Welder Dies Following A 100 Foot Fall From A Water Tower

DATE: December 2, 1992

SUMMARY

On September 21, 1992, a 25 year-old male welder was killed after falling 100 feet from a leg of a municipal water tower. The incident occurred while the victim and a co-worker were welding antenna support brackets onto the leg of the tower. The victim apparently disconnected his fall protection and was climbing the leg of the tower when he fell approximately 100 feet to the ground. NJDOH FACE investigators concluded that these guidelines should be followed in order to prevent similar incidents in the future:

- **Employers must thoroughly plan all work and perform a job hazard analysis of the site prior to starting work.**
- **When practical, employers should provide and require the use of a stable work platform for working at elevated worksites.**
- **Employers should provide a system of fall protection that protects employees at all times when working at elevations.**
- **Employers should ensure that fall protection equipment is appropriate and maintained in good condition. Employees should inspect fall protection equipment before each use to ensure that all components are in operational order.**
- **Employers should insure that material hoists are not used for raising or lowering employees to or from the worksite.**
- **Employers should ensure that electrical safety practices are followed when welding.**
- **Owners of water towers and similar structures should design and install a permanent static safety line system on the tower to facilitate the use of fall protection devices.**

INTRODUCTION

On September 22, 1992, the county medical examiner's office informed NJDOH FACE personnel about this work-related fatal fall. A FACE investigator visited the site the next day to photograph the scene. On September 30, 1992, FACE investigators again visited the scene with the OSHA compliance officer to interview the company owner and examine the equipment involved in the incident. Additional information was obtained from the OSHA file, co-worker witness statements, and the police and medical examiner's reports.

The victim's employer was a construction contractor who specialized in installing antenna mounts on towers. The company has been in business since 1977 and employed 30 non-union workers, 20 of which were "tower hands" who worked aloft. The company did not have a safety program or any written safety procedures. Employee training for climbing and welding is entirely on the job. The victim was a 25

year-old male welder who had been working for the company as a tower hand for four years. He had previously worked as a welder for a municipality.

INVESTIGATION

The site of the incident was a 150 foot tall municipal water tower located near a community recreational area. Space on the tower had been rented to a large communications company for mobile telephone antennas. These antennas were part of a mobile telephone "repeater" system that would receive and immediately rebroadcast mobile telephone calls. The communications company hired a construction company to install the antennas, who in turn sub- contracted the work to two smaller companies. One company (the victim's) had been contracted to weld the antenna brackets onto the tower, while a second would install the antennas onto the brackets.

The water tower consisted of a 40 foot diameter steel water tank mounted on six structural steel legs. Each of the legs was made of welded plate steel with structural steel braces. Although not specifically designed for climbing, these braces were spaced near enough that they could be used as a ladder (see diagram). The top of the tower was accessed by a steel ladder with a ladder cage that was built on one of the legs. A pump house was located near the bottom of the ladder and was the terminating point for a number of antenna and utility cables leading from the tower.

The company was returning to the tower to complete installation of the antenna brackets, a project that would take two days. They had previously installed most of the brackets on the tower legs and were now planning to weld additional brackets above some of those they had already installed. The procedure for installing the brackets was to first climb the tower leg and set up a hoist for hauling materials up the leg. This system used a wire rope running from a trailer-mounted winch through pulleys set at the bottom and top of the leg. Once the hoist was in place, the tower hands climbed the leg and looped nylon straps around the structural steel members as attachment points for their safety belts. These belts were lineman or tree climbing belts that allowed them to sit back against the belts while they worked. The brackets were then hoisted to the work area and welded onto the tower leg. The workers then moved to the next leg to repeat the process.

The day of the incident was clear and sunny. The foreman and three tower hands arrived in the morning and set up the hoist system on the tower leg. The victim was using a lineman's belt that he owned and had modified to make the seat strap more comfortable. Work proceeded uneventfully until about 5:45 p.m., when the victim and a co-worker were finishing welding a bracket about 100 feet up the tower leg. The co-worker stated that they had been up on the leg for a while and that the victim had been tied off to the leg at the same location for about 15 minutes before the incident. The co-worker had completed his weld and handed the welding equipment down to the victim, who was working below him. The victim then finished his weld and began to chip and paint. Noticing that there was a fault in the weld above his head, the victim called down to the foreman to start up the welder so he could redo some spots. He then started to climb up the tower. As the foreman turned to start the machine, he heard the victim yell and saw him fall to the ground. The police and Emergency Medical Services were called and arrived within a few minutes of the fall and began treating the victim, who was still breathing. During this time the shaken co-worker was lowered to the ground on the material hoist line. The victim was transported to the local medical center where he was pronounced dead at 6:21 p.m.

The exact cause of the fall could not be determined. When the company owner later retrieved the worker's equipment from the tower, he found that the victim's equipment bag had been moved to an area above where he had been working. He explained that the victim may have disconnected his fall protection and was moving up the tower to his equipment when he fell. Another possibility was that the victim was tied onto the tower but his safety belt lanyard was wrapped around the connecting clasp in such a way that would allow the clasp to open and disconnect the lanyard. This is possible since there was no locking device on the clasp that would prevent it from opening unintentionally. Because the welding machine was energized moments before the fall, there is the remote possibility that he may have been shocked by the welding electrode. However, there is no physical evidence to support this.

CAUSE OF DEATH

The county medical examiner determined that the cause of death was multiple chest, abdominal, and head injuries.

RECOMMENDATIONS/DISCUSSIONS

Recommendation #1: Employers must thoroughly plan all work and perform a job hazard analysis of the site prior to starting work.

Discussion: It is recommended that all jobs should first be thoroughly planned to identify potential safety hazards and the proper methods of abating them. Once on site, a job hazard analysis should be done to identify and correct any unanticipated hazards. The job hazard analysis should ideally be done by the employer and workers together.

Recommendation #2: When practical, employers should provide and require the use of a stable work platform for working at elevated worksites.

Discussion: In this case, the employees were required to climb the supporting members of the tower leg. Although this was not physically difficult, the angle of the supporting members are not designed to provide a sure footing and could cause a worker to slip while climbing. To prevent this, the employer should provide a stable, moveable work platform for the employees to operate from. An example of this is the use of stationary or suspended scaffolds built against the tower. Articulated "cherry picker" manlifts may also be used in areas accessible to this equipment.

Recommendation #3: Employers should provide a system of fall protection that protects employees at all times when working at elevations.

Discussion: In this case, the employee fell from the tower after he apparently disconnected his fall protection in order to move up the structure. Moving without fall protection is standard procedure with this company as their method of fall protection is only effective when the employee is stationary and

tied onto the structure. It is recommended that other methods of fall protection should be used that protects employees while they are moving as well as when stationary. This may include:

a) Static line systems. This provides a tie off point for the employee to hook onto and provides fall protection coverage at all times. For a tower leg or similar vertical structure, a rope-grab device may be worn by the employee and attached to a temporary safety line that is attached vertically to the leg. Standard static lines should also be attached to the horizontal beams of the structure (see recommendation #7 and figure 2).

b) Safety net systems. Safety nets designed to catch and hold a falling worker may be positioned around the perimeter of the work area. Nets are useful in situations where a large number of workers need to be protected, during long term projects, or where other methods of fall protection are not practical.

Recommendation #4: Employers should ensure that fall protection equipment is appropriate and maintained in good condition. Employers should periodically inspect fall protection equipment to ensure that all components are in operational order.

Discussion: The connecting clasp on the lanyard involved in the incident was not equipped with a locking mechanism. Such a mechanism would prevent the clasp from opening unintentionally, a possibility that was demonstrated by the company owner by wrapping the lanyard around the clasp. To prevent unintentional opening, it is recommended that all lanyard clasps be equipped with locking mechanisms. It was also observed that some of the other lanyards at the site appeared old and worn. Lanyards and other nylon equipment should also be periodically replaced to prevent equipment failures, as nylon will deteriorate with age and exposure to ultra-violet light from sunlight and welding arcs. As the victim owned his own safety belt, it is also recommended that employers periodically inspect all fall protection equipment to ensure that it is in operational order. Employees should inspect their fall protection equipment before each use.

Recommendation #5: Employers should insure that material hoists are not used for raising or lowering employees to or from the worksite.

Discussion: After the incident, the victim's co-worker was lowered to the ground using the material hoist attached to the tower leg. Other witness statements suggest that the hoist was routinely used for both raising and lowering employees. Although not directly related to the incident, this may be a violation of the OSHA Standard 29 CFR 1926.550 (g)(2) which prohibits using cranes or derricks to hoist employees under most circumstances. It is recommended that employers should strictly prohibit this practice and that a safe method of access to the work area should be provided, such as using the ladder cage built on the tower to access a suspended scaffold to the work area.

Recommendation #6: Employers should ensure that electrical safety practices are followed when welding.

Discussion: Although there is no evidence linking the welding equipment and the victim's fall, the timing of the two events suggests the possibility that the victim may have been shocked before he fell. Following electrical safety practices while welding will prevent the possibility of shock related falls or electrocution. Such practices include:

- Using no-load, low-voltage devices to ensure that only extremely low voltage is available to the electrode holder when welding is not taking place.
- Inspection of welding equipment to ensure that the cables, connections, and equipment grounds are sound. The operating voltages should also be periodically checked to make sure they are within specification.
- Ensuring that the employee and surrounding work area is dry and providing the employee with the proper personal protective gear.

Recommendation #7: Owners of water towers and similar structures should design and install a permanent static safety line system on the tower to facilitate the use of fall protection devices.

Discussion: As per recommendation #3: the use of horizontal and vertical static safety lines is a simple and versatile form of fall protection. In order to facilitate the use of fall protection, tower owners should install a permanent static line system on their structures. Contractors who are working on the structures should be required as part of their contract to use this system.

REFERENCES

Code of Federal Regulations 29 CFR 1926, 1991 edition. U.S. Government Printing Office, Office of the Federal Register, Washington DC. pg 203

To contact New Jersey State FACE program personnel regarding State-based FACE reports, please use information listed on the Contact Sheet on the NIOSH FACE web site. Please contact In-house FACE program personnel regarding In-house FACE reports and to gain assistance when State-FACE program personnel cannot be reached.