Contract Worker Electrocuted While Repairing 13.2 KV Power Line in North Carolina

FACE 85-25

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) Project, which is focusing primarily upon selected electrical-related and confined space fatalities. By scientifically collecting data from a sample of fatal accidents, it will be possible to identify and rank factors that influence the risk of fatal injuries for selected employees.

On June 6, 1985, a 38-year-old, first-class lineman was electrocuted while repairing a 13.2 kV power line. The lineman was standing in an aerial bucket.

Contacts/Activities

The Division of Safety Research received a request for technical assistance from officials of North Carolina's Occupational Safety and Health Program to evaluate this electrocution as part of the FACE project. A research team consisting of a safety specialist and an engineering consultant visited the accident site and the electrical construction company that employed the victim. The accident site was photographed by the DSR research team. FACE survey instruments were completed for the comparison workers and the victim. Interviews were conducted with the next of kin, company representatives, and comparison workers.

Synopsis of Events

High winds and severe thunderstorms in this area on June 5, 1985, severely damaged overhead, high voltage power lines. At approximately 11:00 p.m., the line service supervisor of the local power company requested that an electrical construction company supply a crew to help repair the damage. A foreman and three crewmen were assigned this task. The crew arrived with an aerial bucket truck at the work site at approximately 4:00 a.m. on June 6, 1985. A power company official instructed the crew to replace, a pole insulator and a 13.2 kV power line, which had been "downed" by a fallen tree. In order to restore service to as many customers as possible, the power company had previously isolated the "downed" line by cutting the pole jumper on line B of pole A (see drawing #1). Service was then restored to all customers up to the pole jumper that had been cut.

The electrical flow and circuitry that resulted in the electrocution of the lineman is illustrated in drawing #1. When the power line and the insulator had been replaced, the victim, a first-class lineman with twenty years of experience, was instructed by the superintendent to open the last of three fused disconnects (FC-6) on pole A, where the jumper splice was to be made. (Two other fused disconnects (FC-4, FC-5) on pole A were opened by a power company worker before the crew arrived at the accident site.)

While the victim was opening the fused disconnects on pole A, a power company worker was replacing fuses (damaged during the storm) in two of the three fused disconnects (M-2, FC-3) on pole B. Pole B was located approximately one-half mile to the south of pole A. These three lines fed a bank of three transformers (illustrated by the windings in drawing #1) that supplied power to a general store. The superintendent then left his crew and traveled to pole B to inform the power company worker that preparations to make the jumper splice were complete, and the fused" disconnects (F-1, F-2, F-3) on pole B could be opened in order to de-energize the entire line. The power company worker then opened the fused disconnects (FC-2, FC-3) in lines B and C in which the fuses had been replaced. He did not open the fused disconnect (M-1) for line A. Voltage from line A then fed through the line transformer and the store's electrical system to line B, the line on which the splice was to be made. Although the exact voltage could not be determined, power company representatives estimated that the voltage on this line ranged from 4000 V to 7500 V. When informed that the line was de-energized, the superintendent contacted his foreman by truck radio and instructed him to make the splice, but to "buzz" (test) the line first to ensure that it was de-energized. Buzzing a line is a standard practice to test for the presence of high voltage in power lines; however, it could not detect the lower voltage level present in this line. The victim buzzed the line by touching it with pliers he held in his gloved hand. When the victim did not see an arc or hear a buzzing sound, he apparently removed his glove and began to splice the jumper wire. He inserted the supply side of the jumper wire into the splice tube and crimped it. When he grasped the load side of the jumper wire, he completed an electrical circuit between the supply and load sides of the jumper causing the current to pass through his arms and chest. A crewman heard the victim groan and saw his hard hat fall to the ground. The crewman lowered the aerial bucket using controls on the truck, removed the victim from the aerial bucket, and began to administer CPR. The foreman contacted the superintendent on the truck radio and told him to summon the rescue squad. The rescue squad arrived at approximately 4:30 a.m. and transported the victim to a local hospital, where he was pronounced dead on arrival. The splice was later completed by another crewman, after a power company worker de-energized the line by opening the third fused disconnect.

Recommendations

Recommendation #1: Employers should provide linemen with equipment and procedures to address all magnitudes of voltages to which they may be exposed.

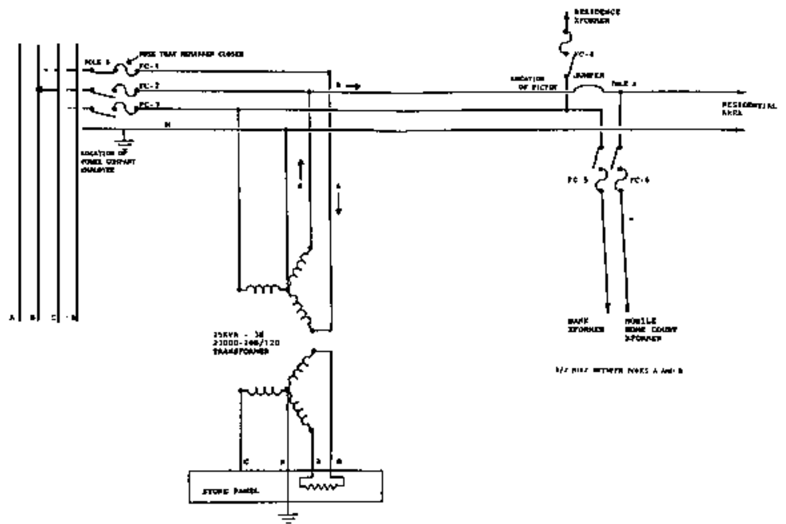
Discussion: To "buzz" a power line to determine if high voltage is present is a standard procedure followed by linemen. However, the "buzz" method did not detect the lower voltages present. Procedures to perform a dual voltage check should be established. Once it is determined by the "buzz" method that high voltage is not present, a low voltage testing device (such as the glowing neon type or the light emitting diode type) should be used to determine if a lower range of voltage is present. The use of a low voltage testing device in this case may have prevented this accident and the establishment of procedures for a complete voltage check may prevent future accidents.

Recommendation #2: During training programs for linemen, employers should emphasize proper procedures for working with multiphase distribution systems and also the hazards associated with these systems.

Discussion: Training programs for linemen should include basic electrical theory sessions that address multiphase distribution systems including the identification, evaluation, and control of the hazards associated with these systems. Due to the possibility that any one phase can serve as the supply for the transformer, the only absolutely safe way to de-energize a three-phase system is to open the fused disconnects in all three phases. Only two of the three fused disconnects were opened in this case. The closed disconnect on the third phase allowed the other two phases to remain energized.

Recommendation #3: Electrical lines should not be repaired, moved, or otherwise accessed without adequate personal protective equipment unless personally de-energized and verified.

Discussion: Linemen should be instructed not to consider another workman's word as verification that a line is de-energized. Linemen should be specifically instructed to wear proper protective equipment (i.e., gloves, sleeves, etc.) and to treat all lines as energized unless they personally de-energize these lines or verify that the lines have been de-energized and proper grounding has been provided.



Drawing 1.

Return to In-house FACE reports

Last Reviewed: November 18, 2015