

## **FACE 82-02: Fall from a Scaffold Involving a Construction Foreman**

### **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) Study. By scientifically collecting data from a sample of similar fatal incidents, this study will identify and rank factors which increase the risk of fatal injury for selected employees.

On August 16, 1982, a 29-year-old male foreman fell from the platform of a 16' welded tubular scaffold and landed head first on the 6" concrete slab. The foreman died approximately 24 hours later in the intensive care unit of a local hospital. The attending medical examiner notified DSR on August 20, 1982.

### **CONTACTS/ACTIVITIES**

Subsequent to receiving notification, DSR sent a research team, consisting of an epidemiologist, safety researcher, civil engineer, safety engineer and safety specialist, to visit the company on August 26, 1982 and the incident site on August 26 and 31, 1982. Interviews were held with the co-owner of the company, new construction foreman and co-workers. Information obtained from these interviews pertained to company history and processes, policies and procedures, incident scenario, safety and training programs, employee evaluations, injury records, and relevant work practices. The incident site was surveyed in the presence of the witnesses who were able to describe the appearance of the site at the time of the incident. The scaffold and truss involved in the incident were still at the site and were observed. During the survey, the locations of the victim, scaffold and truss were identified and 35mm pictures were taken.

### **SYNOPSIS OF EVENTS**

This construction company had been established for approximately 12 years and had erected numerous commercial metal buildings. According to the co-owner, the company had no prior history of occupational fatalities nor disabling injuries.

The construction activity consisted of the erection of a commercial metal building designed to be a retail tire store. The design consisted of 35 metal trusses (each of which was approximately 60' long, 11' high at the apex, and 300 lbs. in weight) set 40" apart and attached to 18' sidewalls (masonry block and metal columns) built upon a 6" concrete slab. The building was approximately 60' wide and 110' long with two garage doors on each side with showroom windows and a main entrance door at the front.

At the time of the incident, the slab with the block and metal sidewall framing (without exterior panels) were complete and (31 of 35) of the 35 trusses had been set and secured in place. The erected trusses had been raised with either a hydraulic, telescoping boom crane or a backhoe with extension attachment. Wooden spacers constructed from 2 x 4's were used to align the truss at a proper distance from a previously placed truss and to minimize its lateral movement until secured. The trusses were secured to the sidewalls by two metal screws at each end and to the proximal trusses by two metal roof purlings which would be attached to the truss by screws.

The working foreman (the victim) and three other employees were involved in the activity of raising, setting and securing the metal trusses on the afternoon of August 16, 1982. There were four trusses left to be

installed, and the workers hoped to finish those that afternoon. The victim and another employee were on the 16' scaffold's 8' x 4' platform which did not have guardrails. The other employee was using a 6' wooden stepladder to reach and remove the hoist chain attached to the truss which had just been raised into place and aligned with a wooden spacer. In the process of removing the chain, the truss began to rotate on its base, in a downward direction. The foreman and other employee grabbed the truss in an attempt to prevent its movement and subsequent damage. The foreman and other employee were not able to maintain the truss. The other employee had to let go while the victim continued to hold on. The truss then continued to rotate on its ends downward and knocked over the scaffold and ladder. It is not clear whether the victim fell before or after the truss hit the scaffold. The other employee was able to hold onto a previously secured truss and this prevented him from falling.

A resident of a nearby home was a trained EMT and was able to provide quick emergency care for the victim. This care consisted of fitting the victim with a cervical collar and keeping him warm. An ambulance arrived approximately 40 minutes after the incident occurred and transported the victim to a nearby hospital.

### **MEDICAL FINDINGS**

While in the hospital, neurosurgery was attempted to relieve cerebral pressure caused by a massive subdural hematoma. The damage was irreversible and the victim died approximately 24 hours after being admitted. Toxicologic tests of blood for alcohol and urine for basic neutral and narcotic drugs were all negative.

### **GENERAL CONCLUSIONS AND RECOMMENDATIONS**

Several factors contributed to this fatal incident. The truss' involved in the incident apparently began to move due to the slippage or shearing of the wood spacer. Spacers observed at the incident site were open-ended and cracked. These conditions diminish their ability to adequately hold an unsecured truss. When the truss began to fall, the victim not only grabbed it but also apparently refused to let go in apparent disregard for his own safety. Also, although less contributory since the entire scaffold was knocked over, the victim and other employees were working from a platform which had no guardrails.

It is recommended that future efforts be made to utilize a more suitable type of temporary spacer. A spacer made of metal and with clasps to fasten it in place would be less likely to be dislodged. Safety training should stress that workers should not grab onto large objects in motion. Future efforts should stress the importance of and strictly enforce the proper use of guardrails around scaffold platforms.

The courtesy and cooperation of the company officials and employees are gratefully acknowledged.

## **FACE 88-27: Dry Wall Finisher Dies in Fall from Ladder on Scaffold**

### **INTRODUCTION**

The National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR), performs Fatal Accident Circumstances and Epidemiology (FACE) investigations when a participating state reports an occupational fatality and requests technical assistance. The goal of these evaluations is to prevent fatal work injuries in the future by studying: the working environment, the worker, the task the worker was performing, the tools the worker was using, the energy exchange resulting in fatal injury, and the role of management in controlling how these factors interact.

On June 23, 1988, a 55-year-old male dry wall finisher was fatally injured when he fell 22 feet from a portable wooden stepladder that was on top of a 17-foot-high mobile scaffold.

### **CONTACTS/ACTIVITIES**

On June 27, 1988, a state Occupational Safety and Health official notified DSR of this fatality and requested technical assistance. On July 12, 1988, NIOSH met with a company representative, discussed the incident with the OSHA compliance officer, photographed the site, interviewed a co-worker who witnessed the incident, and obtained a report from the local fire department's emergency medical service (EMS) rescue squad that responded.

### **OVERVIEW OF EMPLOYER'S SAFETY PROGRAM**

The victim was a dry wall finisher working for a general contracting construction company. The company has been in business for approximately 4 years and currently employs 90 employees, including 4 dry wall finishers. The company uses written safety rules and procedures and provides on-the-job training to employees. The construction jobsite superintendent is responsible for administering the safety program which includes conducting weekly jobsite safety meetings with all the employees. The victim had almost 4 years' experience as a dry wall finisher. He had never received a reprimand for violating safety rules or procedures.

### **SYNOPSIS OF EVENTS**

The construction company had been contracted to build a multilevel brick high school. Construction started in October 1986, with completion scheduled for September 1988. At the time of the incident, most of the exterior work had been completed and the interior finishing work was in progress.

On June 23, 1988, two dry wall finishers were putting filler compound over the heads of the screws that secured sheetrock panels to the interior walls. They were working in the same room from separate scaffolds. The scaffolds were mobile metal scaffolds, 17 feet high, 7 feet long, and 5 feet wide, which were equipped with 8-inch rubber tires with locking casters. The victim's work platform was made up of two 2-inch by 10-inch, 7-foot-long wooden boards and one 2-foot-wide by 7-foot-long standard aluminum plank mounted across the top railing of the scaffold. Additionally, the victim placed an 8-foot wooden stepladder on top of the work platform to reach the upper sections of the wall, which was 25 feet high.

Prior to the incident a co-worker told the victim that the casters on the scaffold were not locked. The victim replied, "I want them that way." The victim positioned the stepladder on the scaffold platform and leaned the top of the ladder against the wall. When the victim climbed the ladder, the force exerted at the ladder's foot caused the scaffold to roll. The victim fell headfirst onto a concrete floor 22 feet below.

The construction superintendent, who was in an adjacent room, heard a disturbance and ran to the incident site. He immediately called the local EMS squad using a two-way walky-talky. An ambulance arrived 4 minutes later, and EMS personnel provided advanced life support. The victim was transported to a local hospital where he was pronounced dead on arrival.

## **CAUSE OF DEATH**

The coroner reported the cause of death as traumatic injuries to the head and chest.

## **RECOMMENDATIONS/DISCUSSION**

***Recommendation #1: Employers should ensure that all employees required to work from elevated work platforms understand the potential danger of a fall, and the proper methods of erecting, placing, securing, and using scaffolds and ladders.***

Discussion: Occupational Safety and Health Administration (OSHA) Safety and Health Standard 29 CFR 1926.451(e)(8) states that, "Scaffolds in use by any persons shall rest upon a suitable footing and shall stand plumb, also the casters or wheels be locked to prevent any movement." The employer should ensure that all employees understand the danger of working on scaffolding; this includes the necessity of locking casters or wheels. Employers should also instruct all employees to report all unsafe working conditions (e.g., the unlocked casters observed by the co-worker) to the supervisor. If the victim had locked the casters or the co-worker had reported this unsafe working condition, this fatality may have been prevented.

***Recommendation #2: Employers should ensure that appropriate guardrails and toeboards are installed on mobile scaffolding used for work at levels exceeding 10 feet above the ground or floor.***

Discussion: OSHA Safety and Health Standard 29 CFR 1926.451(a)(4) requires that guardrails and toeboards be installed on all open sides and ends of platforms more than 10 feet above the ground or floor. The work platform of the mobile scaffolding was 17 feet above the floor, and all four sides surrounding the platform were open. The employer should have equipped the mobile scaffolding with guardrails and toeboards before the platform was used.

***Recommendation #3: Employers should ensure that mobile scaffolding platforms are tightly planked.***

Discussion: OSHA Safety and Health Standard 29 CFR 1926.451(e)(4) requires that mobile scaffolding platforms be tightly planked for the full width of the scaffold. In addition to the hazard created by leaning an 8-foot wooden stepladder against the wall, the platform was only partially planked, creating an opening approximately 17 inches wide by 7 feet long. The employer should regularly inspect to ensure that all scaffolding meets the requirements established by the OSHA Safety and Health Standards (e.g., locked casters, installed guardrails, and tightly planked platforms, etc.).

***Recommendation #4: In the event an employee is injured on the job, the employer should review, and revise if necessary, the safety rules and procedures, inspect the worksite for unsafe working conditions, and initiate actions to ensure safe working conditions before work activities continue.***

Discussion: This fall is one of four falls experienced by employees of the contractor or sub-contractor at this specific jobsite (initiated October, 1986). Although the previous three falls did not result in death, the workers involved received severe injuries including fractures and lacerations. One of these workers is permanently paralyzed as a result of a fall. It is evident that safety conditions are poor at this specific worksite; the employer should initiate immediate action to correct these unsafe working conditions.

## **FACE 88-29: Painter Falls to his Death from a Scaffold**

### **INTRODUCTION**

The National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR), performs Fatal Accident Circumstances and Epidemiology (FACE) investigations when a participating state reports an occupational fatality and requests technical assistance. The goal of these evaluations is to prevent fatal work injuries in the future by studying: the working environment, the worker, the task the worker was performing, the tools the worker was using, the energy exchange resulting in fatal injury, and the role of management in controlling how these factors interact.

On March 24, 1988, a 30-year-old male painter died and a co-worker was injured when they fell from a scaffold to the street and sidewalk 52 feet below.

### **CONTACTS/ACTIVITIES**

State officials of the Occupational Safety and Health Program notified DSR of this fatality and requested technical assistance. On July 28, 1988, a DSR research industrial hygienist conducted a site visit, photographed the incident site, and met with representatives of various companies and local police and fire departments who were involved in the incident.

### **OVERVIEW OF EMPLOYER'S SAFETY PROGRAM**

The employer is a small painting and decorating contractor which employs six workers. The company has no safety program, no safety training, and does not conduct safety meetings with employees. Most of the work the company does is commercial painting and decorating. The victim had worked as a painter for the company intermittently for the past 10 years.

### **SYNOPSIS OF EVENTS**

The employer had been contracted to paint the outside trim on a seven-story office building. The victim and a co-worker were painting from a 12-foot-long scaffold which was 52 feet above the sidewalk. The employer had provided safety belts and lanyards, but did not require the workers to use them. Also, the workers had been offered a bonus to complete the job before a time deadline. These factors may have influenced their decision not to use fall protection equipment.

The scaffold was suspended by two 5/8-inch-diameter steel cables that were attached with large steel hooks to a ledge near the top of the building. The cables ran vertically to a hand-operated hoist winch on each end of the scaffold that allowed workers to raise or lower the scaffold to the desired height. The suspension cables above the scaffold lay across a horizontal metal gutter that was attached to the side of the building. The slack portion of each cable dangled free under the ends of the scaffold.

On March 24, 1988 (16 days after the job began), the victim and co-worker were within a day of completing the job. They were painting at a level approximately 20 feet above and 4 feet horizontally from a utility pole that held a 3-phase, 7200-volt power line. One of the cables dangling under the scaffold was less than a foot from the power line nearest the building.

At the time of the incident the wind was blowing at 15 to 20 miles per hour. As the victim attempted to crank the hoist, the dangling cable nearest the power line contacted the energized wire nearest the building. The scaffold's two suspension cables grounded out and burned in half where they crossed against the metal gutter, causing the scaffold to fall. The scaffold struck the top of the utility pole, breaking off the cross arm and power lines. The victim and co-worker were thrown from the scaffold. The victim landed on the sidewalk below. The co-worker landed on a bank sign, breaking off the brackets where it was attached to the side of the building. He then jumped the remaining vertical distance (approximately 10 feet) to the street below. The scaffold remained across the top of the utility pole with the downed power lines in the street.

The local emergency rescue squad was immediately summoned and arrived at the scene in 2 minutes. The victim and co-worker were treated at the scene and enroute to the hospital. The victim was pronounced dead at the hospital 1 hour and 44 minutes after the incident occurred. The co-worker survived with multiple fractures.

## **CAUSE OF DEATH**

The medical examiner reported that death resulted from multiple traumatic injuries to the head, chest, and abdomen resulting from the fall.

## **RECOMMENDATIONS/DISCUSSION**

***Recommendation# 1: Where the potential for a fall from an elevation exists, employers should ensure that fall protection equipment is provided and used by workers.***

Discussion: The use of a safety belt/lanyard combination is required by 29 CFR 1926.104. Use of the safety belt or body harness/lanyard with a rope grab device is appropriate for persons working from scaffolds at varying heights. Properly used, this type of fall protection would have prevented the workers in this incident from falling.

***Recommendation #2: To ensure proper protection when working near electrical power lines, employers should request that the electrical utility company de-energize the lines or cover them with insulating line hoses or blankets.***

Discussion: Energized power lines in proximity to a work area are hazardous and extra caution must be used when working near these power lines. A safe distance between power lines and scaffolds, ladders, or tools should be maintained at all times; at least one state requires that a 6-foot minimum clearance be maintained. The power line in this instance was only 4 feet from the side of the building. Due to the scaffold location, one of the dangling scaffold cables was less than 1 foot from the power line. In this situation, the power lines should have been de-energized or covered with insulating hoses or blankets before work was begun.

***Recommendation #3: The employer should develop and implement a safety program designed to help workers recognize and avoid hazards.***

Discussion: The dangers associated with working from scaffolds in the proximity of power lines are obvious. OSHA Standard 1926.21(b)(2) states that "the employer shall instruct each employee in the recognition and avoidance of unsafe conditions and the regulations applicable to his work environment to

control or eliminate any hazards or other exposure to illness or injury. " The company in this incident did not provide any training in safe work procedures and did not have written safety rules. Even though it is a small company, the employer should evaluate the tasks performed by workers and identify all potential hazards. A safety program addressing these hazards should be developed and implemented on the job.

***Recommendation #4: Employers should perform job hazard analyses to identify the hazards encountered by their employees, and develop measures for controlling each hazard.***

Discussion: A job hazard analysis is one method of identifying the hazards associated with a specific task. The job hazard analysis, through its breakdown of a job into specific steps, the hazards associated with each step, and the measures planned to control the hazards, provides an ideal means to relay this information to employees. For example, a thorough inspection by the employer would have disclosed the hazard associated with working at this elevation with equipment in such close proximity to a power line. Noting this, injury prevention measures (Recommendations #1 and #2) could have been taken. Failure to adequately identify and control these hazards increases the risk of injury to employees.

***Recommendation #5: Employers should use the job hazard analysis when training employees on the hazards associated with specific jobs and on the countermeasures to control these hazards.***

Discussion: General training on company safety procedures should be supplemented by training on specific hazards associated with specific jobs. Such training can make employees aware of the hazards to which they are exposed. At the same time, countermeasures can be explained.



## **FACE 89-07: Foreman and Painter Die in 48-Foot Fall When Scaffold Collapses**

### **INTRODUCTION**

The National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR), performs Fatal Accident Circumstances and Epidemiology (FACE) investigations when a participating state reports an occupational fatality and requests technical assistance. The goal of these evaluations is to prevent fatal work injuries in the future by studying the working environment, the worker, the task the worker was performing, the tools the worker was using, the energy exchange resulting in fatal injury, and the role of management in controlling how these factors interact.

On November 15, 1988, a 53-year-old male foreman and a 28-year-old male painter died when the scaffold from which they were working collapsed, causing them to fall 48 feet to the ground below.

### **CONTACTS/ACTIVITIES**

State officials of the Occupational Safety and Health Program notified DSR of this fatality and requested technical assistance. On December 15, 1988, a DSR research industrial hygienist met with the state OSHA official who investigated the incident and representatives of various companies and local police and fire departments that were involved in the incident, and photographed the site.

### **OVERVIEW OF EMPLOYER'S SAFETY PROGRAM**

The employer is a painting company with 50 employees. The company consists of a painting division with 29 painters and a small construction division. Most of the company business involves painting buildings and other outdoor structures. The company's Hazard Communication Program consists of a brief verbal orientation to new employees concerning the potential hazards of various chemicals contained in paint. The company also has Material Safety Data Sheets (MSDS) available. However, the company has no written safety program, and did not have any safety meetings or training specifically addressing fall prevention or fall protection.

The foreman involved in this incident had a total of 20 years of experience as a painter, including 15 years with the company as a painter foreman. The other painter had 2 years of experience with the company as a painter.

It should be noted that two painters with the same company died in separate, previous work-related incidents. In 1987, a painter fell to his death from an aerial bucket, and in 1972, a painter suspended in a boatswain's chair came in contact with a power line and was electrocuted.

### **SYNOPSIS OF EVENTS**

The company was hired to paint the outside of several tanks at a petrochemical storage plant. The storage tanks are 48 feet high and 56 feet in diameter. Stairs that wind around the tanks provide access to the top. The top of the tanks are smooth and have a slight downward slope that extends from the center to the outside edge.

The two workers began painting the tanks from the bucket compartment of an aerial bucket truck without wearing any type of fall protection equipment. The painters used this painting method for several days and had completed one tank and were nearing completion of a second tank. However, gaining access to the

unpainted side of the tank by using the bucket truck was not possible because other tanks were too close and some above-ground piping was in the way. Therefore, the foreman decided to finish painting the second tank using a two-point suspension scaffold.

The two workers arrived at the site in the morning on November 15, 1988 and set up the scaffold. The scaffold consisted of a worker platform of tubular steel, measuring 2 feet wide by 17 feet long, with two outside guardrails 24 inches and 48 inches above the platform. The platform was suspended by two wire suspension cables, each of which was 5/16th of an inch in diameter. The cables hung vertically from two tubular steel outriggers placed on top of the tank with the outboard ends extending 24 inches beyond the edge of the tank. The cables ran through an electrically-operated hoist on each end of the scaffold platform. This allowed the workers to raise or lower the scaffold platform to the desired height.

Although there were no eyewitnesses of the incident, physical and circumstantial evidence suggests the following:

1. The scaffold outriggers had been installed on top of the tank with only 200 pounds of counterweight. There were two 50-pound steel bars on each of the two outriggers. The outriggers had been set up to keep the suspension cables at a horizontal distance of 24 inches from the side of the tank. In order to maintain this horizontal distance, the scaffold manufacturer required a minimum of 600 pounds of counterweight for this type of scaffold (300 pounds on each outrigger) to counterbalance the work load.
2. The outriggers were not tied off to prevent them from slipping.
3. One end of a lifeline had been tied to a large vent pipe on the top center of the tank and the other end looped around the side of the scaffold guardrail.
4. Two buckets, each containing approximately 4 gallons of paint, were placed on the scaffold platform.
5. The two workers climbed onto the scaffold platform, raised the scaffold platform all the way to the top, got off on top of the tank, climbed down the tank stairs, and went to lunch.
6. Presumably, some time during the afternoon while the workers were on the scaffold platform, the outriggers slid off the top edge of the tank and the entire scaffold along with the two workers fell approximately 48 feet to a hard-packed gravel surface below.

The two workers were not discovered until 4:56 p.m. At that time a truck driver at the petrochemical storage plant was on his way to lock up the plant premises when he noticed the bodies and scaffold wreckage. The truck driver immediately notified the local fire department emergency medical service. Paramedics arrived at the scene in approximately 5 minutes and upon examining the victims, could not detect any signs of life. The county coroner subsequently arrived and pronounced the two workers dead at the scene.

## **CAUSE OF DEATH**

The medical examiner reported the cause of death for both workers as multiple blunt force trauma.

## RECOMMENDATIONS/DISCUSSION

***Recommendation #1: Employers should ensure that all employees required to work from elevated work platforms understand the potential danger of a fall, and the proper methods of erecting, placing, securing, and using scaffolds.***

Discussion: occupational Safety and Health Administration (OSHA) Safety and Health Standard 29 CFR 1926.451(g)(3) requires that the outriggers of this type of scaffold be securely anchored and that properly designed scaffolds, "... shall be constructed and erected in accordance with such design." For this type of scaffold and the way it was being used, the scaffold manufacturer recommends: (1) a minimum of 600 pounds of counterweight on the inboard end of the outrigger beams (300 pounds on each outrigger), and (2) that the outriggers also be securely tied back.

The fact that the workers only used 200 pounds of counterweight (100 pounds on each side) and that they did not tie back the outriggers indicates they did not fully understand the proper methods of erecting and securing this type of scaffold. The employer should ensure that all employees understand the danger of working on scaffolding. This includes the necessity of properly securing scaffold suspension points. Properly set up, the type of scaffold and anchoring system used in this incident would not have fallen.

***Recommendation #2: Where the potential for a fall from an elevation exists, employers should ensure that fall protection equipment is provided and used by workers.***

Discussion: Although a safety line had been tied to the top of the tank and the workers had safety belts with rope-grab devices at the site (and possibly on the scaffold) during the incident, they were not being worn by the workers. The use of a safety belt/lanyard combination is required by 29 CFR 1926.451(i)(8) for use on two-point suspension scaffolds. The use of the safety belt or body harness/lanyard with a rope grab device is appropriate for persons working from scaffolds at varying heights. Properly used, this type of fall protection would have prevented the workers in this incident from falling even when the scaffolding fell.

***Recommendation #3: Scaffolds should be erected under the supervision of persons who are competent in the use of scaffolds.***

Discussion: OSHA Standard 1926.451(a)(3) states: "No scaffold shall be erected, moved, dismantled, or altered except under the supervision of competent persons. " The fact that the workers in this incident did not set up the scaffold according to the manufacturer's specifications points out that the workers did not understand the correct way to erect the scaffold under those circumstances. The scaffold erection should have been supervised by a worker experienced in erecting this type of scaffold.

***Recommendation #4: When workers are assigned hazardous tasks, or must work at hazardous workstations (such as elevated scaffolds), a standby person should be assigned to continually observe, give assistance, and ensure timely response in the event of an emergency. Additionally, close supervisory contact should be maintained periodically throughout the duration of the work.***

Discussion: On the day of the fatal incident, the two victims apparently worked alone, unobserved. They were not discovered until 4:56 p.m. when a truck driver was locking up the plant. No one was assigned to observe the work from the ground; additionally, the workers were apparently unsupervised from the time they installed the scaffold until the scaffold collapsed and they fell to the ground. Had the scaffold collapse

and resultant fall been observed by someone standing by on the ground, help might have been summoned and emergency medical care administered promptly to the victims improving their chances of surviving the traumatic injuries they received. In any workplace situation which involves the potential for traumatic injury, a "buddy system" and close, periodic supervision are essential to protect the lives of exposed workers.

***Recommendation #5: The designers/owners of tanks of this type should design and install appropriate tank anchorage points for maintenance purposes.***

Discussion: Permanent structures of this type are known to require extensive maintenance when they are designed. It is essential that designers/owners of these facilities incorporate anchorage points on tank roofs to which workers can adequately secure scaffolds and lifelines. Omission of designed anchor points causes workers to improvise anchors or not use them at all. This increases the possibility that a scaffold will be erected incorrectly. If scaffold anchor points had been available on the tank involved in this incident, the scaffold may not have been incorrectly erected, resulting in its failure. Also, if anchor points had been available, it's likely that the workers in this situation may have been tied off, thus preventing their fall when the scaffold fell.

***Recommendation #6: All employers should develop and implement a safety program designed to help workers recognize, understand, and control hazards.***

Discussion: Company management must ensure that employees are trained to recognize and avoid hazardous work conditions and that the work environment is safe. Employers should develop and implement a safety program to protect workers as required by OSHA Standard 1926.20. Additionally, OSHA Standard 1926.21(b)(2) requires employers to "...instruct each employee in the recognition and avoidance of unsafe conditions and the regulations applicable to his work environment to control or eliminate any hazards or other exposure to illness or injury." The company had no formal safety program, and there were no standard operating procedures for any of the tasks performed. Even after having two previous worker fatalities, the employer failed to provide written safety rules and training in safe work procedures. Although a relatively small company, the employer should immediately evaluate the tasks performed by workers, identify all potential hazards, and then develop and implement a safety program addressing these hazards. Prior to starting any job, the employer should conduct a jobsite survey, identify all hazards, and implement appropriate control measures.

## **FACE 89-21: Cement Finisher Dies After 160-Foot Fall from Scaffold**

### **INTRODUCTION**

The National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR), performs Fatal Accident Circumstances and Epidemiology (FACE) investigations when a participating state reports an occupational fatality and requests technical assistance. The goal of these evaluations is to prevent fatal work injuries in the future by studying the working environment, the worker, the task the worker was performing, the tools the worker was using, the energy exchange resulting in fatal injury, and the role of management in controlling how these factors interact.

On December 19, 1988, a 27-year-old male cement finisher was dismantling suspended scaffolding inside a 172-foot-high circular concrete silo when he lost his balance and fell from the scaffolding. His safety lanyard broke and he fell 160 feet to the concrete floor of the silo.

### **CONTACTS/ACTIVITIES**

State officials notified DSR of this fatality and requested technical assistance. On February 13, 1989, a DSR research team conducted a site visit, interviewed company representatives, photographed the site of the incident, and discussed the incident with the OSHA compliance officer and state medical examiner personnel.

### **OVERVIEW OF THE EMPLOYER'S SAFETY PROGRAM**

The victim had been employed for 3 years by a construction company that specializes in slip form construction. The company had 28 workers on site. Concrete forms of different dimensions are erected, set into place and then concrete is pumped into the forms. The company has been in operation since 1928 and employs a corporate safety director. The job superintendent is responsible for safety at the jobsite. Safety meetings are conducted each Monday morning prior to the start of work. Each employee is issued a company safety manual upon hire and training is provided on the job.

### **SYNOPSIS OF EVENTS**

The company had been contracted to construct a holding facility for cement. This included constructing three interconnected concrete silos and installing equipment inside these silos. The silos were 172 feet high and 40 feet in diameter, with 10-inch-thick walls. The project began in October 1988, and by the day of the incident the silos had been constructed and the interior walls had been finished on two of the silos. On the day of the incident the victim and a co-worker were completing the interior finish of the third silo. The two men were working at a height of 160 feet from a suspended scaffold. The scaffold, which was shaped to fit the curvature of the interior wall of the tank, was erected around half the inside diameter of the tank and was suspended from ropes anchored at the top of the silo. As the men finished the inside surface of one half of the tank, they disassembled the scaffold from each end toward the center where a door would provide access to the outside of the silo. The scaffolding, dropped to the floor piece-by-piece as it was disassembled, was then erected around the other half of the tank. The interior walls of all three silos were finished using these procedures.

At the time of the incident the men had completed the interior finish of the third silo and had begun to disassemble the scaffolding. Each man was using a nylon rope lanyard attached to a chain on a scaffold bracket. The brackets were spaced 6 feet apart. As each man reached a point in the operation where he was ready to drop a bracket to the ground, he hooked his lanyard to the chain on the next bracket.

At some point the victim lost his balance and fell off the end of the scaffolding. The co-worker stated that he saw the victim fall and jerk upwards as the lanyard caught him. As the victim's weight dropped back on the lanyard, it snapped, causing him to fall 160 feet to the concrete floor below. The emergency rescue squad was summoned immediately by the company secretary. Employer representatives stated that it was approximately 30 minutes before the rescue squad arrived at the scene. The victim was pronounced dead at the scene.

When the lanyard was inspected, burn damage was discovered in several places, including the point at which it had snapped. This damage probably occurred during welding or burning operations from a previous job.

## **CAUSE OF DEATH**

Although the medical examiner had not completed his report at the time of this investigation, the cause of death is presumed to have been multiple traumatic injuries.

## **RECOMMENDATIONS/DISCUSSION**

***Recommendation #1: Fall-arresting devices should be periodically inspected for damage by a qualified person, and faulty equipment should be immediately removed from service. Additionally, employees required to wear fall protection should inspect their own equipment before the start of each job.***

Discussion: In this instance, fall-arresting equipment was not individually assigned, but was obtained from a common pool. It was possible that a worker would not use the same piece of equipment on a daily basis. For this reason, fall protection equipment should be periodically inspected by a qualified person to determine if it is in suitable condition to be used by workers. Additionally, employers should train workers in inspection techniques that would allow them to identify faulty equipment. Workers should inspect their equipment before the start of work each day. Faulty equipment should be immediately removed from service to ensure worker safety. A properly trained worker would have identified the faulty lanyard upon inspection. Had the faulty lanyard been removed from service, and an undamaged one used instead, this fatality might have been prevented.

***Recommendation #2: Personal protective equipment should be able to withstand the harshest conditions to which it may be subjected on any given job.***

Discussion: The nylon lanyard involved in this incident received burn damage, probably while being used in the vicinity of welding or cutting operations. Many materials, including nylon, can be easily damaged in the presence of extreme heat. For this reason, nylon lanyards should not be used where they might be exposed to conditions that could include extreme heat; rather, steel mesh or wire core lanyards would have been more suitable. Personal protective equipment should be evaluated before being used on any job to ensure that it can withstand the harshest conditions to which it may be subjected without sustaining damage that would jeopardize the safety of a worker.

***Recommendation #3: OSHA requires that workers working from float or ship scaffolds (scaffolds suspended from overhead supports) be protected by an approved safety lifebelt, lanyard, and lifeline secured above the point of operation to an anchor point or structural member.***

Discussion: According to 29 CFR 1926.451 (w)(6), workers working from float or ship scaffolds shall be protected by a safety lifebelt and lanyard hooked to a lifeline which is secured above the point of operation. In this instance, no lifeline was used and the lanyard was hooked directly to the scaffold. Even the required fall protection, however, would not have prevented this incident because a damaged lanyard was used. For this reason, the feasibility of a redundant fall-arresting system should be evaluated. For example, if a lifeline and a lanyard, each anchored at different points on the structure, were both hooked to the safety lifebelt or body harness, two points of suspension would exist. In such a redundant system, if a lanyard broke (as in this instance), the lifeline would still support the worker. If a redundant fall-arresting system had been in effect, this incident might have been prevented.

## **FACE 89-29: Caulking Mechanic Dies in Fall when Scaffold Fails**

### **INTRODUCTION**

The National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR), performs Fatal Accident Circumstances and Epidemiology (FACE) investigations when a participating state reports an occupational fatality and requests technical assistance. The goal of these evaluations is to prevent fatal work injuries in the future by studying the working environment, the worker, the task the worker was performing, the tools the worker was using, the energy exchange resulting in fatal injury, and the role of management in controlling how these factors interact.

On March 15, 1989, a 33-year-old male caulking mechanic died when the scaffold upon which he was working failed, causing him to fall 60 feet to the ground.

### **CONTACTS/ACTIVITIES**

State officials notified DSR of this fatality and requested technical assistance. On April 18, 1989, a DSR safety specialist and safety engineer discussed this case with state officials and emergency services personnel. The incident was reviewed with company officials and the incident site was visited and photographed.

### **OVERVIEW OF EMPLOYER'S SAFETY PROGRAM**

The employer is a caulking contractor with 13 employees, including seven caulking mechanics. The company has been in existence for 52 years. The victim had been employed by the company for the past 16 years, working the last 12 years as a caulking mechanic. The company has no formal safety program. Employee safety training in recognition, identification and control of job hazards is provided through on-the-job training. The victim was serving as the foreman of a two-person crew at the time of the incident.

### **SYNOPSIS OF EVENTS**

On the morning of the incident, the victim and one co-worker completed a 2-hour caulking job, then went to the site of a newly constructed 7-story building to continue a caulking job they had started several days earlier. The front and rear building exterior utilized a combination of precast concrete panels and plate glass, while the sides were entirely of plate glass. They were caulking the precast concrete panels which were architecturally arranged from ground level to the sixth floor.

The caulking contractor provided a personnel lift on site; however, it did not reach above the fifth floor. In order to caulk the precast concrete panels at the sixth-floor level, the workmen would have to use a suspended scaffold.

The victim and co-worker arrived on the site at approximately 9:30 a.m. A window washing contractor was on site and had already rigged a powered 2-point suspended scaffold on the building. The scaffolding was located so that the caulking crew could caulk part of the sixth-floor level. The victim and a window washer decided that they would share the suspended scaffold while the two remaining co-workers, one caulker and one window washer, would share the personnel lift. With this arrangement, the caulking contractor's employees would not have to rig the scaffold they had brought to the jobsite.



The victim and the window washer began their work from the scaffold at the six-floor level. Although the victim had brought safety belts and lifelines to the site, neither group of workers used this personal protective equipment. They had completed work on a section of the sixth floor, and as they began their descent, the end of the scaffold where the victim stood suddenly dropped until the scaffold platform was in a vertical position. The victim, who was not tied off to an independent lifeline, fell approximately 60 feet from the scaffold to hard packed earth. The window washer managed to cling to the other end of the scaffold and a nearby ledge until the personnel manlift could be moved to the scene approximately 25 minutes after the fall.

The victim struck the building numerous times as he was falling. Workers in the area immediately telephoned the local Emergency Medical Service which arrived on the scene approximately 5 minutes after the incident. The victim, who was still conscious, was immediately transported to a nearby medical center where he died from massive internal injuries.

Although the victim had several years of experience using similar 2 point suspension scaffolds, he had not been trained to use this particular type. When the workers were ready to descend, the victim may not have disengaged the parking brake before activating the climber in a downward direction. With this brake set, the scaffold would not lower. Instead, it would lift the cable hanging beneath the scaffold, causing the cable to accumulate slack in the climber housing mechanism. When the victim noticed his end of the scaffold was not descending, he possibly realized the brake was set and released it. When this occurred, the scaffold began to fall because of the accumulated slack line in the housing. It continued to fall because either the slackened line condition allowed the cable to get free of the climber mechanism, or the impact force of the falling scaffold was greater than the resisting force of the climber mechanism.

In addition to the parking brake, these climbing scaffold units are equipped with a centrifugal safety brake. This spring-loaded mechanism is designed to be in contact with the suspension cable and rotate as the cable passes by it. The brake is designed to activate when the centrifugal force of the rotating mechanism exceeds the force of the springs. Although this braking device was designed to activate in this type of circumstance, it malfunctioned because a spring had apparently come loose and jammed in the brake device. This allowed the victim's end of the scaffold to drop to a vertical position. The other climbing unit held the scaffold in suspension. (The problem with the centrifugal safety brake was discovered by the state OSHA compliance officer during inspection of the equipment immediately following the incident.)

## **CAUSE OF DEATH**

The Medical Examiner gave the cause of death as a ruptured liver due to acute abdominal injuries received as a result of the fall.

## **RECOMMENDATIONS/DISCUSSION**

***Recommendation #1: Appropriate personal protective equipment should be worn whenever the potential for a serious fall exists.***

Discussion: In this case, none of the four workers (two caulking mechanics and two window washers) were using any form of personal fall protection, despite the fact that the caulking contractor's employees had safety belts and lifelines in their truck. Although the scaffold climbing mechanism was equipped with an emergency braking device, the device malfunctioned allowing the end of the scaffold to lose its support

causing the victim to fall 60 feet to the ground. Failure to use personal fall protection equipment contributed to the severity of this incident. If fall protection equipment had been used, this fatality may have been prevented.

***Recommendation #2: Employees should receive training in the safe operation of all equipment prior to use.***

Discussion: The victim had worked with suspension scaffolds for several years, but had no experience with the particular type of scaffold involved in this incident. Although most such scaffolds are similar in design, the controls are not standardized. The victim was not trained in the operation of this scaffold. This lack of training in operation of the scaffold involved in this incident may have contributed to this incident.

***Recommendation #3: Equipment should be periodically inspected to ensure that all components are operational. This inspection should be accomplished by personnel thoroughly familiar with the equipment and the design capabilities.***

Discussion: While the scaffold in this incident had reportedly been inspected the previous week, the inspector apparently did not detect the broken spring in the emergency brake. Failure to detect and correct this problem contributed to this incident.

***Recommendation #4: Manufacturers of suspension scaffolds should review design of controls for these units to determine if practical design changes could be made which would reduce the chance of incidents like this in the future.***

Discussion: A design modification which automatically disengaged the parking brake whenever the hoist mechanism is engaged to raise or lower the scaffold could prevent this type of incident from developing. In addition, a standardization of control design for these scaffolds among all manufacturers could reduce the chance of employee error in the operation of the scaffold.

***Recommendation #5: The employer should design, develop, implement, and enforce a comprehensive safety program.***

Discussion: Employers should ensure that employees are trained to recognize and avoid hazardous work conditions and that the work environment is safe. Employers should design, develop, implement, and enforce a comprehensive safety program to protect workers as required by OSHA Standard 1926.20. The company had no formal comprehensive safety program, and unsafe work practices had been tolerated. Although a relatively small company, the employer should immediately evaluate the tasks performed by workers; identify all potential hazards; and then design, develop, implement, and enforce a comprehensive safety program addressing these issues. Also, prior to starting any job, the employer should conduct a jobsite survey, identify all hazards, and implement appropriate control measures.

## **FACE 89-35: Stucco Mason Dies in Fall from Scaffold**

### **INTRODUCTION**

The National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR), performs Fatal Accident Circumstances and Epidemiology (FACE) investigations when a participating state reports an occupational fatality and requests technical assistance. The goal of these evaluations is to prevent fatal work injuries in the future by studying the working environment, the worker, the task the worker was performing, the tools the worker was using, the energy exchange resulting in fatal injury, and the role of management in controlling how these factors interact.

On April 21, 1989, a 28-year-old male stucco Mason died as the result of falling approximately 48 feet from a scaffold.

### **CONTACTS/ACTIVITIES**

State officials notified DSR of this fatality and requested technical assistance. On May 15, 1989, two research safety specialists met and discussed the incident with the company's representative and the Occupational Safety and Health Administration (OSHA) compliance officer assigned to the case. The foreman assigned to the job was interviewed, and the incident site was inspected and photographed. Reports relating to the incident were obtained from the responding emergency medical service and investigating police department.

### **OVERVIEW OF EMPLOYER'S SAFETY PROGRAM**

The victim had been employed for 6 months as a stucco mason by a contracting company that has been in operation for 18 months. (Stucco is a material which is applied while in a plastic state to masonry or frame walls to form a hard exterior finish.) The company employs 16 workers, including 8 stucco masons. The employer has no written safety policy and does not use written safety rules or procedures. Also, personal protective equipment was not used at the jobsite, except for head protection (i.e., hard hats).

### **SYNOPSIS OF EVENTS**

The company had been contracted to apply stucco to the outside walls of a recently built six-floor college dormitory. Tubular welded frame scaffolding had been erected around the perimeter of the dormitory from ground level to the uppermost floor to enable the workers to apply the stucco material.

On the morning of the incident the victim was working as a member of a 16-person crew assigned to continue work on the dormitory. Several small (2-3 person) groups were involved in different phases of work on two sides of the dormitory. The victim and two co-workers were affixing lath (i.e., 2-foot by 8-foot sheets of heavy gauge perforated paper laminated to approximately 14-gauge wire) to the outer wall of the dormitory. The lath would later be covered by the stucco material. The victim was working from the scaffolding at the fifth level, while the two co-workers were working from the scaffolding at the fourth and sixth levels.

Although the incident was unwitnessed, it is assumed that the victim started to climb to the next level of scaffolding by stepping onto the bottom guardrail. (The victim had been previously observed climbing from level to level of the scaffolding without using the built-in scaffold ladder.) The guardrail, which may have

been loosely secured or not secured at all to the scaffolding uprights, gave way allowing the victim to fall approximately 48 feet to the ground. Another employee saw the victim strike the scaffold planking at the first level before he struck the ground (see Figure).

Emergency medical service (EMS) personnel arrived at the scene in approximately 4-5 minutes. EMS technicians found the victim unconscious and breathing intermittently. They began advanced life saving support treatment and then transported the victim to the local hospital emergency room. The victim died at the hospital approximately 90 minutes after the incident.

## **CAUSE OF DEATH**

The medical examiner reported the cause of death as multiple blunt force trauma.

## **RECOMMENDATIONS/DISCUSSION**

***Recommendation #1: Where the potential for a fall from an elevation exists, employers should ensure that fall protection equipment is provided and used by workers.***

Discussion: The use of safety belt/lanyard combination is required by 29 CFR 1926.104. Use of the safety belt or body harness/lanyard with a rope grab device and lifeline is appropriate for persons working from scaffolds at varying heights. This type of fall protection permits employees to move about the scaffold without being restricted while still providing fall protection. Properly used, this type of fall protection may have prevented the worker in this incident from falling. In this case, however, no fall protection equipment of any type was provided for the workers, clearly indicating management's lack of concern for worker safety.

***Recommendation #2 Employers should conduct initial and periodic inspections of erected scaffolding.***

Discussion: After the erection of scaffolding at any project site the employer should designate a competent person to initially inspect the scaffolding and again, at designated intervals, re-inspect the scaffolding. Areas of consideration for inspection should include, but not be limited to the following:

- 1) Braces
- 2) Brackets
- 3) Footing (anchorage)
- 4) Guardrails and Toeboards
- 5) Ladders
- 6) Legs
- 7) Locking Pins
- 8) Overhead Protection
- 9) Planking
- 10) Poles
- 11) Securing
- 12) Slippery Conditions
- 13) Trusses
- 14) Uprights.

The loose or unsecured guardrail may have been identified and corrected had proper installation, initial inspection, and/or periodic inspection procedures been used.

***Recommendation #3: Employers should comply with OSHA standards 1926.451 (a)(4), which requires guardrails and toeboards be installed on all open sides and ends of platforms more than 10 feet above the ground or floor, and 1926.451(a)(6), which requires screens between guardrails and toeboards where persons are required to work or pass under the scaffold.***

Discussion: Although additional injuries to other employees haven't occurred, the potential does exist. The scaffolding around the perimeter of the dormitory does not have any toeboards or protective screens installed. Employees working on the ground are at risk of being struck by falling objects (e.g., tools, materials). Employers should comply with OSHA standards 1926.451(a)(4) and 1926.451(a)(6) to further protect these employees at risk.

***Recommendation #4: Employers should ensure that foreign-born workers fully understand all information, particularly safety-related information, pertaining to their jobs.***

Discussion: The victim was of Korean descent and could not speak any English. He was from a different culture with possible different ideas of "safe" work ethics. The company has the responsibility to ensure that all workers understand the hazards associated with the work involved. Companies that employ foreign-born (immigrant) workers should identify the different languages spoken by the employers and design, implement, and enforce a comprehensive multilanguage safety program. The program should include, but not be limited to, a competent interpreter to explain the safety regulations to the foreign-speaking employees. Also, the employer should develop and post, at conspicuous places, safety posters/signs in that language.

***Recommendation #5: Worker safety should be considered and addressed in the planning phase of all work projects.***

Discussion: Safety concerns should be discussed and incorporated into all work projects during planning and throughout the entire project. In this instance, safety procedures for the work being performed were not planned. Employees were allowed to work in an area where the potential for a fall existed without adequate written and verbal instructions in recognition and avoidance of fall hazards, and without adequate fall protection equipment.

***Recommendation #6: The employer should design, develop, implement, and enforce a comprehensive safety program which includes worker training in recognizing and avoiding hazards.***

Discussion: The company had no formal comprehensive safety program, and unsafe work practices had been tolerated. Although a relatively small company, the employer should immediately evaluate the tasks performed by workers; identify all potential hazards; and then design, develop, implement, and enforce a comprehensive safety program addressing these issues as required by OSHA standard 1926.20. Additionally, OSHA Standard 1926.21(b)(2) requires employers to "instruct each employee in the recognition and avoidance of unsafe conditions and the regulations applicable to his work environment to control or eliminate any hazards or other exposure to illness or injury." Also, prior to starting any job, the employer should conduct a jobsite survey, identify all hazards, and implement appropriate control measures.



**Figure.** *The victim fell from the fifth-floor level of the scaffolding shown here, when he either stood on or fell against the guardrail causing it to give way. The victim was not wearing any fall protection equipment.*

## FACE 90-12: Painter Dies When Scaffold Falls Inside Municipal Water Tank in Indiana

### SUMMARY

A journeyman painter died when the swing scaffold he was using to access the interior of a 68-foot-tall by 32-foot-diameter municipal water tank fell. The painter was working from a single point suspension scaffold near the top of the tank. The painter was wearing a safety belt and lanyard secured to a lifeline. When he finished painting the upper area of the tank the painter disconnected his lanyard from the lifeline and moved to the other end of the scaffold to hand the spray paint gun he was using to his foreman. The foreman had just taken the spray paint gun from the victim when he heard a "pop" and saw the scaffold on which the victim was standing fall to the floor of the tank 65 feet below. Investigation after the incident revealed that the two "U" bolts on the cable which supported the block and tackle from which the scaffold was suspended had loosened enough to allow the cable to slip through them, causing both the scaffold and all of its supporting hardware to fall. The victim was pronounced dead at the local hospital approximately 1 1/2 hours after the incident. NIOSH investigators concluded that, in order to prevent similar incidents in the future, employers must ensure that:

- *appropriate personal protective equipment be worn properly and consistently whenever the potential for a serious fall exists*
- *suspension scaffold rigging be inspected periodically to ensure that all connections are tight and that no damage to the rigging has occurred since its last use.*

### INTRODUCTION

On October 22, 1989, officials of the Indiana Occupational Safety and Health Administration notified the Division of Safety Research (DSR) of the death of a 37-year-old male painter who died on October 21, 1989, when the suspension scaffold he was working fell 65 feet inside a municipal water tank. Technical assistance was requested by the Indiana Occupational Safety and Health Administration, and on November 30, 1989, a DSR safety specialist conducted an investigation of this incident. The investigator discussed the case with state officials and emergency services personnel. The investigator reviewed the incident with company officials, and investigated and photographed the incident site.

The employer, a painting contractor with 20 employees, has been in business for 7 years. The company has a designated safety officer and written safety rules and procedures, but no formal training program. The victim was hired as a journeyman painter, and had worked for the company for 1 month at the time of the incident. The victim had previously been employed as a painter by other contractors for approximately 10 years.

### INVESTIGATION

The victim was a member of a three-man crew engaged in painting the interior and exterior of two 68-foot-tall by 32-foot-diameter municipal water tanks. The crew had been working on this project for 2 weeks prior to the incident, and had completed all work on one tank and most of the exterior work on the second.

On the day of the incident, the crew arrived at the worksite at approximately 11:30 a.m. The crew consisted of a foreman, the victim, and a groundman. The foreman was going to spray paint the interior of the water

tank while the victim was to finish work on the exterior of the tank. The groundman was to work inside the tank handling the spray paint lines used in the operation. The victim, a journeyman painter, asked to paint the interior of the tank. The foreman agreed, and the victim proceeded to paint the interior of the tank while the foreman finished work on the exterior of the tank.

Access to the interior of the tank was provided through a manhole on the side of the tank at ground level, and a second manhole located on top of the tank. This second manhole was reached by climbing a fixed ladder on the exterior of the tank.

The interior sidewalls of the tank were reached via a swing scaffold rigged inside the tank. This scaffold consisted of an aluminum ladder secured to a steel "stirrup" (a steel bar bent into a box shape and installed perpendicular to the ladder) at each end. The ladder was thus subjected to loading while in a horizontal position, rather than in the vertical position for which it was designed. Cables from each stirrup ran to a common tie-off point. A cable from this common tie off point then passed through a block and tackle. By pulling on this cable the entire scaffold could be raised and lowered from the ground level of the interior of the tank (Figure). The block and tackle which supported the scaffold was secured by a single cable which looped around a vertical steel pipe on top of the tank and fastened back to itself by two "U" bolts.

The entire crew entered the tank through the lower manhole. The groundman and the supervisor then raised the scaffold with the victim on it to the top of the tank. The victim was wearing a safety belt and lanyard which was secured to a lifeline, with the lifeline secured to a steel railing on the top of the tank. The victim proceeded to paint the top few feet of the tank's interior. The foreman climbed the exterior ladder to the manhole on top of the tank to help complete work near the tank's top. At approximately 1:00 p.m., the victim completed painting at the upper level. He then disconnected his lanyard from his lifeline and moved over to where he could hand the paint spray gun to the foreman so the foreman could finish a small area at the top of the tank. The foreman had just taken the spray gun from the victim when he heard a "pop" and saw the victim and the scaffold on which he was standing, fall to the floor of the tank 65 feet below. The victim and the scaffold struck the floor of the tank, barely missing the groundman. The foreman called to the groundman and told him to go next door and call an ambulance. The foreman then descended the ladder on the exterior of the tank and went in to assist the victim. The Emergency Medical Service (EMS) unit arrived on the scene approximately 5 minutes after the incident, removed the victim from the tank via the lower manhole, and transported him to the local hospital. The victim was pronounced dead at the hospital at 2:29 p.m.

Investigation after the incident revealed that the two "U" bolts on the cable which supported the block and tackle had allowed the cable to slip through them, causing both the scaffold and all of its supporting hardware to fall. This particular rig had been used daily for 2 weeks preceding the incident with no problems.

## **CAUSE OF DEATH**

The cause of death was listed by the coroner as "hemorrhage from severe liver laceration and brain stem hematoma."



## RECOMMENDATIONS/DISCUSSION

***Recommendation #1: Appropriate personal protective equipment should be worn at all times whenever the potential for a serious fall exists.***

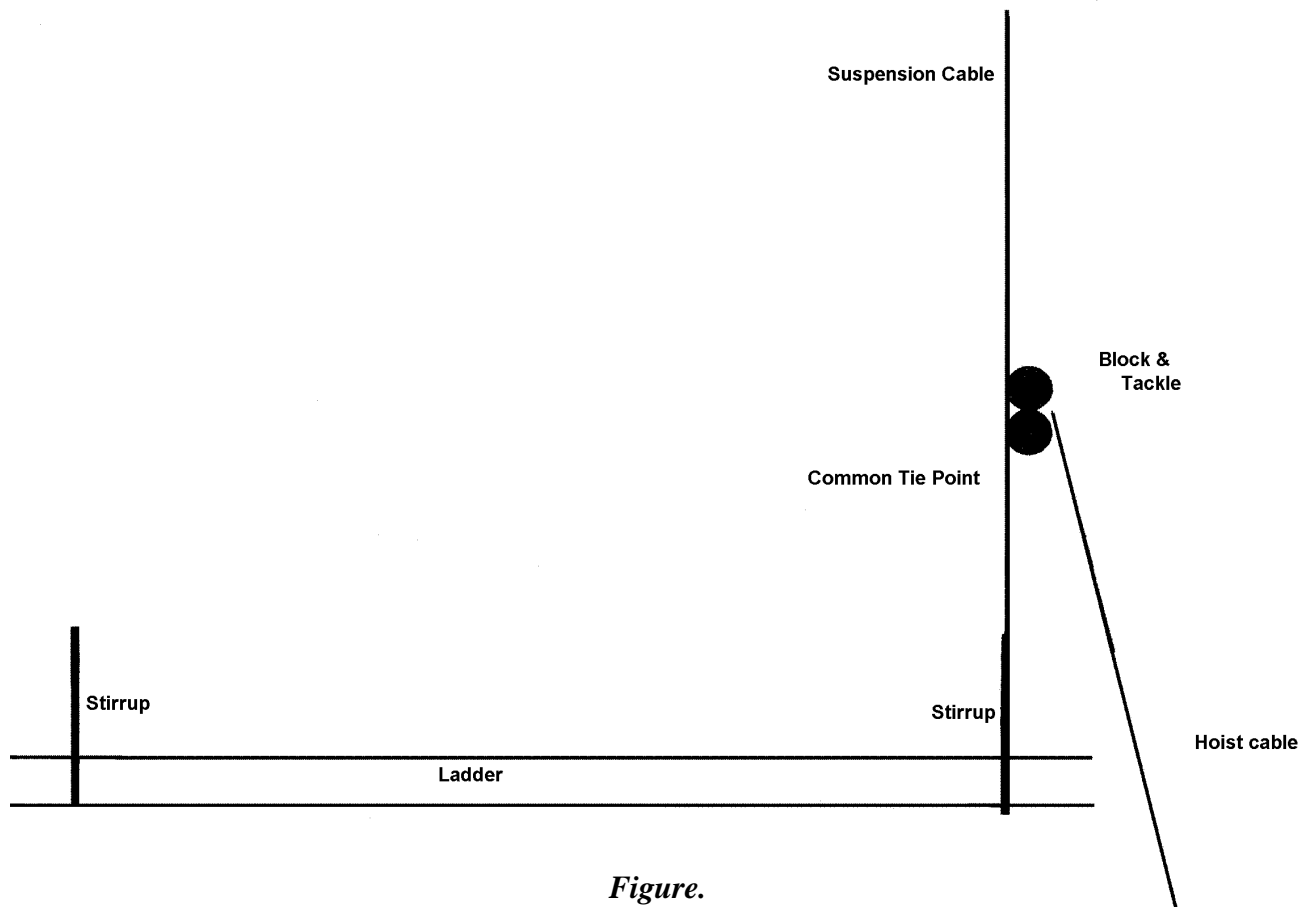
Discussion: In this case the victim was wearing a safety belt and lanyard, however at the moment when the incident occurred he was not hooked up to his lifeline. This failure to use PPE at all times during the job allowed the victim to experience a fatal fall when a scaffold failure occurred.

***Recommendation #2: Suspension scaffold rigging should be inspected periodically to ensure that all connections are tight and that no damage to the rigging has occurred since its last use.***

Discussion: The scaffold rigging in this case had been used daily for 2 weeks prior to the incident; however, no periodic inspection program was in place. It appears that the "U" bolts holding the scaffold had loosened over time, although this loosening had not been observed by workers at the site.

***Recommendation #3: Equipment should only be used for the purpose for which it was designed.***

Discussion: The "scaffold platform" in this incident was a simple aluminum ladder. This ladder was designed to support a load in a vertical position but was being utilized to support a load while in a horizontal position. While this did not directly contribute to this incident, the potential for a failure of the ladder while being used in this manner was certainly present.



***Figure.***

## **FACE 90-13: Asbestos Worker Dies in Fall from Scaffold in Indiana**

### **SUMMARY**

A 21-year-old asbestos worker died as a result of injuries sustained in a 12-foot fall from a scaffold. The victim was a member of a six-man crew engaged in the removal of asbestos-contaminated insulation from a series of large ducts on the exterior of an electric power generation plant. The victim was removing asbestos insulation from a large outdoor metal duct approximately 14 feet above the ground. The worksite was accessed by tubular metal scaffolding. The victim was working at the 12 foot level of the scaffold. The scaffold was not decked at this level. Instead, the crew had installed a single 2-inch by 12-inch plank across the tubing. The plank extended beyond the tubing on both sides and was not fastened in position to the tubing. Instead, the crew had driven two nails into each end of the plank at 45 degree angles to hold the plank against the tubing while allowing them to slide the plank along the tubing to various areas where they were working. The nails on one end of the plank had loosened sufficiently to slip free from the scaffold. The weight of the victim on the opposite end of the plank caused the plank to rise up in the air, dropping the victim to the ground below. NIOSH investigators concluded that, in order to prevent similar occurrences in the future, employers and employees must:

- *fully deck all scaffolds and secure decking material in accordance with existing OSHA regulations*
- *provide appropriate fall protection equipment to all employees whenever the potential for a serious or fatal fall exists*
- *provide safety training to all employees which address all potential hazards to which the employee may be exposed, especially the proper use of scaffolding and fall protection equipment.*

### **INTRODUCTION**

On November 2, 1989 officials of the Indiana Occupational Safety and Health Administration notified DSR of the death of a 21-year-old male asbestos worker who died as a result of a 12-foot fall from a scaffold on August 18, 1989 and requested technical assistance. On November 29, 1989 a DSR safety specialist conducted an investigation of this incident. The case was discussed with state officials and emergency services personnel, and the incident was reviewed with company officials.

The employer is a large, multistate insulation contractor. The company employs 500 individuals, including 100 asbestos workers who remove asbestos-contaminated insulation. The company has a designated safety officer and written safety policy and procedure manuals. The victim had been employed by the company for 1 month at the time of the incident. Although the victim had received safety training from the company, the primary focus of this training was asbestos removal procedures. (Note: The company had no policy in place requiring the use of fall protection equipment at the time this incident occurred. Since the incident, a policy has been implemented requiring the use of safety belts/lifelines whenever employees are working on any elevated surface.)

### **INVESTIGATION**

On the day of the incident, a six-man crew was removing asbestos-contaminated insulation from a series of large ducts on the exterior of an electric power generation plant. The crew had been working intermittently at the plant (as environmental conditions permitted) for several days prior to the incident.

On the morning of the incident, the crew started work at 7:00 a.m. The victim was removing asbestos insulation from a large outdoor metal duct approximately 14 feet above the ground. The worksite was accessed via metal tubular scaffolding.

Each section of the scaffolding formed a 10-foot by 6-foot rectangle. The victim was working at the 12-foot level where the scaffold was not decked. Instead, the work crew had installed a single 8-foot-long, 2-inch by 12-inch plank across the tubing. This plank extended approximately 14 inches past the end of the scaffold tubing on one side, and approximately 10 inches past the tubing on the other side. This plank was not fastened in position on the scaffold tubing; rather, the crew had driven two nails into each end of the plank at 45 degree angles, to hold the plank against the tubing (Figure). This procedure allowed the workers to slide the plank along the tubing (along the 10-foot side) to various areas where they were working.

The victim was sitting astride the tubing, on the end of the plank with the 14-inch overhang, to remove asbestos from the duct. Two co-workers had stepped off of the same plank about 5 minutes earlier.

Although no one witnessed the incident, it appears that the nails on one end of the plank had loosened sufficiently to allow the plank to slip free from the scaffold. The weight of the victim on the opposite end of the scaffold caused the plank to rise up in the air, dropping the victim to the ground below where he was struck by the falling plank. The two co-workers heard the victim and the plank strike the ground. The co-workers immediately called for help and went to the victim. The victim was conscious but told the co-workers that he "couldn't feel anything." He asked the co-workers to "put my hands on my chest," which they did.

Local Emergency Medical Service (EMS) personnel arrived on the scene approximately 8 minutes after the incident, and promptly transported the victim to a local hospital. The victim died in the hospital 65 hours after the incident.

## **CAUSE OF DEATH**

The Coroner gave the cause of death as bronchopneumonia and sepsis complicating blunt force injury of the neck.

## **RECOMMENDATIONS/DISCUSSION**

***Recommendation #1: All scaffolding should be fully decked and all decking material secured in accordance with 29 CFR 1910.28(1) and 1926.451(2).***

Discussion: The scaffold in this incident was not properly decked, and the planking used for decking was not properly secured. These two conditions were major contributors to this incident.

***Recommendation #2: Appropriate fall protective equipment should be employed wherever the potential for a serious or fatal fall exists.***

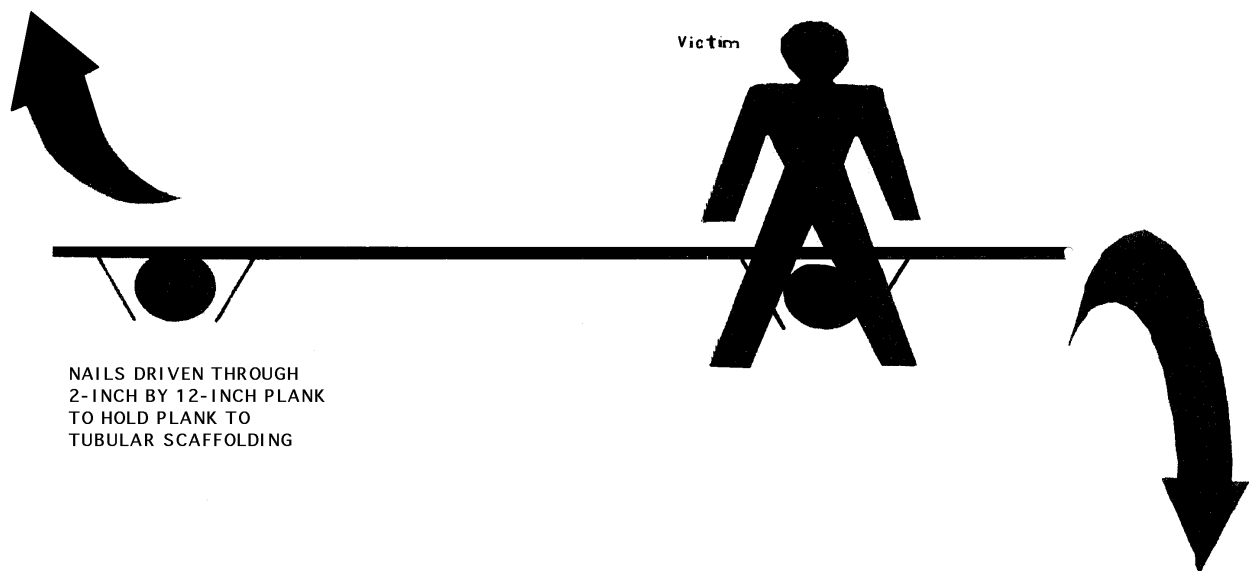
Discussion: The victim was not using any type of fall protection equipment when this incident occurred. A safety belt and lanyard could have prevented this fatality had they been utilized.

***Recommendation #3: Employee safety training should address all potential hazards to which an employee may be exposed.***

Discussion: While the employer in this case did have a safety training program, this program dealt specifically with the hazards of asbestos removal work. The employer's program failed to address other hazards to which employees may be exposed, such as falls and the proper installation and use of scaffolding. A comprehensive safety training program emphasizing the hazards posed by falls and stressing the use of appropriate personal fall protection equipment, might have prevented this fatality.

## REFERENCES

1. 29 CFR 1910.28. Code of Federal Regulations. Washington, D.C.: U.S. Government Printing Office, Office of the Federal Register.
2. 29 CFR 1926.451. Code of Federal Regulations. Washington, D.C.: U.S. Government Printing Office, Office of the Federal Register.



*Figure.*

## **FACE 90-16: Painter Dies Following a 40-foot Fall from Scaffold Inside Water Tank in Ohio**

### **SUMMARY**

A painter sandblasting the interior of a water tank, died after falling 40 feet from a four-point suspension scaffold when one of the nylon suspension ropes broke. The painter had previously welded some steel brackets to the inside top wall of the tank in order to install a fall protection anchor cable. Later, as the painter, a co-worker, and the company owner were raising one end of the scaffold platform during a sandblasting operation, a suspension rope broke, causing the painter to fall. An OSHA investigation determined that the rope broke at a point where it had been burned, presumably when the steel brackets were welded. NIOSH investigators concluded that, in order to prevent future similar occurrences, employers should:

- *prohibit welding in the vicinity of synthetic rope suspension scaffolding*
- *construct and maintain suspension scaffolding in accordance with OSHA and ANSI Standards*
- *ensure that fall protection equipment is provided and used by workers as needed*
- *develop and implement a safety program to help workers recognize and control hazards*
- *develop and implement procedures for entry and work in confined spaces.*

Additionally, tank designers/manufacturers should:

- *design and install appropriate tank anchor points for maintenance purposes*

### **INTRODUCTION**

On November 20, 1989, a 39-year-old male painter (victim) fell 40 feet from a scaffold, when one of the nylon suspension ropes supporting the scaffold broke. Although the incident occurred in Ohio, the victim died in a Pennsylvania hospital. On November 30, 1989, officials from a county coroner's office in Pennsylvania notified the Division of Safety Research (DSR) of the death, and requested technical assistance. On December 12, 1989, a research industrial hygienist from DSR traveled to the incident site to conduct an investigation. The DSR investigator reviewed the incident with company representatives and the OSHA compliance officer assigned to the case, and obtained photographs and diagrams of the incident site.

The employer is an industrial painting contractor who has been in business for 10 years. Most of the employer's business involves painting building exteriors and other outdoor structures. Contracted work is either done by the owner himself or with the help of one or two hired workers, depending on the job. The victim in this incident was the owner's brother, who also owned his own painting company and had been an industrial painter for 15 years. The employer has no safety program.

### **INVESTIGATION**

The employer had been contracted by a manufacturing company to sandblast and paint the interior and exterior of a 250,000- gallon steel water tank, which measures 48 feet high by 30 feet in diameter. The tank

has an 18-inch-diameter manway on the side 12 inches from the bottom, and a 3-foot-square hatch on top of the tank near the edge.

The employer hired a laborer to help him with the job. The owner and laborer had sandblasted and painted the outside of the tank 3 weeks prior to the incident, using a two-point suspension scaffold. The scaffold consisted of a platform (20 feet long and 2 feet wide) constructed of angle iron and wood planks with a metal guardrail. The top rail of the guardrail was 40 inches above the platform. The platform was suspended by two, 5/8-inch-diameter nylon ropes from a triangular framework ("stirrup") of angle iron at the ends of the platform. The nylon ropes passed through a block and tackle hoist at both ends of the platform. The other end of each rope was tied to a vent pipe on top of the tank. By pulling and letting up on the individual ropes and tying them to the platform, the scaffold platform could be positioned at the desired height.

After painting the exterior of the tank, the owner hired his brother (the victim) to help him sandblast and paint the interior. In order to remove the moisture and condensation inside the tank, the owner opened the manway and hatch, and positioned two propane salamander heaters equipped with blowers just outside the manway to blow warm air into the tank. The owner, the victim, and the laborer entered the tank through the manway and hatch with the necessary scaffold parts, and set up a suspension scaffold similar to the two-point suspension scaffold used on the outside of the tank. However, with this scaffold, three platforms were joined together by overlapping the ends of two other platforms inside the stirrups at the ends of the center platform. The resulting configuration formed a "U"-shaped, four-point suspension scaffold (Figures 1 and 2).

Before the suspension scaffold was raised into position, the victim climbed a ladder to weld steel brackets to the opposite side walls at the top of the tank. The brackets were used to anchor a horizontal 3/8-inch-diameter steel cable (to be used as a fall protection anchor cable). The nylon suspension ropes were lying on the floor of the tank while the brackets were being welded. After the welding, the owner inspected the suspension ropes by passing each rope length through his hands, but did not notice any apparent damage to the ropes.

The four suspension ropes and two, 300-watt portable utility lights were then tied to angle iron roof support beams at the top of the tank. Another 300-watt utility light was secured to the center scaffold platform. The entire scaffold platform was raised to approximately 40 feet above the floor and the victim began sandblasting the top portion of the tank wall. During the sandblasting, the victim wore a supplied air respirator (without an auxiliary, escape-only SCBA), a sandblaster's hood, gloves, and coveralls. The owner urged the victim to wear a safety belt, secure it to a vertical rope (lifeline) with a rope-grab device, and secure the other end of the lifeline to the horizontal steel cable at the top of the tank. The victim chose not to wear the fall protection equipment, saying that it would get in his way. After the victim had sandblasted as much of the top portion of the tank as he could reach, the platform was lowered to the floor of the tank and the nylon suspension ropes were reattached to roof support beams above the portion of the tank which had yet to be sandblasted. The three men began raising the scaffold platform by alternately raising each suspension point a few feet at a time. Again, the victim did not wear any type of fall protection equipment. The laborer, however, did wear a safety belt/lifeline tied off to the steel cable as the owner had suggested. The owner was standing at the bottom of the tank during this time.

While the victim (who was standing on the platform at one end) was pulling on a suspension rope to raise one end of the scaffold, it broke, causing that end of the platform to fall. The victim fell approximately 40 feet, landing on a horizontal, 2-inch-diameter water pipe at the bottom of the tank. The laborer managed to remain standing on the other platform leg which stayed intact (Figure 2). The owner rushed to the victim

(who was unconscious but still breathing), placed the victim on a piece of planking, and the owner and laborer subsequently removed him from the tank through the manway. The laborer then ran to the manufacturing plant for help. The county emergency medical service (EMS) was notified and arrived at the site 12 minutes later. The victim was rushed to a local hospital and then air transported to a larger hospital where he died in the operating room 3 hours later. An OSHA investigation determined that the suspension rope broke at a point where it had been burned.

## **CAUSE OF DEATH**

The coroner listed the cause of death as blunt force trauma to the head and trunk.

## **RECOMMENDATIONS/DISCUSSION**

***Recommendation #1: Synthetic rope used in suspension scaffolding should be protected from heat producing sources.***

Discussion: Paragraph 3.25 of the American National Standards Institute (ANSI) "Safety Requirements for Scaffolding," A10.8-1977, states that "Special precautions shall be taken to protect scaffold members, including any wires, fiber, or synthetic rope when using a heat producing process." Occupational Safety and Health Administration (OSHA) standard 29 CFR 1926.451(a)(18) states that "No welding, burning, riveting, or open flame work shall be performed on any staging suspended by means of fiber or synthetic rope." An OSHA investigation after the incident determined that the rope had broken at a point where it had been burned. Exactly how the rope was burned is not clear. The victim had previously welded steel support brackets to the inside of the tank. Although the welding was not done from the scaffolding platform, it was performed above the nylon rope which was lying on the floor of the tank before the scaffolding was raised. Also, the 300-watt utility lights may have come too close or contacted the nylon suspension ropes sometime during the sandblasting operation.

***Recommendation #2: Suspension scaffolding should be constructed and maintained in accordance with OSHA Standard 19 CFR 1926.451, and ANSI Standard A10.8-1977.***

Discussion: The OSHA and ANSI Standards require synthetic or fiber rope used for scaffold suspension to be capable of supporting at least six times the rated load (29 CFR 1926.451(a)(19) and (i)(5), and ANSI A10.8-1977, 3.23). Due to the size and type of rope being used it is questionable whether it was capable of meeting this requirement.

***Recommendation #3: Where the potential for a fall from an elevation exists, employers should ensure that fall protection equipment is provided and used by workers.***

Discussion: Although fall protection equipment, consisting of a steel anchor cable secured horizontally across the top of the tank (to secure lifeline ropes), lifeline ropes, safety belts, and rope-grab devices, was available at the site during the incident, it was not used by the victim. The use of a safety belt/lanyard combination is required by 29 CFR 1926.451(i)(8) for use on two-point suspension scaffolds. The use of the safety belt or body harness/lanyard with a rope-grab device is appropriate for persons working from scaffolds at varying heights. Properly used, this type of fall protection would have prevented the victim from falling even when the scaffolding fell.

***Recommendation #4: Employers should develop and implement a safety program designed to help workers recognize, understand, and control hazards.***

Discussion: OSHA Standard 1926.21(b)(2) states that "the employer shall instruct each employee in the recognition and avoidance of unsafe conditions and the regulations applicable to his work environment to control or eliminate any hazards or other exposure to illness or injury." Even small companies should evaluate the tasks performed by workers, identify all potential hazards, then develop and implement a safety program addressing these hazards, and provide worker training in safe work procedures. Prior to starting any job, the employer should conduct a jobsite survey, identify all hazards, and implement appropriate control measures.

***Recommendation #5: Employers should develop and implement specific procedures for entry and work in confined spaces.***

Discussion: The owner and workers in this incident were working inside a confined space. Even though the victim died from the result of a fall, there were other potential hazards associated with the work to be performed inside the tank ( i.e., painting the inside of a tank with a toxic and flammable paint). Although most of the work contracted by the employer does not require confined space entry, it is reasonable to expect that future work might require the employer and hired workers to enter other types of confined spaces. The company should therefore, develop and implement a confined space entry program as outlined in NIOSH publications 80-106, "Working in Confined Spaces," and 87-113, "A Guide to Safety in Confined Spaces." Minimally, the following items should be addressed:

1. *Has the air quality in the confined space been tested for safety?*
  - Oxygen supply at least 19.5%
  - Flammable range less than 10% of the lower explosive limit
  - Absence of toxic air contaminants
2. *Have employees and supervisors been trained in the selection and use of personal protective equipment and clothing?*
  - Fall protection
  - Respiratory protection
  - Emergency rescue equipment
  - Protective clothing
3. *Have employees been trained for confined space entry?*
4. *Have employees been trained in confined space rescue procedures?*
5. *If ventilation equipment is needed, is it available and/or used?*
6. *Is the air quality tested when the ventilation system is operating?*



***Recommendation #6: The designers/manufacturers of tanks of this type should design and install appropriate anchor points for maintenance purposes.***

Discussion: Permanent structures of this type are known to require extensive maintenance when they are designed. It is essential that designers/owners of these facilities incorporate appropriate anchor points on tanks to which workers can adequately secure scaffolds and lifelines. Omission of designed anchor points causes workers to improvise anchors or not use them at all. This increases the possibility that a scaffold will be erected using improper procedures and components.

## **REFERENCES**

1. American National Standards Institute (ANSI) Inc., Safety Requirements for Scaffolding. ANSI A10.8-1977, 1977.
2. Office of the Federal Register. Code of Federal Regulations. Labor. 29 CFR Part 1926, pages 20, 180-181, U.S. Department of Labor, Occupational Safety and Health Administration, Washington, D.C.
3. National Institute for Occupational Safety and Health, Criteria for a Recommended Standard ... Working in Confined Spaces. DHHS (NIOSH) Publication Number 80-116, December 1979.
4. National Institute for Occupational Safety and Health, A Guide to Safety in Confined Spaces. DHHS (NIOSH) Publication Number 87-113, 1987.

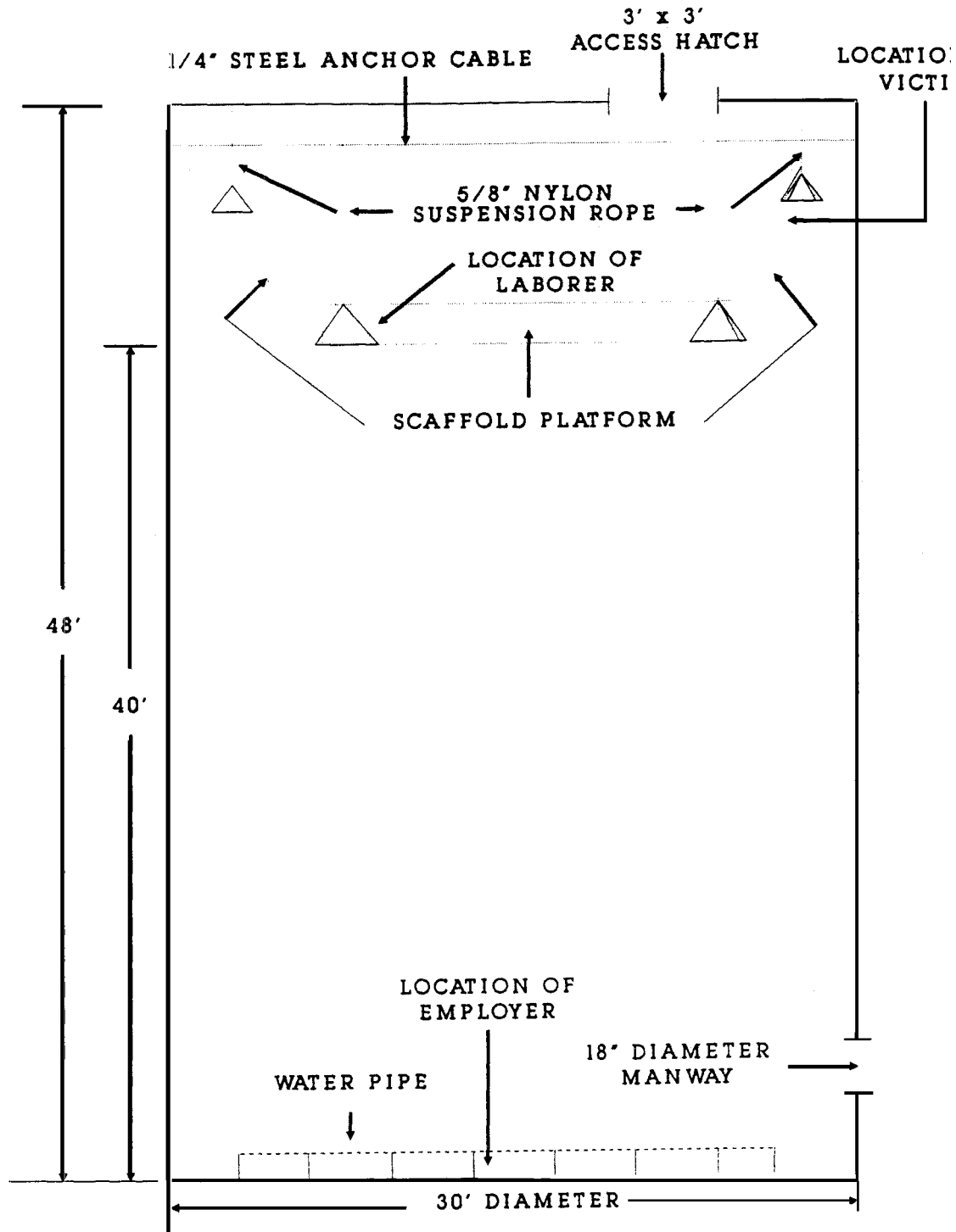
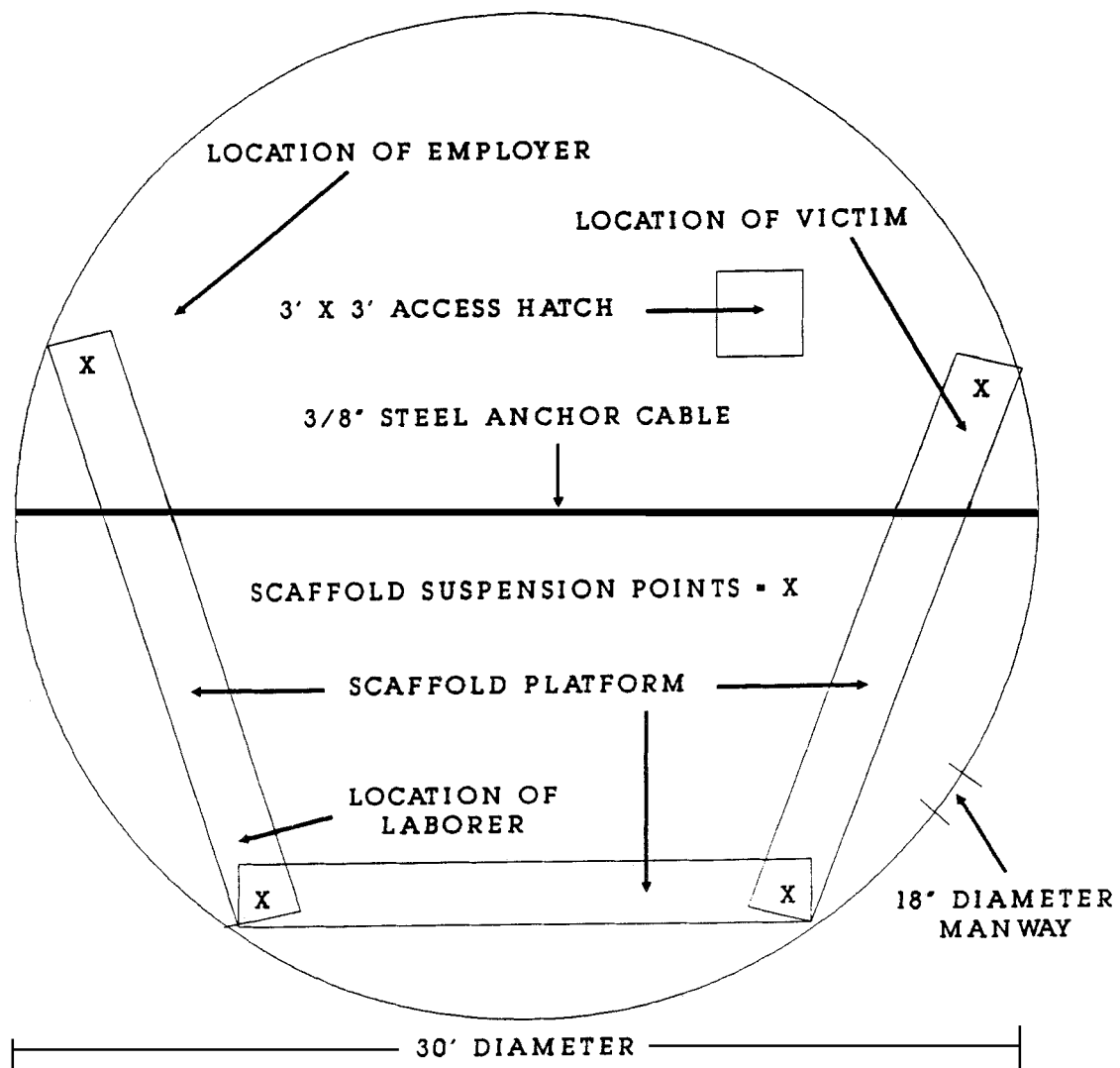


Figure 1. Water Tank (Side View)



*Figure 2. Water Tank (Top View)*

## **FACE 90-20: Mason Dies after Falling 36 Feet from Scaffolding**

### **SUMMARY**

A male brick mason (victim) fell 36 feet to his death while working from a tubular welded frame scaffold. The victim was working as part of a brick laying crew on the exterior of a new building. At the time of the incident, the crew was working from the 6th level of the scaffold. When the work had been finished at this level, the foreman told the workers to take a break while he and a laborer raised the planks to the next level. For some unknown reason, the victim stayed on the scaffolding. Prior to his unwitnessed fall 36 feet to the ground, the victim was seen with one foot on a scaffold brace and the other on the brick sill of the building. NIOSH investigators concluded that, in order to prevent future similar occurrences, employers should:

- *ensure that employees are informed of the hazards of using diagonal braces as a means of climbing a scaffold*
- *conduct scheduled and unscheduled safety inspections regularly at each jobsite*
- *develop, implement, and enforce a comprehensive safety program that includes, but is not limited to, training workers in the proper methods of erecting and working from scaffolds*
- *provide appropriate fall protection equipment to all workers who may be exposed to a fall hazard.*

### **INTRODUCTION**

On November 3, 1989, a 33-year-old brick mason died after falling 36 feet from a tubular metal frame scaffold. On November 9, 1989, officials of the Maryland Occupational Safety and Health Administration notified the Division of Safety Research (DSR) of the death and requested technical assistance. On December 12, 1989, a DSR safety engineer conducted an investigation and met with a company official to discuss the incident. Photographs of the incident site were taken and emergency medical services (EMS) records were obtained.

The employer is a masonry construction company that has been in business for 6 years. The company employs 100 workers, including 30 masons. The company has a designated safety officer and a written safety policy and safety procedures. The company holds regular safety meetings and provides both on-the-job and classroom safety training. Prior to this incident the company had gone approximately 2 years without a lost-time injury. Since this incident, the company has instituted measures for taking disciplinary action for failure to comply with safety rules.

The victim had been hired as a mason/foreman approximately one month prior to the incident. The victim had worked as a mason for over 10 years prior to coming to work for this company.

### **INVESTIGATION**

The victim was working as part of a four-person crew (foreman, two masons and a laborer) laying brick on the exterior of a new building. The crew was working from the 6th level of a tubular welded frame scaffold. (Each level of the scaffold was 6 feet high.) The scaffolding was erected about 2 feet parallel from the face of the building and had attached outriggers (metal brackets installed on the scaffolding toward the

building) on which planks were placed for the masons to work from. The crew had just finished laying the brick for the window sill at the third floor level. The foreman told the victim and another mason to take a break while he and a laborer raised the planks to the next level. The co-worker stepped from the scaffold into the building and went down to the ground floor to get some coffee. The victim, for unknown reasons, decided not to leave the work area. He was noticed by a worker to have one foot on the brick sill and his other foot on one of the scaffold's diagonal braces. Witnesses stated that there was some moisture on the scaffolding components that morning which may have made the metal slippery. The victim apparently lost his balance (or slipped) and fell, unwitnessed, to the ground through the center of the scaffolding. The foreman had his back to the victim and was two sections of scaffolding away when the incident happened. The sound created when the victim hit the ground alerted the other workers that he had fallen.

The emergency medical service (EMS) was summoned and arrived at the scene within 2 minutes after receiving the call. The EMS records indicate that the victim was unconscious and in respiratory arrest. He was bleeding from both ears and the nose and had a compound fracture of the skull. The technicians were unable to determine the victim's blood pressure and 8 minutes after arriving were no longer able to detect a pulse. The victim was transported by helicopter to a trauma center where he was pronounced dead on arrival.

## **CAUSE OF DEATH**

The medical examiner's report stated that the cause of death was due to head injuries.

## **RECOMMENDATIONS/DISCUSSION**

***Recommendation #1: Employers should ensure that employees are informed of the hazards of using diagonal braces as a means of climbing a scaffold.***

Discussion: The victim was apparently climbing or maneuvering on the scaffolding by using the diagonal braces as a foot support. Employers should instruct workers that the proper way to climb scaffolding is via the ladders provided.

***Recommendation #2: Employers should conduct scheduled and unscheduled safety inspections regularly at each jobsite to ensure worker compliance with established safe work procedures.***

Discussion: Employers should conduct, or appoint safety personnel to conduct, scheduled and unscheduled safety inspections at each jobsite to ensure that established safety procedures are being followed. Conducting such safety inspections demonstrates to workers a management commitment to enforcing its safety policies and procedures.

***Recommendation #3: Employers should develop, implement, and enforce a comprehensive safety program that includes, but is not limited to, training workers in the proper methods of erecting and working from scaffolding.***

Discussion: Employers should emphasize worker safety by developing, implementing, and enforcing a comprehensive safety program to reduce and/or eliminate worker exposures to hazardous situations. The safety program should include, but not be limited to, the proper methods for erecting and working from scaffolding.

***Recommendation #4: Employers should provide appropriate fall protection equipment for all workers who may be exposed to a fall hazard.***

Discussion: Employers should provide appropriate fall protection equipment for all workers exposed to fall hazards, and should provide worker training in the proper use of this equipment. Once this training is provided, employers should initiate measures to ensure the use of this fall protection equipment. A safety belt and lanyard would be appropriate fall protection equipment for use on scaffolding.

## **FACE 91-02: Electrician Dies After Fall in South Carolina**

### **SUMMARY**

A 34-year-old male electrician died after falling 12 feet from a scaffold that he was erecting. The victim and a helper were installing conduit for the lighting system in a new shopping mall directly below the steel-beam framework of the building's ceiling. The victim and his helper were using a mobile, aluminum-tubular-frame scaffold with 6-foot-high tiers, to access their work area. After dismantling the scaffold and moving to a location 30 feet from their previous work area, they erected the first tier and locked it in place. The victim erected the second tier of scaffold while the helper returned to the previous location to get some components for the third tier. At the time the helper left, the victim was moving two wooden floorboards from the second tier to the third tier. When the helper returned, he found the victim lying facedown on the concrete floor. The victim was bleeding severely from the nose and mouth, but was conscious. The supervisor at the scene called the job superintendent in the company trailer by two-way radio and told him to call the emergency medical service (EMS). Five minutes after the incident occurred, the victim lost consciousness and no vital signs could be detected. Cardiopulmonary resuscitation (CPR) was initiated immediately by co-workers. The emergency medical service (EMS) arrived 15 minutes after being called and transported the victim to the hospital, where he was pronounced dead on arrival. NIOSH investigators concluded that, in order to prevent future similar occurrences, employers should:

- *provide required personal protective equipment to employees, and ensure that it is used*
- *provide safety training to all new employees*
- *periodically observe the working habits of new employees to ensure that they are accomplishing their assigned tasks in a safe manner.*

### **INTRODUCTION**

On October 11, 1990, a 34-year-old electrician died after falling 12 feet from a mobile scaffold. On October 16, 1990, officials of the South Carolina Safety and Health Administration notified the Division of Safety Research (DSR) of this fatality, and requested technical assistance. On November 8, 1990, two safety specialists from DSR traveled to the incident site to conduct an investigation. The investigators reviewed the incident with the jobsite superintendent, the city police, and the county coroner. Photographs of the incident site and a final report were obtained from the county coroner. The police report was also obtained.

The employer is an interstate electrical contractor that has been in operation 70 years and employs 250 workers. The 17 workers employed at this jobsite included 7 electricians, 8 helpers, 1 supervisor, and the jobsite superintendent. The company hired the electricians and helpers from applications obtained through the local job service. The victim had been on the job for 2 days. New employees receive a handbook that contains the company safety rules. Weekly tailgate safety meetings are conducted at the jobsite by the job superintendent. The company provides on-the-job training, and funding for employees to attend a certified technical college. The job superintendent is responsible for safety.

## INVESTIGATION

The company had been contracted to install the electrical system for a new shopping mall complex under construction. The company had been working at the site for 4 months. On the day of the incident, the victim (an electrician) and a helper were installing conduit directly below the steel-beam framework of the structure's ceiling. The 1/2-inch conduit would encase the conductors for the structure's lighting system. The victim and the helper were using a mobile, aluminum-tubular-frame scaffold to access their work area. The scaffold was three tiers high. Each tier measured 4 feet wide by 8 feet long by 6 feet high. The work area was about 22 feet above ground.

The two men began work at 7:00 a.m., and by 8:00 a.m. were ready to move the scaffold to a new position. The two top tiers were dismantled and the bottom tier unit was moved 30 feet across the concrete floor to a new work area. Once in position, the scaffold's outriggers were put in place and the casters were locked. The men began to re-assemble the top two tiers of the scaffold. The second tier was put in place and the bottom section for the third tier was placed across its top. The victim began to move the two 2-inch by 8-inch by 8-foot floor boards from the second tier to the third tier. He had moved one of the boards when the helper walked to the previous work area to retrieve one of the side sections for the third tier.

When the helper returned, he found the victim lying facedown on the concrete floor. The victim was bleeding severely from the nose and mouth. The supervisor in the area called the superintendent in the company trailer by two-way radio and told him to call the emergency medical service (EMS). Five minutes after the incident occurred, the victim stopped breathing and no vital signs could be detected. Co-workers immediately initiated cardiopulmonary resuscitation (CPR). The EMS arrived 15 minutes after being called and transported the victim to the hospital, where he was pronounced dead by the attending physician.

## CAUSE OF DEATH

The coroner listed head trauma as the cause of death.

## RECOMMENDATIONS/DISCUSSION

***Recommendation #1: Employers should provide adequate personal protective equipment and ensure its use.***

Discussion: As required by 29 CFR 1910.268(g), safety belts and straps should be provided and the employer should ensure their use when work is performed at heights more than 4 feet above ground.

***Recommendation #2: Employers should instruct new employees in the proper methods to be used in the performance of assigned tasks.***

Discussion: Employers should ensure that new employees are instructed in the proper methods for performing assigned tasks, such as erecting and working from scaffolds, prior to the initiation of work.

***Recommendation #3: Employers should periodically observe the working habits of new employees to ensure that the workers are performing their assigned tasks in a safe manner.***

Discussion: Employers should conduct periodic random safety inspections to ensure that employees are performing their assigned tasks in accordance with established safe work procedures. Any violation of safety rules should be corrected immediately.



## **REFERENCE**

29 CFR 1910.268(g), Code of Federal Regulations, Washington, D.C.: U.S. Government Printing Office, Office of the Federal Register.

## **FACE 91-06: Construction laborer Dies After Falling 61 Feet From Work Platform in Virginia**

### **SUMMARY**

A 33-year-old male construction company laborer (victim) died after falling 61 feet from an elevated, electric-powered, mast climbing work platform. Brickmasons and other company employees (including the victim) were working from the platform to complete the brick-laying phase for the exterior of a six-story building. At the beginning of the work day, the work platform had been raised to the fifth floor level when the victim realized that the work he needed to do was on the fourth floor level. The victim notified one of the brickmasons (co-worker), who lowered the platform. When the platform walkway cleared the top of a window opening (measuring 4 feet wide by 5 feet high), the victim sat down on the walkway edge and attempted to step onto the window sill about 3 feet below. The victim's feet slipped off the sill, and he fell through the opening between the window and platform walkway to the ground 61 feet below. The victim died from injuries sustained in the fall. NIOSH investigators concluded that, in order to prevent future similar occurrences, employers should:

- *conduct jobsite surveys to identify potential hazards and implement appropriate control measures*
- *provide safety training that specifically addresses all identified jobsite hazards*
- *develop and implement safe work procedures for workers who are exposed to fall hazards*
- *provide appropriate fall protection equipment to all workers who may be exposed to a fall hazard.*

### **INTRODUCTION**

On November 1, 1990, a 33-year-old male construction laborer died after falling 61 feet from a brickmason's motorized lift/work platform. On November 14, 1990, officials of the Virginia Occupational Safety and Health Administration (VOSHA) notified the Division of Safety Research (DSR) of the death and requested technical assistance. On December 6, 1990, a research industrial hygienist from DSR traveled to the incident site and conducted an investigation. The DSR investigator reviewed the incident with the company owner, the medical examiner, and the VOSHA compliance officer assigned to the case. Photographs of the incident site were obtained during the investigation.

The employer in this incident is a construction company that has been in business for 36 years. Most of the work performed by the company involves masonry construction for large buildings. The company employs 50 workers, most of whom are brickmasons and laborers. The victim had been employed by the company over the previous 4 years as a laborer. The company has a written safety program consisting of general construction safety requirements. Enforcement of the company safety requirements is documented and had resulted in previous terminations of some employees. Construction safety is the responsibility of the jobsite foreman, who also conducts weekly "tailgate" safety meetings. The victim had attended numerous weekly safety meetings for this construction project. These safety meetings covered such subjects as general construction site safety, jobsite emergencies, and scaffolding. New employees receive on-the-job safety training from supervisors and co-workers.

## INVESTIGATION

A general contractor subcontracted the employer to lay the exterior brick for a six-story building at a university. The employer assigned a construction crew consisting of a foreman, four brick-masons, and two laborers (one of whom was the victim) to do the job. The crew had been working at the jobsite for about 2 weeks. By this time they had completed laying the bricks up to the fifth floor on one side of the building.

The brick work was done from an electric-powered, mast-climbing work platform (Figure). The platform was supported by a steel-frame mast secured to the building with cross members. The base of the mast was supported on an I-beam frame trailer (26 feet by 5 feet) with outriggers. The center of the main platform rode up and down the mast on a rack and pinion carriage, and was powered by two, 4-horsepower electric gear motors. The platform was operated with a remote pendant controller located on the platform.

The work surface of the steel-frame platform measured 7 feet wide by 50 feet long. It consisted of a plywood-surfaced main platform for holding materials (bricks, mortar, etc.), 5.5 feet wide by 50 feet long, and a wood-planked walkway platform ("foot boards") 20 inches wide by 50 feet long where workers stood to lay the brick.

The walkway was positioned 18 inches below the surface of the main platform and extended along the working face of the building at about 4 inches clearance. The outboard side and ends of the entire work platform were surrounded by a 42-inch-high steel frame/wire mesh guardrail and fence. Under normal working conditions, a guardrail is not installed on the walkway side of the platform.

At 6:30 a.m. on the day of the incident, the victim, co-worker and other brickmasons arrived at the site and climbed on the work platform to begin their work for the day. Using the pendant controller, the co-worker raised the work platform to the fifth story of the building. After reaching this level, the victim realized that the work he needed to do was inside the building on the fourth floor. He mentioned this to the co-worker, who lowered the work platform back toward the fourth floor.

As the platform descended, the victim attempted to enter the building through a window opening (measuring 4 feet wide by 5 feet high) on the fourth floor (Figure). When the platform walkway cleared the top of a window opening, the victim sat down (facing the building) on the walkway edge and began to step onto the window sill frame. When he did this, the walkway was still about three feet above the sill. At this moment, the co-worker yelled to the victim, "Wait a minute ... Wait a minute." The victim responded, "That's okay Buddy, no problem."

The victim supported himself with his elbows on the walkway foot boards. As he placed his feet on the sill and pushed off with his elbows, he slipped, falling forward. The victim struck his chin on the window sill, fell 61 feet, struck a horizontal I-beam on the trailer base, and landed 18 inches below the I-beam on the ground in the center of the trailer base.

The co-worker was the only one who witnessed the victim's fall. He yelled to the other brickmasons that the victim had fallen. The foreman, who was on the ground near the trailer, ran to the victim. The co-worker lowered the platform to a few feet above the ground. The co-worker and other brickmasons administered cardiopulmonary resuscitation (CPR) while the foreman called the emergency medical service (EMS). Personnel from the local EMS and the university police arrived approximately five minutes after receiving the call. EMS personnel checked the victim's vital signs, then called the local coroner, who pronounced the victim dead at the scene.

## CAUSE OF DEATH

The medical examiner listed multiple severe injuries as the cause of death.

## RECOMMENDATIONS/DISCUSSION

***Recommendation #1: Employers should conduct jobsite surveys to identify potential hazards and implement appropriate control measures.***

Discussion: Employers should conduct jobsite and equipment surveys to identify potential worker hazards. Once potential hazards have been identified, appropriate control measures should be recommended and implemented prior to the start of work at any jobsite.

Workers on this type of work platform (or scaffolding) at positions in front of open areas (e.g., windows, cantilevered sections, etc.), are exposed to a fall hazard. Fall protection consisting of a guardrail or other appropriate fall protection equipment (e.g., safety belt and lifeline) should be provided in accordance with OSHA Standard 29 CFR 1926.451(a)(4), and ANSI Standard A.92.6-90, Self-Propelled Elevating Work Platforms.

***Recommendation #2: Employers should provide safety training that specifically addresses all identified jobsite hazards.***

Discussion: OSHA Standard 29 CFR 1926.21(b)(2) states, "The employer shall instruct each employee in the recognition and avoidance of unsafe conditions and the regulations applicable to his work environment to control or eliminate any hazards or other exposure to illness or injury." Workers who use work platforms, scaffolds, etc., are exposed to fall hazards, and should be trained in specific safe work procedures and the use of fall protection equipment pertaining to their work.

***Recommendation #3: Employers should develop and implement safe work procedures for workers who are exposed to fall hazards.***

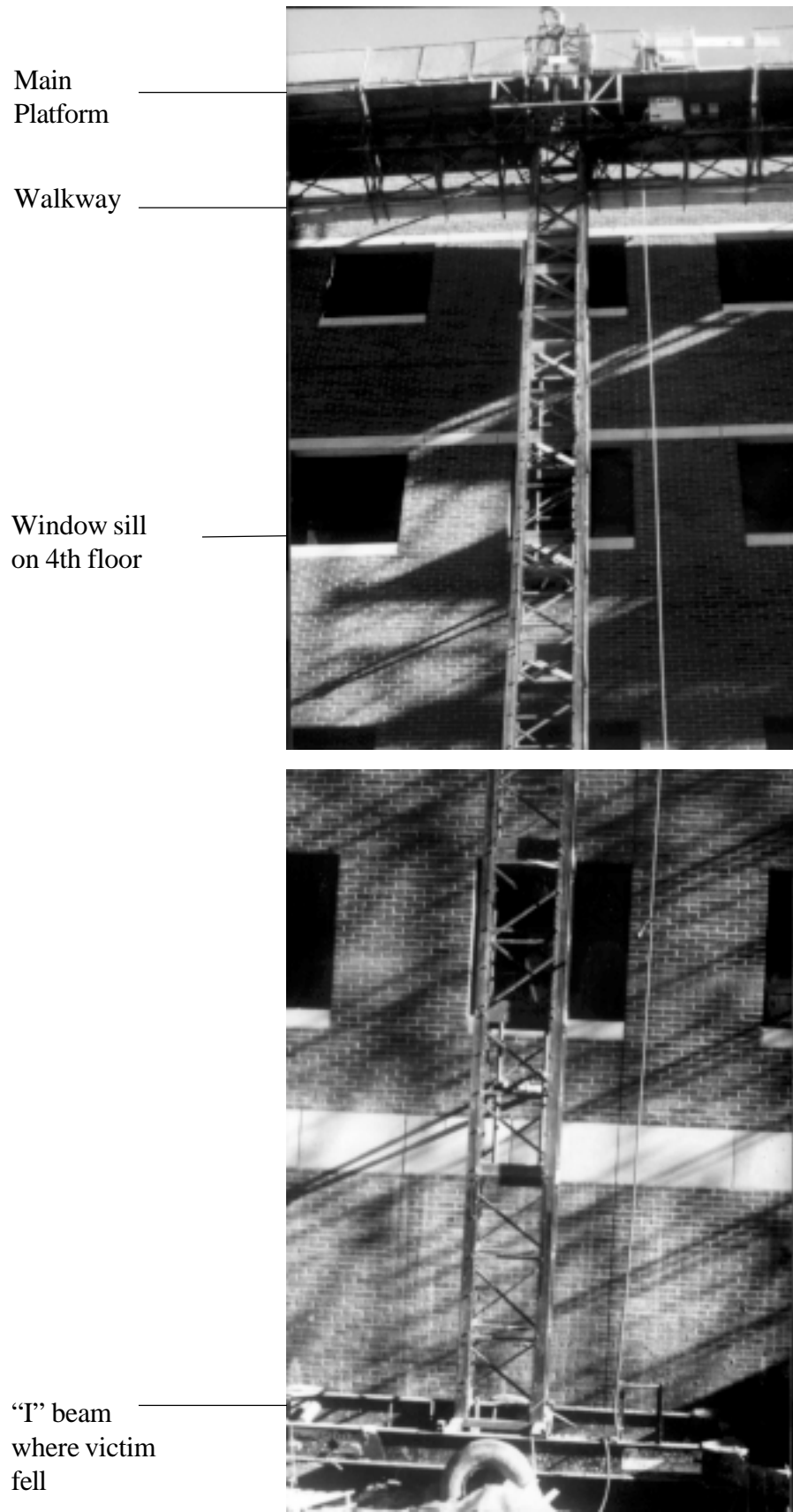
Discussion: The platform manufacturer had provided an operator's manual for the work platform. There are safe work procedures in the manual, but none specifically address fall protection. Printed safe work procedures for all elevated work platforms should address fall protection, especially for situations when the platform is in front of open areas at locations more than 4 feet above the ground level, and/or when the platform is in motion. Workers should not be allowed to stand or sit on the walkway of this type platform while the platform is in motion.

***Recommendation #4: Employers should provide appropriate fall protection equipment for all workers who may be exposed to a fall hazard.***

Discussion: Employers should provide appropriate fall protection equipment for all workers exposed to fall hazards, and should provide worker training in the proper use of this equipment. Once this training is provided, employers should initiate measures to ensure the use of this fall protection equipment.

## **REFERENCES**

1. Office of the Federal Register, Code of Federal Regulations, Labor, 29 CFR Part 1926.21(b)(2), and Part 1926.451(a)(4), U.S. Department of Labor, Occupational Safety and Health Administration, Washington, D.C., July 1989.
2. American National Standards Institute, Inc., A.92.6-90, Self-Propelled Elevating Work Platforms, October 1990.



*Figure.*

## **FACE 93-15: Painter/Sandblaster Dies Following a 30-foot Fall from Scaffolding Inside a Water Tank--South Carolina**

### **SUMMARY**

A 48-year-old male painter/sandblaster (the victim) died of injuries received after falling 30 feet from a tubular welded frame scaffold. The victim was part of a three-man crew that was sandblasting the interior of a newly constructed water storage tank needed for fire fighting. In preparation to sandblast and spray paint the tank's interior, workers on the daylight shift (7 a.m. to 5 p.m.) had erected 2 separate 30-foot-high tubular welded frame scaffoldings inside the tank. The victim and foreman were working the afternoon shift (5 p.m. to 3 a.m.) sandblasting the tank's interior walls, each working from an individual scaffold. A third crew member, the hole-watch, had been assigned ground duties which primarily consisted of getting supplies and assisting the sandblasters. At about 12:30 a.m. the following morning, the holewatch noticed that the victim had shut off his blast hose. A few minutes later, the foreman descended from the scaffolding upon which he was working and informed the holewatch he was ready to move his scaffolding. The foreman, after talking with the holewatch, wondered why the victim had stopped work and went looking for him. The victim was found lying injured and conscious, but incoherent, on the deck of the tank. The Emergency Medical Service (EMS) was called and arrived in less than 5 minutes. EMS personnel administered first aid and transported the victim 7 miles to the local hospital where he died 8 days later. NIOSH investigators concluded that, to prevent similar occurrences, employers should:

- *ensure that fall protection equipment is provided and used by workers where the potential for a fall from an elevation exists*
- *evaluate their current safety program and incorporate specific training procedures emphasizing the importance of recognizing hazards in the workplace, and following established safe work procedures with particular consideration to using appropriate personal protective equipment*
- *designate a competent person to conduct regular safety inspections.*

### **INTRODUCTION**

On April 7, 1993, a 48-year-old male painter/sandblaster (the victim) was injured when he fell 30 feet from a scaffold. He died 8 days later, on April 15, 1993, as a result of the injuries he received in the fall. On April 22, 1993, officials of the South Carolina Occupational Safety and Health Administration (SCOSHA) notified the Division of Safety Research (DSR) of this fatality, and requested technical assistance. On May 13, 1993, a safety specialist from DSR investigated the incident and reviewed the circumstances with one of the two company owners and the SCOSHA compliance officer assigned to the case. Photographs of the incident site were taken, and the medical examiner's report was requested.

The employer in this incident was a commercial and industrial painting contractor that had been in operation for 14 years and employed about 100 workers, of which approximately 90 were painters/sandblasters. The employer had a written safety policy and a safety program which consisted of job-specific safety procedures, a confined space entry program, a hazardous communication program, random drug testing, and a disciplinary program. Company management personnel were responsible for the enforcement of the safety program on a collateral-duty basis. The employer provided on-the-job training, and management personnel conducted tool-box safety meetings on a weekly basis. The victim worked for the company for

1 day as a painter/sandblaster, but had approximately 20 years' experience working in this occupation. This was the first fatality the company had experienced.

## INVESTIGATION

On the day of the incident, the victim arrived for his first day of work at about 4:40 p.m. The painting contractor had been hired by a paper processing plant to paint a metal, 40-foot-high by 40-foot-diameter water storage tank that had recently been constructed to store water for fire fighting. The contractor had rented tubular welded frame scaffolding to be used in completing the sandblasting and painting of the tank's interior. The daylight shift erected 2 separate 30-foot-high scaffoldings inside the tank in preparation for sandblasting during the afternoon shift.

The victim was picked up at the plant gate by the daylight foreman and given a site orientation which consisted of a review of basic safety rules for the paper processing plant (e.g., the need to wear eye and head protection within the plant) and location of the water storage tank. Following the orientation, the foreman spent 5 to 10 minutes with the victim discussing basic on-the-job safety rules, which included using personal protective equipment (e.g., safety belt, face shield, and blast hood). The victim was driven to the contractor's supply paint trailer (which was located on-site) and issued his blast hood, face shield, and safety belt and lanyard. Next, he was driven to the water tank and introduced to the afternoon foreman who was overseeing work at the water tank. Since the victim had approximately 20 years of experience, the afternoon foreman assumed he knew how to perform the job safely, and instructed him to start work. [Note: The victim apparently left the safety belt and lanyard that he had been issued in the daylight foreman's truck.]

At the time of the incident, approximately 12:30 a.m., the victim and foreman were each working from one of the 30-foot-high tubular welded frame scaffolds, sandblasting the interior wall of the tank. A third crew member, the holewatch, whose duties were restricted to ground activities, procured supplies and helped the sandblasters move the scaffolds. At about 12:35 a.m., the holewatch noticed that the victim had shut off his blast hose. A few minutes later, the foreman descended from the scaffolding upon which he was working, and informed the holewatch he was ready to move his scaffolding. The foreman, after talking with the holewatch, wondered why the victim had stopped work and went looking for him. He found the victim, lying injured and conscious, but incoherent, on the deck of the tank (Figure). The EMS responded in less than 5 minutes to the call for assistance, administered first aid, and transported the victim 7 miles to the local hospital, where he died 8 days later on April 15, 1993.

## CAUSE OF DEATH

The medical examiner's report listed the cause of death as closed head injury.

## RECOMMENDATIONS/DISCUSSION

***Recommendation #1: Employers should ensure that fall protection equipment is provided and used by workers where the potential for a fall from an elevation exists.***

Discussion: Employers should ensure by observation that fall protection equipment is being used. A lifeline for attaching a safety belt and lanyard was secured to the tanks' interior wall and was available during the incident; however, the victim apparently left the fall protection equipment he had been issued in the back of the daylight foreman's truck when he was driven to the worksite. The victim had approximately 20 years' experience in this occupation, and it was assumed he was aware of the need to wear fall protection equipment.



**Recommendation #2: Employers should evaluate their current safety program and incorporate specific training procedures emphasizing the importance of recognizing hazards in the workplace, and following established safe work procedures with particular consideration to using appropriate personal protective equipment.**

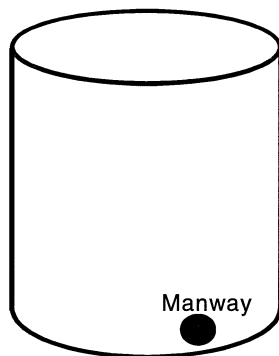
Discussion: In addition to developing a written safety program, employers should provide workers with appropriate training for the work they are to perform, and ensure they are proficient in job safety procedures before work begins. Such training should include recognizing hazards in the workplace, following established safe work procedures, and wearing appropriate personal protective equipment.

**Recommendation #3: Employers should designate a competent person to conduct regular safety inspections.**

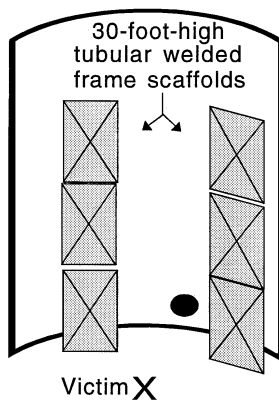
Discussion: A competent person<sup>1</sup> should conduct scheduled and unscheduled safety inspections of worksites to help ensure that established company safety procedures are being followed, and that appropriate personal protective equipment is used. Such inspections also demonstrate that the employer is committed to the company safety program and to the prevention of occupational injury.

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<sup>1</sup>Competent person: One who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has the authority to take prompt corrective measures to eliminate them.



Exterior of 40-foot-diameter by 40-foot-high water tank.



Interior, including scaffolding arrangement and location of victim inside water tank.

**Figure. Exterior and Interior of Water Tank**  
Not to Scale

## **FACE 94-15: Carpenter Dies After Falling 17 Feet From A Scaffold-- South Carolina**

### **SUMMARY**

A 28-year-old male carpenter (the victim) died after falling from a scaffold and striking his head on the ground. The victim and two co-workers had been assigned to install soffit board around the roof overhang of a private residence that was under construction. A co-worker observed the victim standing on the scaffold platform, nailing a board to the roof overhang, when he either lost his balance and fell, or became ill and fell onto the scaffold. He sat upright and started leaning to his right. At that time, a co-worker yelled to another co-worker in the area, to grab the victim as he might fall off the scaffold. Seconds later, the victim toppled off the unguarded scaffold, 17 feet to the ground, striking his head. The co-workers ran to the victim and found him unconscious and not breathing. One co-worker started cardiopulmonary resuscitation, while the other co-worker called for an ambulance. The ambulance and coroner arrived about the same time and the coroner pronounced the victim dead at the scene. NIOSH investigators concluded that, to prevent similar occurrences, employers should:

- *provide adequate guarding on scaffolding*
- *develop, implement, and enforce a comprehensive written safety program*
- *utilize contract language that requires sub-contractors to implement a site-specific safety and health program prior to the initiation of work*
- *routinely conduct scheduled and unscheduled workplace safety inspections*
- *encourage workers to actively participate in workplace safety.*

### **INTRODUCTION**

On June 22, 1994, a 28-year-old male carpenter (the victim) died from injuries received in a 17-foot fall from a scaffold. On July 23, 1994, officials of the South Carolina Occupational Safety and Health Administration (SCOSHA) notified the Division of Safety Research (DSR) of this fatality, and requested technical assistance. On September 21, 1994, a DSR safety specialist conducted an investigation of this incident. The incident was reviewed with the employer, county coroner, and SCOSHA compliance officer assigned to the case. Police and coroner's reports were obtained during the investigation.

The employer was a roofing contractor that had been in business for 12 years and employed four workers, all of whom were carpenters. The employer had no written safety program, but informal safety talks were said to have been given at each job-site. The victim had been employed for 1 day prior to the incident, and had about 4 years experience as a carpenter. This was the first fatality experienced by the employer.

### **INVESTIGATION**

The employer had been subcontracted to do outside trim work at a residence under construction in a private residential housing community. The house was a two-story wood and aluminum structure, and work had been in progress for about 2 days prior to the incident.

On the day of the incident, the workers (victim and two co-workers), arrived at the jobsite about 6:30 a.m., and were assigned to install soffit boards around the roof overhang of the house. Two carpenter's bracket scaffolds (i.e., scaffolds consisting of wood or metal brackets supporting a platform), were erected on opposite sides of the house. The scaffold from which the victim fell was 17 feet high and the platform consisted of one board (2-inches thick by 12-inches wide, which extended to a length of about 29 feet and was about 18 inches from the wall of the house). The platform, which was not protected by any guardrails, was supported by five pieces of angle iron irregularly spaced and attached to the studs of the house (Figure). The victim had been working from the platform nailing soffit boards to the overhang of the roof when the incident occurred. He was observed by a co-worker bending over, just prior to falling to the platform. It is unknown whether the victim became ill or lost his balance and fell to the platform; however, earlier that morning the victim had been complaining of chest pains but refused to go to the hospital for an examination. After the victim fell to the scaffold platform, he sat upright and began leaning over to his right. The co-worker on the ground had witnessed the event and yelled to the other co-worker, who was inside the house by the bay window, to grab the victim as he might fall off the platform. Seconds later, the victim toppled off the end of the unguarded scaffold, 17 feet to the ground, striking his head. The co-workers ran to the victim and found him unconscious and not breathing. One co-worker started cardiopulmonary resuscitation, while the other co-worker called for an ambulance. The ambulance and coroner both arrived about 10 minutes after being notified and the coroner pronounced the victim dead at the scene.

## **CAUSE OF DEATH**

The coroner's report listed the cause of death as severe head injury and fractured cervical spine.

## **RECOMMENDATIONS/DISCUSSION**

### ***Recommendation #1: Employers should provide adequate guarding on scaffolding.***

Discussion: The victim was nailing soffit boards to a roof overhang while standing on an unguarded scaffold platform. Guarding of the scaffold platform, as required by CFR 1926.451 (a)(4), which states "Guardrails and toeboards shall be installed on all open sides and ends of platforms more than 10 feet above the ground or floor," was not present.

### ***Recommendation #2: Employers should develop, implement and enforce a comprehensive written safety program.***

Discussion: The employer did not have a written safety program. The development, implementation, and enforcement of a comprehensive safety program should reduce and/or eliminate worker exposures to hazardous situations. The safety program should include, but not be limited to, protecting scaffold platforms with appropriate guardrailing and toeboards, the recognition and avoidance of fall hazards, and the use of appropriate safety equipment such as safety nets or safety belts and lanyards.

### ***Recommendation #3: Employers should utilize contract language that requires sub-contractors to implement a site specific safety and health program prior to the initiation of work.***

Discussion: General and subcontractors should use contract language that requires all subcontractors to identify how they intend to implement a site-specific safety and health program prior to the initiation of work. Subcontractors' safety programs should be consistent and compatible with the general contractor's

safety program. The contract should contain clear and concise language as to which party is responsible for a given safety or health issue. Any differences should be negotiated before work begins. Once the provisions for these responsibilities have been established, the respective parties should ensure that the provisions of the contract regarding safety and health are upheld.

***Recommendation #4: Employers should routinely conduct scheduled and unscheduled workplace safety inspections.***

Discussion: Employers should be cognizant of the hazardous conditions at jobsites and take an active role to eliminate them. Additionally, scheduled and unscheduled safety inspections should be conducted by a competent person<sup>1</sup> to ensure that jobsites are free of hazardous conditions. Even though these inspections do not guarantee the elimination of occupational injury, they do demonstrate the employer's commitment to the enforcement of the safety program and to the prevention of occupational injury.

***Recommendation #5: Employers should encourage workers to actively participate in workplace safety.***

Discussion: Employers should encourage all workers to actively participate in workplace safety and should ensure that all workers understand the role they play in the prevention of occupational injury. In this instance, the victim was working from a platform 17 feet from the ground without any guarding. Workers and co-workers should look out for one another's safety and remind each other of the proper way to perform their tasks. Employers must instruct workers of their responsibility to participate in making the workplace safer. Increased worker participation will aid in the prevention of occupational injury.

## **REFERENCES**

29 CFR 1926.451 (a)(4) Code of Federal Regulations, Washington, D.C.: U.S. Government Printing Office, Office of the Federal Register.

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<sup>1</sup>Competent person: One who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has the authority to take prompt corrective measures to eliminate them.

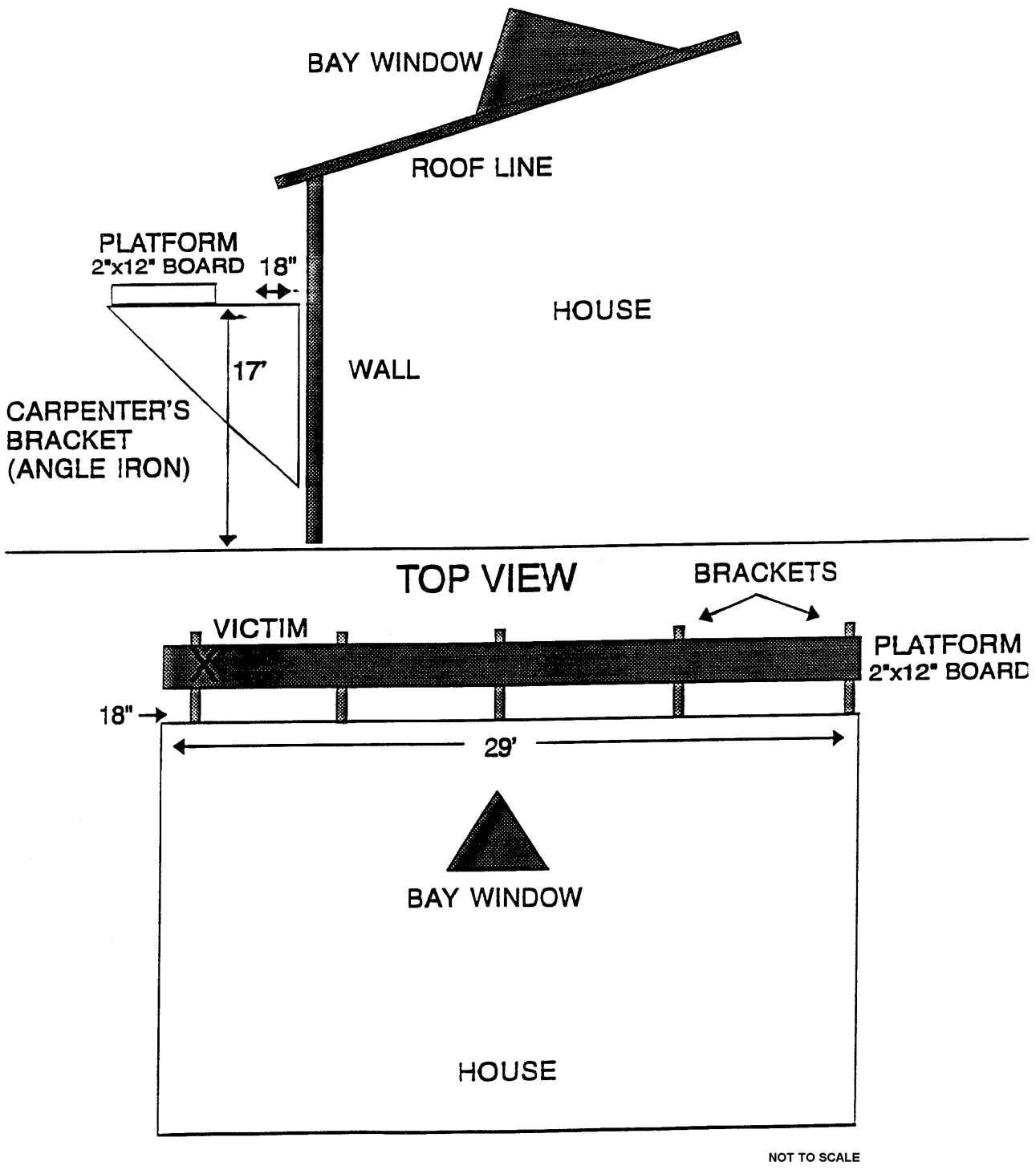


Figure. Scaffolding Layout (Side View)

## **FACE 95-06: Painter Dies After 35-Foot Fall From Scaffold--Tennessee**

### **SUMMARY**

A 60-year-old male painter foreman (the victim) died after falling 35 feet from the top stage of a tubular scaffold. The victim and a co-worker were painting the window frames and roof eaves of a church. The victim was working from a mobile tubular scaffold scraping and painting the roof eaves, while the co-worker was working on the windows from an extension step ladder. The top stage of the scaffold, from which the victim was working, was not equipped with side rails. After their morning break, the men repositioned the scaffold. The victim began to climb the scaffold to the top, and told the co-worker to put scrapers and a propane torch in the tool basket and tie the basket to the pull rope attached to the top rail of the scaffold. The victim was standing on two, 12-inch-wide by 6-foot-long unsecured boards that covered only 2/3 of the floor of the scaffold stage. As the co-worker was placing the tools in the basket, he heard a noise and looked up to see the victim falling from the top of the scaffold. The victim fell between the boards and the outside rails of the scaffold for approximately 15 feet. He then struck a scaffold cross brace that flipped him to the outside of the scaffold, and fell another 20 feet onto a 36-inch-high air conditioning unit. NIOSH investigators concluded that, to prevent similar occurrences, employers should:

- *provide adequate guarding on scaffolding and ensure its proper set-up*
- *ensure that appropriate fall protection equipment is available and correctly used when working where there is a danger of falling*
- *develop, implement, and enforce a comprehensive written safety program*
- *routinely conduct scheduled and unscheduled workplace safety inspections*
- *encourage workers to actively participate in workplace safety.*

### **INTRODUCTION**

On November 21, 1994, a 60-year-old male painter foreman (the victim) died of injuries received in a 35-foot fall from a scaffold. On January 30, 1995, officials of the Tennessee Occupational Safety and Health Administration (TOSHA) notified the Division of Safety Research (DSR) of this fatality, and requested technical assistance. On March 15, 1995, a DSR safety specialist conducted an investigation of this incident. The incident was reviewed with the employer and the TOSHA compliance officer assigned to the case. The medical examiner's report, the death certificate, and photographs of the site immediately following the incident were obtained during the investigation.

The employer was a commercial painting contractor that had been in business under the present ownership for 23 years, and employed anywhere from 20 to 90 painters, depending upon the workload. The employer had a written safety policy and basic written safe work procedures. Weekly safety meetings were conducted by the supervisor at the jobsite and training was conducted on the job. Fall protection equipment such as safety belts and lanyards were supplied by the employer. The victim had worked for the employer for 20 years. This was the first fatality experienced by the employer.

## INVESTIGATION

The employer had been contracted to scrape, prepare, and repaint the window frames and roof eaves of a church. The work had progressed on a part-time basis over a 2-month period. Up to that point, the men had finished most of the window frames using extension ladders and were ready to begin work on the roof eaves using a mobile tubular scaffold. The scaffold stages were 5-feet-high by 3-feet-wide by 6-feet-long. Seven stages were necessary to access the eaves. The men did not put the side rails on the seventh stage. Two 12-inch-wide boards were placed on the floor of the 7th stage, leaving a 12-inch gap between the edge of the board and the outside rail of the scaffold.

On the day of the incident, the victim was working from the scaffold scraping the eaves while the co-worker was working from an extension ladder finishing the windows. After their morning break, the victim began to climb the scaffold and instructed the co-worker to place additional scrapers and a propane torch in the tool basket that was tied to a pull rope attached to the top rail of the scaffold. As the co-worker was gathering the tools to place in the basket, he heard a noise and looked up to see the victim falling from the top of the scaffold. The victim fell between the edge of the floor board and the outside of the scaffold, falling approximately 15 feet before striking a cross brace on the scaffold. The victim was flipped to the outside of the scaffold and fell an additional 20 feet, landing on a 36-inch-high air conditioning unit. The victim was unconscious but breathing. The emergency rescue service was summoned by phone from the church parsonage and transported the victim to the local hospital, where he was pronounced dead by the attending physician.

## CAUSE OF DEATH

The medical examiner listed the cause of death as traumatic shock due to closed head trauma, ruptured spleen, and blunt force trauma, due to a fall.

## RECOMMENDATIONS/DISCUSSION

***Recommendation #1: Employers should provide adequate guarding on scaffolding and ensure its proper set-up.***

Discussion: The victim was scraping the roof eaves while standing on a scaffold stage without guardrails or toeboards. Guarding on scaffold platforms, is required by 29 CFR 1926.451 (a) (4), which states "Guardrails and toeboards shall be installed on all open sides and ends of platforms more than 10 feet above the ground or floor." Additionally, there were only two 12-inch-wide boards on the floor of the scaffold stage, leaving the 12-inch gap which the victim fell through. Proper set-up procedures include the installation of guardrails, midrails, and toeboards around the platform perimeter, as well as ensuring that the working surface is completely covered, eliminating floor openings.

***Recommendation #2: Employers should ensure that appropriate fall protection equipment is available and correctly used when working where there is a danger of falling.***

Discussion: 29 CFR 1926.501 (b) (1) states that "each employee on a walking/working surface (horizontal and vertical surface) with an unprotected side or edge which is 6 feet (1.8m) or more above a lower level shall be protected from falling by the use of guardrail systems, safety net systems, or personal fall arrest systems." In this incident, the scaffold was not equipped with guardrails, and although safety belts and lanyards were available in the truck, they were not used.

***Recommendation #3: Employers should develop, implement, and enforce a comprehensive written safety program.***

Discussion: The employer had basic written safety rules; however, the development, implementation, and enforcement of a comprehensive safety program should identify, and reduce or eliminate worker exposures to hazardous situations. The safety program should include, but not be limited to, ensuring that scaffold platforms are equipped with appropriate guardrails and toeboards; employing worksite hazard assessments to enable the recognition and avoidance of fall hazards; and providing, and enforcing, the use of appropriate safety equipment such as safety nets, or safety belts and lanyards.

***Recommendation #4: Employers should routinely conduct scheduled and unscheduled workplace safety inspections.***

Discussion: Employers should be aware of the hazardous conditions at jobsites and should take an active role to eliminate them. Scheduled and unscheduled safety inspections should be conducted by a competent person<sup>1</sup> to ensure that jobsites are free of hazardous conditions. Even though these inspections do not guarantee the prevention of occupational injury, they may identify hazardous conditions and activities that should be rectified. Further, they demonstrate the employer's commitment to the enforcement of the safety program and to the prevention of occupational injury.

***Recommendation #5: Employers should encourage workers to actively participate in workplace safety.***

Discussion: Employers should encourage all workers to actively participate in workplace safety and should ensure that all workers understand the role they play in the prevention of occupational injury. In this instance, the victim was working on a scaffold 35 feet above the ground without any guarding or safety equipment. Workers and co-workers should look out for their personal safety and the safety of co-workers. When workers observe hazardous conditions or activities, they should, depending on the circumstances, notify management and/or remind co-workers of the proper way to perform their tasks and protect themselves. Employers must instruct workers of their responsibility to participate in making the workplace safer.

Increased worker participation will aid in the prevention of occupational injury.

## **REFERENCES**

29 CFR 1926.451 (a) (4) Code of Federal Regulations, Washington, D.C.: U. S. Government Printing Office, Office of the Federal Register.

29 CFR 1926.501 (b) (1) Code of Federal Regulations, Washington, D.C.: U.S. Government Printing Office, Office of the Federal Register.

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