



The National Institute for Occupational Safety and Health (NIOSH)

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# Electrocution Resulting from Crane Cable Contact with Power Line

FACE 82-03

## I. INTRODUCTION

This report is based upon an investigation of a single occupational electrocution resulting from a crane's cable coming in contact with a 7200 volt power line. At approximately 11:25 A.M. on October 15, 1982, the accident occurred at the construction site of a 200,000 gallon water tank being erected on the Donley farm in Greene County, Pennsylvania. This tank was being built for the East Dunkard Township Water Association by Welding Inc. of Charleston, West Virginia.

This investigation is part of the National Institute for Occupational Safety and Health (NIOSH) Division of Safety Research's (DSR) Accident Investigation Program and was made pursuant to a formal request from Dr. James L. Frost, Deputy Chief Medical examiner for the State of West Virginia. The objective of this report is to provide additional information on the background and circumstances of this fatal accident so that the Deputy Chief Medical Examiner may better comprehend its etiology. The content of this report does not address immediate causes nor standard violations which was the focus of the investigation conducted by the Occupational Safety and Health Administration (OSHA).

The information included in this report results from both interviews with pertinent individuals and direct observation at the accident site. A pre-investigation conference was held via telephone with a co-owner of the company on October 27, 1982. Representatives of DSR visited the accident site on October 28, 1982 and conversed with the owner of the farm, the job foreman, and co-workers who were there at the time of the accident. DSR representatives also visited the company headquarters in Charleston on November 3-4, 1982. The co-owners of the company, the crane operator involved in the accident, the assistant to the shop superintendent who was in charge of safety presentations, office workers, and the next-of-kin of the victim were all interviewed and found to be extremely accommodating.

## II. BACKGROUND

Welding Inc., the employer of the victim, began as a small job shop in June of 1947 and has since expanded into doing general construction and fabricated steel activities. These construction activities (for example, erection of boilers, water tanks, metal buildings, overnight facilities, pools, ice rinks, pipelines, and commercial buildings) have taken place within a 200-250 mile radius of Charleston, WV. The annual number of workers employed by the company has ranged from 83 to 90 full-time equivalents for 1979-81. The company employs approximately four truck drivers (occupation of the victim) and

three crane operators. The company owns heavy equipment (tractors, trailers, backhoes, dozers, cranes, etc.) and occasionally rents equipment it needs, but doesn't have. The company has four cranes. Employees who operate heavy equipment receive on-the-job training and no formal instruction.

With specific reference to water tank construction, the company has twenty years' experience. For the past ten years, the company has erected approximately twenty to thirty tanks per year. These water tanks have ranged in size from 200,000 to 750,000 gallons. Average erection time for a four or five men crew is ten to fourteen days. The parts for the tanks are fabricated at the company shop in Charleston and then shipped by truck to the erection site. Construction of these tanks is somewhat seasonal; the company can erect some tanks in the winter when the snow is off the ground and they can get to the job site.

According to the employer, the company has a safety program although it does not exist in written form. The assistant to the shop superintendent teaches safety and organizes weekly safety presentations. These presentations, which are thirty minutes in length, are given at the company headquarters in Charleston. Employee attendance at these presentations is not mandatory and only those employees who are not in the field are potentially able to attend. The company provides hardhats and safety glasses (both prescription and nonprescription) while employees are responsible for providing their own safety shoes.

With reference to the overall injury experience of the company, data were abstracted from the OSHA logs and are shown in Table 1. During 1979-81, the total (first-aid and OSHA recordable) injury rate ranged from 45.0 to 57.7 injuries per 200,000 person-hours (equivalent to 100 person-work years where 2000 hours constitute one work year). The magnitude of the total injury rates reflected the large incidence of first-aid injuries. The company's first-aid injury incidence rates ranged from 20.8 to 31.4 injuries per 200,000 person-hours and consisted mainly of foreign bodies in the eye(s). The OSHA recordable injury rates (injuries which result in lost workday(s) and/or medical attention other than first aid) range from 12.1 to 27.2 injuries per 200,000 person-hours. In comparison, the 1980 OSHA recordable injury experience for the non-residential building construction industry (SIC 154) was 19.4 injuries per 200,000 person-hours.

With reference to the company's accident history pertinent to this fatal accident, the company had a history of two other fatal accidents and one near-miss. Approximately 10 years ago, a water tank was being painted when a worker on a scaffold fell approximately 10 feet to his death. The other fatal accident occurred approximately 10 to 12 years ago, was a crane-related electrocution, and involved the same crane operator. During an electrical storm, the crane had broken down along the side of the road. The operator was moving the boom in order to allow sufficient space to jump the dead battery. After positioning the boom, the operator was leaving the cab when he and his helper were shocked. According to several company sources, the subsequent OSHA investigation could not determine whether the electricity resulted from current jumping from the powerlines overhead (the boom may have been within the absolute limit of approach to the powerlines) or from lightning striking the crane. No citations were issued. The near-miss occurred in May 1982 and involved a crane's boom/cable coming in contact with overhead power lines. This near-miss occurred at a coal field where a crew was using a crane to load the sections of another crane's boom into a truck. An employee was holding on to the line when the crane operator, the father of the employee, swung the boom into the 40,000 volt powerlines. The employee received serious but nonfatal injuries.

### III. CIRCUMSTANCES OF THE ACCIDENT

The company was contracted to build two water tanks for the East Dunkard Township Water Association. All pieces for both tanks were fabricated at the company's shop in Charleston. These pieces were then transported by truck and unloaded at the first job site. The first tank had been completed and the crew was transporting the pieces for the second tank to its erection site on the Donley farm, a distance of approximately 1 1/2 miles. The fatal accident occurred on the second day of erecting this second tank.

The erection site for the tank had been selected by a consulting engineer and a subcontractor had laid the concrete foundation. The victim had driven a truck from Charleston the day before the accident in order to transport the fabricated pieces and equipment from the site of the completed first tank. On the day of the accident, the crew at the job site included

the victim, foreman, crane operator, and three welders. The victim, who had been with the employer for 4-1/2 years and had 2 years' experience as a truck driver, had worked 13 hours the day before while the crane operator, who worked for the employer for approximately 14 years and had 10 years' experience as a crane operator, had worked 12 hours.

On the day of the accident, the crew began work at 7:00 a.m. At the time of the accident (approximately 11:25 a.m.), the first load for that day had been brought over from the site of the first water tank. At this time, the first 10 feet of the tank had been erected. The crane was situated on the east side of the tank (see photograph 1). The loaded truck was parked next to the crane in an excavated space (see photograph 2). The first load of the day was being removed from the truck at the time of the accident. At this time, the job foreman had left the site in order to make a telephone call. The victim and one welder were assisting the crane operator in unloading the truck while the other two welders were working inside the tank. An enclosed ladder (see photograph #3) was the first item unloaded from the truck. The crane operator lifted the ladder off the truck and swung it to his right (northward) over the top of the tank. He was planning to place the ladder on the dirt bank on the north side of the tank (see photograph #4, apparently believing that this was the side of the tank to which the ladder would be attached. However, the employer stated that this ladder was to go on the south rather than the north side. After clearing the tank, the crane operator was swinging and lowering the ladder simultaneously. The boom was extended approximately 45' and the jib was not attached. The crane operator had difficulty making the load clear the welding equipment on the northern side (see photograph #5). The victim thus decided to assist with moving the ladder around the welders and placing it on the ground. The welder who was helping unload stayed on the truck. The victim held onto the ladder and the welding equipment was between him and the crane. This factor along with the slope of the land and the position of the crane apparently precluded the operator and the welder from completely observing the victim. The victim gave the crane operator a hand signal to continue moving the ladder, and once the crane operator began to swing and lower the ladder, the victim was apparently completely out-of-sight. The next thing the crane operator knew was that a portion of the crane cable near the end of the boom was on fire (see photograph #6) and he swung the boom in the opposite direction, away from the powerlines. The crane operator then left the crane, turned off the welding equipment, and found the victim laying on the ground. Subsequent to the accident, the employer contacted the electric company who came out and moved the line to the far side of the crosstie and insulated it (see photograph #7). The co-owner of the company stated that in the future requests would always be made prior to starting construction.

#### IV. ACKNOWLEDGEMENTS

NIOSH's Division of Safety Research wishes to express its gratitude for the assistance and cooperation of the Deputy Chief Medical Examiner, the employer, and the individuals (employees and next-of-kin) who were interviewed. The employer was extremely accommodating and took every conceivable action to fully assist NIOSH with the investigation. The interviewees were extremely congenial and facilitative when providing information and answering questions. It was the assistance and cooperation of these parties that made this report possible.

TABLE I

##### EMPLOYMENT AND INJURY CHARACTERISTICS OF THE COMPANY 1979-1981

Year	Full-Time Equivalent	Person Hours of Exposure	First Aid Injuries	Nonlost Workday Injuries	Lost Workday Injuries	Total Injuries	Occupational Injury Rates (per 200,000 person hours)			
							First Aid Injuries	Nonlost Workday Injuries	Lost Workday Injuries	Total Injuries
81	85	165889	26*	2	8	36	31.4	2.4	9.7	43.5
80	83	173281	18**	10	11	39	20.8	11.5	12.7	45.0
79	90	183885	28***	15	10	53	30.5	16.3	10.9	57.7

\*includes 17 foreign body in the eye(s) injuries

\*\*includes 12 foreign body in the eye(s) injuries

\*\*\*includes 14 foreign body in the eye(s) injuries

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