

MISSOURI OCCUPATIONAL FATALITY ASSESSMENT AND CONTROL EVALUATION (MO FACE)

Tower Construction Worker Dies Following 940-Foot Fall From Television Tower

MO FACE Investigation #98MO161

Date: September 16, 1999

Type: Fall

SUMMARY

On December 8, 1998, a 21-year-old tower construction worker was killed after sliding approximately 1,000 feet down a supporting guy wire. The victim and co-workers were in the process of attaching dampeners to the guy wires when the incident occurred. The tower being constructed was a three-sided, 10-foot-face, 1,040-foot tall structure to be utilized for a high definition digital television antenna. The victim was at the 940-foot level when the incident occurred. He was wearing a positioning safety belt with a T-Bar attached to the D-rings of the belt. Attached to one end of the T-bar was an adjustable length lanyard with a large hook and the other end was a large hook.

It appears the victim placed the hook attached to his T-Bar over the guy wire. Apparently the victim did not attach his other positioning lanyard to the tower before sliding out onto the guy wire. As the victim slid out onto the wire he discovered he was not attached to the tower. At this point he was able to hang on and not slide down the wire. The closest co-worker who was aware the victim was in trouble climbed out to help him back to the tower. The victim had one foot over the top of the wire but could not keep himself from sliding. He started sliding and could not stop. The victim then slid rapidly down the wire striking the anchorage point on the ground. He was pronounced dead at the scene.

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

- provide employees with a 100% fall protection system compatible with the work being performed, instruct employees in the proper use of the system and equipment, and ensure their use;
- provide workers with a proper work-positioning system, instruct workers in the proper use and limitations of the system, and ensure its use;
- develop, implement, and enforce a comprehensive written safety program which includes a commitment to 100% tie off and written procedures to implement 100% fall protection.

Additionally, manufactures of tower components and tower owners should:

- consider installing fall-protection fixtures on tower components during fabrication or erection that would facilitate the use of fall protection.

INTRODUCTION

The MO FACE investigator was notified of an occupational fatality at a tower construction site in Missouri at 3:49 p.m. on December 8, 1998, approximately five hours after the incident. The MO FACE investigator arrived at the incident site at 9:00 a.m. on December 9, 1998. On site at this time were the company owner and employees, the general contractor for the project, the representative for the broadcasting company, and a compliance officer for the Occupational Safety and Health Administration (OSHA).

The employer is a tower erection company who has been in business for approximately 36 years and, at the time of the incident, employed six employees. The company had written safety rules and procedures in place for the tasks performed by the workers. According to the employer, the victim had received training that specifically addressed the hazards associated with the fatality.

The victim was part of a six-man crew. He had worked for this employer approximately six months and had been on-site for approximately two months. This was the company's first fatality incident.

INVESTIGATION

The tower erection company contracted with a tower manufacturing company to erect and install a 1,000-foot, ten-foot face, three sided, high definition television tower and antenna for a Missouri television broadcasting company. The site of the new tower was on the same site as an existing tower owned by the television station. The new tower was being constructed approximately 100 feet from the original tower. The tower erection company had completed assembling the tower sections and were in the process of attaching lights and guy wire dampners. The dampners are bolted on the guy wires approximately 10 feet out from the tower.

The crew had arrived on site that morning around 8:00 am. Weather conditions mandate whether the crew ascends the tower to work or works on the ground. On the day of the incident the weather was clear and approximately 50 degrees. The crew ascended the tower via the installed elevator which operates within the center of the tower to the approximately the 900-foot level. The workers were attaching the line dampners and had completed several installations prior to the incident.

The victim was at the 940-foot level at the height of one of the guy wire attachments. The victim was fitted with a positioning belt with seat straps, a T-Bar connected between the two positioning D-rings, a large "shepherds" hook connected to the T-Bar, one positioning lanyard, and a loop strap integrated with a large "shepherds" hook. The

process to install the line dampners is to attach the loop strap to the tower and to the positioning lanyard, which is attached to the positioning belt; attach the T-Bar assembly onto the guy wire; sit down in the seat of the positioning belt and slide out onto the guy wire to the desired location. The loop strap and lanyard maintains the worker's distance from the tower and the weight of the worker is hanging on the guy wire. The worker's hands are free to install the dampner and then, using the loop strap/lanyard, pull himself back up the tower.

This incident occurred when the worker sat down into his positioning belt and started his decent out onto the guy wire. After sliding out several feet, the worker discovered that his positioning lanyard was not attached to his loop strap. At this point he yelled up to the job foreman, who was a short distance away, that he was in trouble. The foreman immediately climbed down to the 940-foot level and was attempting to rescue the worker. The worker had cotton gloves on and was holding on to the guy wire. The foreman was very close to rescuing the worker. The worker began to lose his grip on the wire and could not stop his decent. He slid the entire length of the guy wire, and struck the anchorage point on the ground.

CAUSE OF DEATH

Craniocerebral trauma, and massive chest, abdominal and extremity trauma.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Employers should provide employees with a 100% fall protection system compatible with the work being performed, instruct employees in the proper use of the system and equipment, and ensure their use.

Discussion: In this incident, the employee was using a positioning safety belt, but no other fall-protection system was in place to protect him as he moved on the tower or out onto the guy wires. Employers should provide employees with a 100% fall-protection system compatible with the tasks being performed, instruct workers in the proper use of the system and equipment, and ensure its use.

Fall-protection is defined as follows: Employees at risk of falling from work levels over six (6) feet above the ground or working surface must be protected by some conventional means of fall protection, which may include an integral fall-arrest system. This applies to ascending, descending, moving point-to-point, or any other tower construction or alteration-work activity conducted at an elevated work station. Employers should also require a minimum of three-point contact (two hands and one foot or two feet and one hand) at all times when employees are moving on the tower.

Fall protection for tower work is more easily provided when the employee is stationary and can tie-off at one location on the structure. When employees are required to move about on the tower, other means of fall protection are recommended, which can include, but are not limited to, the following: A split lanyard with connectors at each end large

enough to completely encircle tower members to which they are to be attached (these large connectors may require a special order from a fall-protection equipment manufacturer as the throat opening must be large enough to encircle the member) or a split lanyard made of reinforced fabric. The reinforced lanyards can be looped around the tower member. The connector at the terminal end of each lanyard is snapped around the lanyard itself. Each of these split lanyards has a Y configuration, with the end of the Y attached to the D-ring at the center back (dorsal position) of the employee's full-body harness. The connector at the end of each forked lanyard is released and moved one at a time, as the worker moves on the tower. This may be the most feasible method for fall protection when moving horizontally on the tower. When there is an anchor point above the worker's head, a properly installed and used retractable lifeline or retractable lanyard may be considered.

An additional system should be in place to protect the worker while climbing the tower. There are several systems available that provide fall protection as the employee climbs the tower. Examples include the use of a safety-climb device/system (metal cable equipped with a cable-grab device) installed on the tower leg and a rope lifeline attached at the tower top which hangs vertically and next to the safety-climb device/system. The worker attaches the front (sternal) D-ring on his harness to the cable grab device on the metal cable of the safety-climb device/system, using a connector. Additionally, a lanyard is used with the connector at one end snapped into the D-ring in the back of the worker's harness and the other end connected to a rope-grab device on the vertical rope lifeline. As the worker moves up the ladder, he reaches above his head and slides the rope grab up so that it remains overhead. Should the worker begin to fall, the grab will stop his fall in seconds.

The first person going up the tower is at greatest risk as there has been no vertical lifeline established. To ensure 100% fall protection during the initial ascent, an anchor hook can be used to establish temporary anchor points. The anchor hook is attached to a telescoping pole to which a lifeline or retractable lanyard is attached. The retractable lanyard extends between the D-ring in the middle of the harness back and the anchor hook. If a lifeline is used, a rope grab travels on the rope and is attached to the center D-ring on the harness back. The other end attaches to the anchor hook. When the employee moves the hook, he must always be attached to the structure. Once he reaches the top of the structure he secures the lifeline to an anchor point and can then use the lifeline and rope grab for future climbs. Tie-off adapters should be issued to each employee to allow them to establish an anchorage on the tower.

For more information regarding these and other available methods to achieve 100% fall protection, employers should consult with safety professionals and fall-protection-equipment sales representatives to learn more about systems available that meet their particular needs. Employers should keep in mind that when there are no specific OSHA regulations governing the safety of workers performing these tasks, the OSHA general duty clause (Public Law 91-596, Section 5 (a) (1) may apply .

Recommendation #2: Employers should provide workers with a proper work-positioning system, instruct workers in the proper use and limitations of the

system, and ensure its use.

Discussion: A work-positioning system is required if a worker must be held in place while his hands are free to work. A positioning device system is defined as follows: a positioning device system means a body belt or body harness rigged to allow an employee to be supported on an elevated vertical surface, such as a wall, and work with both hands free while leaning. The system includes an anchor point, a belt or harness and a connecting device. Work-positioning systems are to be used only for the assistance for which they are designed, they must not be relied upon to provide fall arrest. In this incident, the employee may not have been equipped with a proper work-positioning system. The system the victim was using to tie onto the tower and the guy wire consisted of a ½-inch nylon-rope lanyard connected to a loop strap with a connector looped into strap. Proper systems require that all connectors on the work-positioning equipment be installed properly at the time of manufacture and prohibit looping strapping through the eye of a connector as was done in this incident. The size of the connectors must be compatible with the members to which they are to be connected and all connectors must be in working condition. Also all connectors or snap hooks must be of the self locking type. Employers should provide a proper and effective work-positioning system, ensure its use and inform employees that a positioning system alone does not provide 100% fall protection.

Recommendation #3: Employers should develop, implement, and enforce a comprehensive written safety program which includes a commitment to 100% tie off and written procedures to implement 100% fall protection.

Discussion: The evaluation of tasks to be performed at the work site forms the basis for development, implementation, and enforcement of a safety program. Key elements of such a program should include, at minimum, frequent and regular inspection of the work site and should include provisions for training employees in hazard identification, avoidance and abatement. The comprehensive safety program should include a clear statement indicating the employer's commitment to providing 100% fall protection, to preventing worker death and minimizing injury due to falls, and a commitment to meeting OSHA safety requirements, including the general-duty requirements. The fall protection plan should include, but may not be limited to:

- identification of worksite activities that require fall protection;
- any methods to be used to eliminate the fall hazard;
- all protective systems and PPE to be used for worker protection;
- training for workers;
- minimum standards for protection systems and their use;
- ongoing evaluation to correct any deficiencies in the system or in the use of the system by workers,

- a plan for worker involvement in identifying fall hazards;
- a plan for systematic review of the plan.

Recommendation #4: Manufacturers of tower components and tower owners should consider installing fall-protection fixtures on tower components during fabrication or erection that would facilitate the use of fall protection.

There are fall protection fixtures that can be engineered into the tower design and added during component fabrication or erection that would facilitate the use of fall protection systems. For example, the installation of safety-climb devices/systems on all tower legs, the installation of permanent horizontal and vertical lifelines, and the installation of anchorage points. These and other methods should be researched and evaluated keeping in mind that employees will need to perform work on existing towers whenever services are to be changed or maintained.

REFERENCES

Code of Federal Regulations 29 CFR 1910, 1997 edition. U. S. Government Printing Office, Office of the Federal Register, Washington, DC.

Public law 91-596, December 29, 1970, Occupational Safety and Health Act of 1970, Section 5 (a) (1).