occupational Safety and Health

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

**SUBJECT:** Coil Tester Electrocuted while Testing Insulation on a Conduit Coil in California

***SUMMARY***  
**California FACE Report #94CA004**  
**February 10, 1995**

On February 23, 1994, a 43-year-old white, Hispanic male coil tester (the decedent) died after being electrocuted while testing the insulation on a conduit coil. The decedent was working at a coil testing bench where he was testing the insulation on the wires to make sure it was not defective prior to shipment. There were no barriers between the decedent and the energized coil, and the insulation on the testing device was cracked. Examination of the test equipment revealed that it had been repaired with glass filament strapping tape. The decedent was wearing personal protective equipment (PPE) which included work boots, safety glasses, ear plugs, a back support belt, and leather gloves at the time of the incident. Witnesses stated they heard the decedent groan and saw him fall backward, hitting his head on a conveyor as he fell. They came to his aid and began cardiopulmonary resuscitation (CPR) and called 911. Paramedics arrived in a few minutes, continued CPR, and transported the decedent to a local hospital where he was pronounced dead. The CA/FACE investigator concluded that in order to prevent similar future occurrences, employers should:

- follow the manufacturing guidelines and recommendations for the use of all electrical equipment.
- maintain all electrical installations in a safe operating condition.
- have all electrical power panel switches labeled.

**INTRODUCTION**

On February 23, 1994 at approximately 5:15 p.m., a 43 year old white, Hispanic male (the decedent) was electrocuted while testing wiring insulation on a conduit coil. The employer in this incident was a manufacturer of flexible conduit. The CA/FACE investigator was informed of the incident on March 1, 1994 by the California Occupational Safety & Health Administration's (Cal/OSHA) Bureau of Investigations (BOI) office. Copies of the Cal/OSHA Report, the Sheriff's Report, and the Coroner's Autopsy Report were all obtained by the CA/FACE investigator. No site visit was conducted because the CA/FACE investigator was refused access to the site.

## INVESTIGATION

On the day of the incident at approximately 5:15 p.m., the decedent was working at a coil testing bench. The product he was testing was a coil of flexible conduit containing three insulated wires which was manufactured at the site. These coils are similar in size to a common garden hose. Before shipping, the coils must be tested to make sure the insulation on the wires is not damaged. This is done at a coil testing bench using test equipment designed for this purpose. The coils are tested at 1500 to 2000 Volts AC, depending on the type of product.

The test procedure is conducted by clamping one high voltage lead to the wires and the other lead to the conduit. The leads are then energized for one minute. If current leakage exceeds 1.1 amps, the coil is rejected. After the test, the high voltage leads are de-energized and disconnected.

At the time of the incident, the decedent wore work boots, safety glasses, ear plugs, a back support belt, and leather gloves for PPE. Witnesses stated that they heard the decedent groan and saw him fall backward, hitting his head on a conveyor as he fell. They came to his aid, initiated CPR, and called 911. A co-worker turned off the power switch to de-energize the coil tester. He stated that he had a difficult time identifying the switch which turned off the power since they were not labeled. Paramedics arrived a short time later and continued with CPR and transported the decedent to a local hospital. The decedent was pronounced dead at the hospital at 6:04 p.m. The gloves the decedent was wearing appeared to have burn holes in one finger on each glove and the Sheriff reported that the victim had corresponding burn marks on his fingers.

Examination of the test equipment after the incident revealed that it had been repaired with glass filament strapping tape. The power leads were coaxial in design. The internal conductor carried the test current while the external/surrounding conductor acted as a ground. There were breaks in the outer insulation and outer grounding conductor of the leads. These breaks had been taped over using strapping tape. This repair did not correct the break to the grounding conductor so there was no grounding of the cable past the point of repair. Additionally, the tape used would not have provided insulation at the voltage in use.

After the incident, it was discovered that the manufacturer of the test equipment used by the employer, had sent a letter to the employer in May, 1993 recommending that they change their work stations. They suggested that they enclose the test specimen and interlock the enclosure so that the leads could not be energized while the enclosure was open. At the time of the incident, these changes had not been implemented by the employer.

## CAUSE OF DEATH

The Coroner's Autopsy Report stated that the cause of death was electrocution with electrical burns to the second finger on the right hand and fourth finger on the left hand.

## RECOMMENDATIONS/DISCUSSION

**Recommendation #1: Employers should follow the manufacturing guidelines and recommendations for the use of all electrical equipment.**

Discussion: This incident may have been prevented if the recommended test bench modifications had been installed by the employer. The manufacturer had specified these modifications in a letter dated May 26, 1993. The proposed modifications would have added barricades and safety devices to isolate the employees from contact with test leads and products whenever they were energized to 2000 volts. The Dielectric testing areas in two department had no means of isolating employees from contact with energized leads or products, whether the contact was accidental or from improper work practices.

Under Title 8 of the CCRs section 2940 (b), Employers Responsibility, the employer shall furnish such safety devices and safeguards as may be necessary to make the employment or place of employment as free from danger to the safety and health of employees as the nature of the employment reasonably permits. The employer shall examine or test each safety device at such intervals as may be reasonably necessary to ensure that it is in good condition and adequate to perform the function for which it is intended. Any device furnished by the employer found to be unsafe shall be repaired or replaced. Employees shall be instructed to inspect each safety device, tool or piece of equipment, each time it is used and to use only those in good condition. The employer shall require the use of safety devices and safeguards where applicable.

**Recommendation #2: Employers should maintain all electrical installations in a safe operating condition.**

Discussion: This incident may have been prevented if proper maintenance of the coaxial cable had been performed. As of February 23, 1994, repairs to the high voltage leads from the test units in the decedent's work area were made with glass filament strapping (packaging) tape. In areas where the outer shield of the coaxial cable had broken, this repair would leave the outer shield of the coaxial cable ungrounded past the repair. The attachment points on the clamps at the ends of the high voltage cables were also wrapped with the same tape. This tape was not designed to provide electrical insulation at high voltages. Under Title 8 of the California Code of Regulations (CCRs) section 2714 (b) all electrical installations shall be maintained in a safe operating condition. If any unsafe condition develops, it shall be promptly corrected.

**Recommendation #3: Employers should have all electrical power panel switches labeled.**

Discussion: In this incident the electrical circuit breaker which contained the breaker supplying 120 volts of electrical power to the coil testing area was not marked to indicate its function. Under Title 8 of the CCRs section 2340.22 (a) each disconnecting means for motors and utilization equipment and for each service, feeder, or branch circuit at the point where it originates shall be legibly marked to indicate its purpose unless located and arranged so the purpose is evident. The marking shall be of sufficient durability to withstand the environment involved.

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**February 10, 1995**

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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.

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

**California FACE Program**  
**California Department of Health Services**  
**Occupational Health Branch**  
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**Richmond, CA 94804**