FACE INVESTIGATION: #94MO127

SUBJECT: Apprentice Lineman Electrocuted On Pad-Mounted Underground Transformer.

SUMMARY:

A 35 year-old apprentice lineman was electrocuted and a journeyman lineman received a flash burn when a 7620-volt energized power supply line contacted the case of an underground pad-mounted transformer. The victim was in contact with the transformer casing, and may have also been in contact with a nearby chain-link fence, when the journeyman lineman pulled the terminal from the transformer. The terminal end broke apart, the co-worker lost control of the line, and it contacted the transformer casing. The workers believed they had de-energized the unit and supply line prior to working on this unit.

The MO FACE investigator concluded that in order to prevent future similar occurrences employers should:

- **ensure that linemen follow established safe-work procedures to de-energize, ground, and verify through testing prior to beginning maintenance and repair operations on electrical transmission lines and equipment.**

- **ensure that prior to any work on an electrical system, all involved workers are familiar with the operation of every electrical component.**

- **employees who work around electrical transmission lines, electrical circuits, and electrical equipment should be trained in cardiopulmonary resuscitation (CPR).**

- **develop, implement and enforce a comprehensive safety program that includes, but is not limited to, training in hazard recognition and avoidance.**

INTRODUCTION:

On July 4, 1994, an apprentice lineman was electrocuted and a journeyman lineman received a flash burn when a 7620-volt energized supply line contacted the casing of a pad-mounted transformer during an attempt to restore power to part of a housing sub-development. This 59 year-old electrical cooperative provided electrical service to this area of Missouri for approximately 20 years. At the time of the incident the company employed 79 persons, as well as a safety officer who devotes up to 25 percent of his time toward company safety. The company had a written manual and written safety rules and procedures in place for the specific task performed by the victim. Several types of safety training were available to the workers at this facility including on-the-job, manuals and video.

INVESTIGATION:

On July 4, 1994, at 8:45 p.m., a journeyman and an apprentice lineman were on call for electrical service problems. At approximately 5:00 p.m. the workers were dispatched to an outage problem and returned to the area office at 7:30 p.m. They were dispatched again at approximately 8:45 p.m. to a suburban subdivision (incident site) reporting a power outage. The two men replaced a line fuse on a powerline-pole and restored service to the area. The men returned to the area office at 9:10 p.m. At 9:20 p.m. the two men were again dispatched to the same location to respond to another outage. Upon arrival, the two men surveyed the outage area. The service to the subdivision is provided by pad-mounted transformers each supplying power to two or four houses. In the service series experiencing this outage there were 11 houses and six transformers. The first three houses had “lights on” and were unaffected, indicating that transformer three in this series possibly had the problem and was affecting the other eight houses with “no lights” in this series. Believing the transformers were energized in a chain configuration, the journeyman lineman went to transformer two to de-energize the series. He used a "hot stick" to disconnect the energized terminator from transformer two. The lights in the houses supplied by this transformer went out, so the journeyman believed he had de-energized remaining the series. There were no lights on in the houses remaining in the series. He was unaware that the terminal he had disconnected was a special “Y type” terminal (See diagram). This terminal type has a power lead coming in and out, as well as attaches and energizes its transformer. The lead out then goes underground and energizes transformer three. Disconnecting this type of Y-terminal from the transformer did not de-

energize the series, under these circumstances. The journeyman lineman then returned to transformer three to check for any faults. The victim was holding a flashlight for the journeyman and was in contact with the transformer casing and possibly a nearby chain-link fence. The journeyman, believing he had de-energized the line, used pliers or clines and pulled the power supply terminal from the transformer. The terminal end may have been previously damaged and broke apart. The energized supply line then contacted the transformer case causing a flash burn to the journeyman. The victim, being in contact with the case and possibly the fence, provided a path to ground and received an electrical shock. The co-worker received a flash burn to his face and arms. He then ran to the truck and retrieved a pare of gloves in hopes of removing the victim from the energy source. During this time the line fuse that was repaired earlier, located on a nearby powerline pole blew and de-energized the line. A resident saw the flash and called 911. The co-worker then returned to the victim and assisted a resident with CPR. Emergency crews from the local fire department arrived and continued CPR, advanced life support measures, and prepared the victim and the co-worker for transportation to a local trauma center.

The lineman was treated for his burns and released; the victim was pronounced deceased upon arrival at the trauma center.

CAUSE OF DEATH:

The Certificate of Death lists the cause of death as probable electric shock

RECOMMENDATION/DISCUSSION:

RECOMMENDATION #1: **Ensure that linemen follow established safe-work procedures to de-energize, ground, and verify through testing prior to beginning maintenance and repair operations on electrical transmission lines and equipment.**

DISCUSSION: Employers should ensure that linemen follow established safe-work procedures. De-energize, ground, and verify through testing prior to beginning any maintenance and repair operations on electrical transmission lines and equipment.

RECOMMENDATION #2: **Employers should ensure that, prior to any work on an electrical system, all involved workers are familiar with the operation of every electrical component.**

DISCUSSION: The lineman may not have been aware that they were disconnecting a Y-type terminal connector at transformer three. This type of terminal is rarely used by the employer. Closer visual inspection of this terminal would had indicated the type of terminal used, and would have alerted the linemen that isolating the remaining series of transformers from this point could not be accomplished.

RECOMMENDATION #3: **Employees who work around electrical transmission lines, electrical circuits, and electrical equipment should be trained in cardiopulmonary resuscitation (CPR).**

DISCUSSION: According to NIOSH Alert Request for Assistance in Preventing Fatalities of Workers Who Contact Electrical Energy (NIOSH Publication 87-103), "Prompt emergency medical care can be lifesaving for workers who have contacted either low voltage or high voltage electrical energy. Immediate cardiopulmonary

resuscitation (CPR) followed by advanced cardiac life support (ACLS) has been shown to save lives." CPR was administered immediately after the victim contacted the electrical energy. In this incident the trauma received from the electricity was severe and the victim did not survive.

RECOMMENDATION #4: **Develop, implement, and enforce a comprehensive safety program that includes, but is not limited to, training in hazard recognition and avoidance.**

DISCUSSION: All employers should emphasize the safety of their employees by developing, implementing, and enforcing a comprehensive safety program. The safety program should include, but not be limited to, training workers in the proper selection and use of personal protection equipment, along with the recognition and avoidance of hazards in the work environment.

The Missouri Department of Health, in co-operation with the National Institute for Occupational Safety and Health **(NIOSH)**, is conducting a research project on work-related fatalities in Missouri. The goal of this project, known as the Missouri Occupational Fatality Assessment and Control Evaluation **(MO**

SIGNATURES:

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Thomas D. Ray
MO FACE Program Coordinator
Chief Investigator

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Daryl Roberts
Chief
Bureau of Environmental Epidemiology

DISSEMINATION LIST

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California State Public Health Foundation	CA FACE Program
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Jackson County Missouri Office of the Medical Examiner
Mine Safety and Health Administration
Missouri Department of Agriculture
Missouri Department of Elementary & Secondary Education
Missouri Department of Health, Office of Injury Control
Missouri Department of Labor and Industrial Relations
Missouri Department of Public Safety
Missouri Department of Social Services
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Missouri Hospital Association
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North Central Missouri Safety Council
OSHA Area Office, Kansas City, MO
OSHA Area Office, St. Louis, MO
Safety and Health Council of Western Missouri & Kansas
Safety Council of Greater St. Louis
Safety Council of the Ozarks
Shelter Insurance Companies
St. Joseph Safety Council
St. Louis City Medical Examiner Office
St. Louis County Department of Community Health
St. Louis County Medical Examiner Office
The Educational Center on Family Violence
University of Missouri, Agricultural Engineering