The National Institute for Occupational Safety and Health (NIOSH)

Promoting productive workplaces through safety and health research

City Foreman Electrocuted and Three Crew Workers Critically Injured While Erecting a Traffic Control Pole

FACE 85-17

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 electrically-related fatal injuries and confined space fatalities. By scientifically collecting data from a sample of fatal accidents, the FACE will identify and rank factors which increase the risk of fatal injuries for selected employees.

On April 23, 1985 a foreman was killed and three members of his crew were critically injured while erecting a 36' concrete traffic control device pole which came into contact with a 26 KVA power line. A fifth man, the derrick truck operator, was uninjured.

Contacts/Activities

The Division of Safety Research received an invitation from a Florida county health officer to evaluate this accidental electrocution as part of the FACE project. A research team consisting of a safety engineer, a safety specialist, and an engineering consultant worked with the city's Insurance and Risk Management Officer to collect data concerning this accident.

The city employs approximately 8400 full time personnel; however, the total workforce can be as many as 12,000, due to the hiring of temporary workers. Management responsibilities of the city's safety and health program are performed by the insurance and risk management staff, which is located within the Financial Department. The city has developed a written safety program, issues an Employee Safety Handbook to each new city employee, and has a comprehensive Safety Policy Manual specifically for the Traffic Engineering Department whose members were involved in this accident.

Although the Traffic Engineering Department has a specific safety program concerning these work activities, the employees do not receive training relative to working near or with high voltage power lines. However, the city has an electric authority that operates and maintains electrical distribution within the city. The electric authority employees are thoroughly trained in the recognition, evaluation, and control of hazards associated with electrical distribution.

Local visits were made to the city Electric Authority, to the city motor pool, and to the accident site. Site photographs, taken the day of the accident, were available in the Office of Insurance and Risk Management. Additionally, the accident site, showing the completed work, was photographed by the NIOSH team (video and 35mm cameras). The crane operator was interviewed, although the three injured crewman were not because they were still in critical/guarded condition. Comparison workers from the city's Electric Authority were selected and interviewed, because these employees are exposed to similar workplace hazards.

Synopsis of Events

On April 22, 1985, the crew from the city Traffic Engineering Department prepared a foundation excavation approximately 3' x 3' x 6' deep for the pole at a four-way intersection. While excavating the foundation, the crew encountered a water main, at a depth of about 3 1/2 feet. A wooden box form was erected inside the excavation to keep the water main from being embedded in concrete upon setting the pole. The foundation excavation was approximately 3 feet horizontal from the edge of the street pavement and was located under a three phase 26 KVA overhead power line. The bottom phase of the power line was approximately 28 feet above ground level.

On the morning of the accident the crew arrived to erect the pole. The pole was 36 feet in length, approximately 10 inches square at the top, 16 inches square at the bottom, and weighed 5,240 pounds. The pole was rated 100% conductive. The pole was attached to a "pole digger derrick truck" by a one inch steel hoist rope rigged slightly below the pole's midpoint with the upper portion of the pole contained in a stabilizing clamp located at the end of the derrick truck boom. This method provides for the lifting of poles in an almost vertical position for ease of placement in foundation excavations. A field supervisor who arrived on the scene, felt that the derrick truck was obstructing traffic and he began directing traffic at the intersection. The pole was then hoisted, placed into position over the hole, and the butt end of the pole was lowered approximately 3 1/2 feet into the hole just above the wood form protecting the water main. The pole could not be placed directly into the hole because the energized overhead power lines were in the way. Therefore, the foreman and the crew members had to push against the butt of the pole to guide it into proper position for lowering it to the bottom. It is possible they were trying to position it so as to not damage the enclosed water line. The derrick truck operator then received a hand signal from one of the workers to lower the pole. The derrick truck operator was not sure which crew member gave the hand signal because of the crew's position while pushing on the pole and the operator's obscured vision. However, as the operator lowered the pole, it came into contact with the bottom phase of the overhead three phase 26 KVA power line. Upon contact, a flash occurred and the derrick truck operator immediately pulled the pole away from the power lines. The contact of the pole to the 26 KVA power line resulted in the fatal electrocution of the foreman, and critical injuries to the other three crew members on the ground. One of the injured workers stated that all four men were wearing insulated lineman's gloves; however, only one pair of insulated gloves could be found at the scene of the accident.

The field supervisor, who was directing traffic, heard the loud noise and immediately proceeded to the accident scene. He radioed central dispatch for help, and a rescue vehicle, which was in the vicinity of the accident site, arrived on the scene within one minute and first aid was begun. E.M.T.'s arrived on the scene a short time later. The fatally injured worker was flown by life flight helicopter to a local hospital where he was pronounced dead-on-arrival.

Conclusions/Recommendations

Recommendation #1: Employers should enforce existing regulations concerning crane operations.

Discussion: OSHA standards 1926.550 (a)(15) and 1910.180 (J) require that the minimum clearance between electrical lines rated 501CV or below and any part of the crane or load shall be ten feet, unless the electrical lines have been "deenergized and visibly grounded" at the point of work or physical contact between the lines, equipment, or machines is "prevented" by the erection of insulating barriers which cannot be part of the crane. Additionally, 29 CFR 1926.550 (a)(15MV) requires that a person be designated to observe clearance of the equipment and to give timely warning for "all" operations where it is difficult for the operator to maintain desired clearances by visual means. The crew in this case did not satisfy these requirements.

Recommendation #2: Employers should enforce policies and procedures concerning specialized tasks, such as pole setting.

Discussion: The Employee Safety Handbook included a detailed procedure to be followed when installing a traffic pole. This procedure requires that (a) insulated “sleeves” be placed over the primary conductors and the end of the pole being set; (b) lines be deenergized and tagged and automatic re-set devices on the lines be deactivated when setting a pole near energized lines with voltage of l3 KVA or above; (c) employees wear rubber lineman’s gloves with appropriate voltage rating when setting a pole in energized areas. Compliance with those procedures would have reduced the threat of serious injury.

Recommendation #3: Employers should hold management and first-line supervisory personnel responsible for job site safety.

Discussion: Two supervisory employees permitted this task to be performed without taking proper precaution, as specified in the Employee Safety Handbook. This deviation from handbook requirements suggests that safety responsibilities at the job site are not adequately defined or enforced by higher levels of supervision. City management should develop safety responsibilities for all levels for supervision and supervisory personnel must be held accountable for all safety responsibilities.

Recommendation #4 Employers should assure that personnel assigned to perform a specific task are thoroughly trained in the performance of this task and any associated hazards.

Discussion: The personnel assigned to set the traffic signal pole were trained in the proper procedures of pole setting; however, precautions noted in the employee handbook were not implemented. They did not receive extensive training in working near or with high voltage power lines or the electrical hazards generally associated with this work. Personnel working near or around high voltage power lines should receive training, so that they would be able to recognize and control the hazards present and prevent future accidents. Other city departments, such as the electric authority, should be considered for performing these activities, if they are properly trained.

Recommendation #5: Employers should assure that engineering and design personnel should be made aware of problems concerning field work activities and associated hazardous field conditions.

Discussion: The location of the pole displayed poor hazard awareness considering the proximity of the overhead power lines and the underground interference caused by the water main. Personnel performing design engineering activities should assist in identifying existing hazardous conditions which could interfere with the safe performance of field work.

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