DATE: May 27, 1992

FROM: Fatal Accident Circumstances and Epidemiology (FACE) Project
Minnesota Department of Health (MN FACE)

SUBJECT: FACE Investigation MN9202
Lineman Electrocuted by Contacting Energized 4160-Volt Power Line

SUMMARY

A 34-year-old male (victim) electric utility worker died after contacting an energized 4160- volt power line as he was attempting to replace a termination bracket bolt. The procedure took place within one foot of the energized wire, and the lineman was not wearing protective gloves. Earlier, he had had difficulty in handling a 1/4" bolt and had to descend from an aerial bucket to retrieve it from the ground after dropping it. The victim had appropriate personal protective equipment available (high voltage gloves, safety glasses, and hard hat). However, according to a coworker, he apparently removed the gloves in order to improve hand dexterity after re-ascending in the bucket. The coworker, acting as an observer, lowered the unconscious victim within one minute of hearing a zap and seeing the slumped, unresponding figure. Emergency medical procedures (CPR and ACLS) were administered within the recommended time limits, but the victim was not resuscitated. MN FACE investigators concluded that, in order to prevent similar occurrences, the following safety guidelines should be followed:

> Personal protective equipment, protective devices, and special tools provided for work should be used by employees.

> Employees working in the vicinity of energized lines should consider the effects of their actions, taking into account their own safety as well as the safety of other employees on the job site.

> When performing tasks requiring hand dexterity, protective equipment other than insulating gloves should be considered.

> Use checklists prior to starting work to ensure use of proper safety procedures and equipment.

INTRODUCTION

On April 16, 1992, MN FACE personnel were notified by a city funeral director of a work-related fatal electrocution that occurred ten days earlier. On the same day, MN FACE investigators interviewed (via telephone) the employer representative and coworker, and the attending emergency room physician. Reports from the county sheriff and MN OSHA were requested. A site investigation was conducted on April 22, 1992.

The employer in this event was the city. It employed two electrical workers at the time of the incident. The city has a safety officer and written safety rules and procedures. The 34-year-old victim was the head of the city's electrical department since November 1991 and had worked as a linesman for eleven years. Within the last year of work, the victim had become a certified journeyman.

INVESTIGATION

The incident occurred outdoors on an electrical pole having two sets of 3 phase, 4160-volt wires. The weather was warm and slightly overcast. The pole had been damaged above the cross arm on April 3, 1992. It was necessary to de-energize the east set of wires to make the necessary repairs. All standard operating procedures, including lockout and use of insulating devices, were taken and this work proceeded without incident.

A termination of the west, energized set of wires had been bent during a storm the previous summer. After finishing work on the de-energized lines, the victim decided to straighten this termination on the pole as well. The victim was working from a bucket, at a height of 18 feet. The termination, attached to a bracket, required attachment onto the pole with two 1/4" nuts and bolts.

Before the incident occurred, the victim, wearing high voltage (20,000 V) gloves, dropped one of the nuts onto the ground while attempting to screw it on. Using gloves for this procedure was an acceptable safe work practice. After finding the nut, the victim re-ascended to continue the work. The victim had the gloves on while the bucket was re-ascending, but the coworker believes that at some point they were removed for better finger dexterity. The termination itself, approximately 1 foot in height, was at ground potential, but an energized 4160-V wire came out from the top of it. It was with this wire that the victim apparently made unintentional contact.

As the coworker was moving into position to watch the worker in the bucket, he heard a buzz or zap. When the victim did not respond to queries from his coworker, he was lowered immediately. The victim was unconscious. A trained ambulance driver began CPR within two to three minutes of the incident, and emergency medical responders were on the scene administering oxygen within five minutes. The victim was transported to a hospital within ten minutes of the incident, where ACLS protocols were followed for approximately one and one-half hours before he was pronounced dead. Despite the rapid medical response time, the emergency room attending physician told MN FACE that a pulse was never re-established after the incident. It was determined that electricity entered the left hand and exited the right hand.

CAUSE OF DEATH

The cause of death was electrocution.

RECOMMENDATIONS AND DISCUSSION

Recommendation #1: Employees should use the personal protective equipment, the protective devices, and the special tools provided for their work (National Electrical Safety Code, 1990).

Discussion: When working on energized lines and equipment, it is necessary to insulate the employee from energized parts. The high voltage gloves would suffice as an adequate protective measure in this case. It is probable, however, according to both the coworker and the OSHA compliance officer investigating this fatality that the victim took his insulating gloves off to make his task easier. An easy-to-hold, non-conductive tool for bolt attachment may have helped prevent this fatality by making the task more easily performed with insulating gloves on.

Recommendation #2: Employees who work on or in the vicinity of energized lines should consider all the effects of their actions, taking into account their own safety as well as the safety of other employees on the job site (National Electrical Safety Code, 1990).

Discussion: During hazardous work tasks, employees must be aware at all times of the hazards they face. Although the termination was at ground potential in this case and the bolt could have been screwed on without shock, it was only about one foot away from the

4160-V line. Employees must be trained to recognize such hazards and know the protective measures to take in these circumstances.

Although not directly related to this fatality, during the course of the investigation it was revealed that the employee was not tied off in the bucket. Employees should be required to tie off in an aerial lift with a body belt and lanyard, in accordance with OSHA Standard 29 CFR 1926.556(b)(2)(v). In the event of a non-fatal shock, this procedure could prevent a possible fall fatality.

Recommendation #3: Employees who perform electrical work requiring hand dexterity should consider using protective equipment other than insulating gloves.

Discussion: The victim had difficulty handling the small 1/4" bolt with the gloves on. Frustration with the bulky gloves, which may have led to the removal of them, may have contributed to this fatality. To increase safety for tasks requiring hand dexterity, it may be necessary to de-energize wires or put insulating blankets in place to protect workers from unintentional shock.

Recommendation #4: Checklists of proper safety procedures and equipment for each job type could be used to reinforce safe work practices.

Discussion: Developing a system in which coworkers jointly check safety procedures before each job might remind employees and reinforce the use of proper and effective safe work practices. A joint system like this may also encourage discussion of other possible methods that could be used for particular tasks.

REFERENCES

1. ANSI [1990]. National Electrical Safety Code, C2-1990, Section 42-420. New York, NY: American National Standards Institute.

2. Office of the Federal Register, Code of Federal Regulations, Labor, 29 CFR Part 1926.556(b)(2)(v), U.S. Department of Labor, Occupational Safety and Health Administration, Washington, D.C., July 1991.