Bridge Painter Falls 364 Feet After Suspension Scaffold Collapses

DATE: February 3, 1993

SUMMARY

On September 8, 1992, a 34 year-old male bridge painter died after falling 364 feet when a supporting rope on his two-point suspension scaffold broke. The incident occurred while the victim and a co-worker were moving the scaffold along the main supporting cable of a large suspension bridge. The crew was moving the scaffold into position when one of two supporting ropes broke, causing one end of the scaffold to collapse. The victim, who was not using fall protection, tumbled out of the scaffold and fell to his death. The co-worker was hooked onto the scaffold and was rescued with minor injuries. NJDOH FACE investigators concluded that, in order to prevent similar incidents in the future, these safety guidelines should be followed:

- **Employers should ensure that the proper scaffolding is selected and used within design specifications.**
- **Employers should ensure that all scaffold safety devices are in place and operational.**
- **Employers should ensure that appropriate fall protection is provided and used by all employees working at elevations.**
- **Employers and employees should conduct a job hazard analysis to identify and correct potential hazards.**

INTRODUCTION

On September 8, 1992, the OSHA area safety supervisor notified NJDOH FACE personnel about this work-related fall. On the same day, a FACE investigator visited the site to photograph the scene. On September 17, 1992, the FACE investigator interviewed the employer representative and examined the scaffold involved in the incident. Additional information was obtained from the OSHA file, witness statements, police reports, and the county medical examiner's report.

The victim's employer was a large national painting contractor that has been in business for approximately 80 years. The company employs a full time safety officer who travels to the different sites at which the company is operating and has a written safety program. At this site, the foremen held weekly safety meetings with the painters who were required to sign a roster to indicate they were present. Company policy for violating safety rules included penalties and dismissal from the job. The victim was a 34 year-old male journeyman painter who had worked part time for the company since April 1991 and full time since November 1991. He had done this type of work for about 10 years and was considered by management to be one of company's best workers.

The site of the fatality was on an 8,000 foot inter-state suspension bridge that spanned a large river. In April 1991, the painting company began work under a contract to paint the bridge, a project that was expected to take 15 months and was nearing completion. Twenty-seven workers were employed at the time of the incident, mostly painters hired from the local trade union halls. Their task at this phase of the project was to abrasive blast the old paint from the main bridge suspension cables and repaint them with a lead-based paint.

This was the second fatal incident to occur while painting the bridge. On August 10, 1991, a 26 year-old painter was electrocuted when the steel reinforced water hose connected to his power washing gun contacted a 13,000 volt electrical powerline (see FACE report #NJ-9110). The painter was washing the steel beneath the bridge deck to prepare it for painting when a sagging loop of the water hose contacted the power line.

INVESTIGATION

Background

The fall occurred from one of the two main suspension cables that spanned the length of the bridge (see figure 1). The 28 inch diameter main suspension cables ran between two 374 foot high towers and were anchored on each end of the bridge. Smaller descending cables (suspenders) ran vertically from the main cables to support the bridge deck below. For this project, the company used two-point suspension scaffolds attached to the main cables as work platforms. Each scaffold measured 20 feet long by 28 inches wide and had been modified by mounting rails and plywood to the sides of the scaffold. The scaffolds were positioned directly beneath the main suspension cable, and both the cable and the scaffold were covered with a tarp to create an enclosed area to contain the blasting material. The painter wore an air-supplied abrasive blasting hood while blasting to protect him from the lead paint dust and abrasive material.

At the time of the incident, the company was working on the north main suspension cable, moving west towards the center of the bridge. A total of nine scaffolds were set up in two groups on the main suspension cable; a group of five scaffolds on the cable near the east tower (where the incident occurred), and a second group of four scaffolds located further down the cable. Each of the five scaffolds near the tower held a single painter and his equipment, including the abrasive blasting pot, bags of walnut shell blasting material, and the scaffold hoist motors. The scaffolds were suspended from the main suspension cable by wrapping two 5/16 inch steel cable ropes into slings around the bridge suspension cable. Each of the two steel ropes were reeved thorugh an air-powered hoist and attached to stirrips that were secured to the scaffold platform. The two hoists allowed the scaffold to move up and down from the main cable.

Each painter was responsible for cleaning and painting a 40 foot section of the main suspension cable. When a painter completed a 20 foot section, he occasionally requested help from a rigger to move the scaffold along the main cable to the next 20 foot section. The rigger (who assisted all the crews) entered the scaffold by climbing down a short length of rope tied to the main cable handrail. Positioning themselves at opposite ends of the scaffold, each worker passed a length of ¾ inch manilla rope over the main suspension cable and tied off the ends to the scaffold stirrups. After the ropes were secured, the scaffold hoist motors were activated to lower the scaffold until it was supported by the two manilla ropes. The workers then slid the hoist cables (which were now slack) a short distance along the main suspension cable. The scaffold hoists were again started to raise the scaffold and free the manilla ropes.

This process was repeated until the scaffold was moved into position and usually took 20 to 30 minutes to complete.

While aloft, the workers were required to wear a safety belt with two sets of hooks for fall protection. One set consisted of large hooks that were attached to the main cable handrail for walking along the cable. The second set was a device for tying onto safety lines while working in the scaffold. Two 5/8 inch nylon safety lines were secured to the handrails of the main cable and ran down to the bridge deck where they were tied off. These lines were separate from the scaffold and were usually moved immediately before or after the scaffold was moved. While moving the scaffold, the workers were to tie off to the short line that was used for entering and exiting the scaffold.

Incident

The morning of the incident was clear and warm. The painters arrived at the worksite around 7 a.m. and got their work assignments from the supervisor. At that time, the victim asked the supervisor for a new rope for moving the scaffold, and was given a new piece of manilla rope (manilla was preferred over nylon rope because it holds knots better). The crew then took a truck to the bridge tower, rode the elevator to the top, and walked along the main cable to the scaffolds. At about 8:30 a.m., the victim completed work on his section of cable and requested help from the rigger to move the scaffold. The rigger entered the scaffold, tied off to one of the nylon safety lines, and positioned himself by the scaffold hoist. The victim was wearing a safety belt with two lanyards wrapped around his waist, but did not tie off to the safety lines. Following the above procedure, the two workers tied the supporting ropes over the main cable and started to move the scaffold.

As the scaffold was moved along the cable, the rigger disconnected his fall protection because they had moved out of reach of the nylon safety lines. He then tied off to the short line used to enter the scaffold. When that line also moved out of reach, he tied off to the scaffold hoist cable. The victim apparently never tied off to any of the lines.

At about 9 a.m., the two were positioning the scaffold hoist cables for the final six inches of the move. The rigger stated that he was moving his cable when the supporting rope on his side broke. The scaffold fell about 6 inches onto the hoist cable, shearing the drive shaft as the hoist took the weight of the scaffold. The cable ran freely through the hoist mechanism, causing the scaffold to collapse on one side. The victim tumbled down and out of the collapsing scaffold and was killed instantly when he fell 364 feet to a grassy area beneath the bridge. The rigger was also thrown out of the scaffold but was saved by his fall protection. He was able to climb back into the dangling scaffold and held onto the hoist. His co-workers quickly came and lowered a line to the rigger which he hooked to his safety belt. He was rescued from the scaffold and treated for minor injuries.

An investigation of the incident by the area OSHA office and local police agencies found the following factors contributed to the fatality:

1. The scaffold, which had a load rating of 500 pounds, was estimated to weigh over 1,700 pounds at the time of the incident. Approximately two thirds of this weight was distributed on the side of the scaffold where the rope broke. The weight was sufficient to overload both the rope and the scaffold hoist mechanism.

2. The scaffold hoists were not equipped with separate cable overspeed braking devices which could have stopped the collapse of the scaffold. The company had the devices on site but had not installed them on the hoists.
3. Steel cable chokers were previously used to support the scaffold while it was moved but ropes were substituted because they were faster to move and did not scrape the paint.
4. The manufacturers of the scaffold hoist recommended moving the scaffold by first lowering it to the ground. With the load removed, the hoist cables would then be moved before raising the scaffold back up to the working position.

CAUSE OF DEATH

The county medical examiner determined that the cause of death was from multiple injuries.

RECOMMENDATIONS/DISCUSSIONS

Recommendation #1: Employers should ensure that the proper scaffolding is selected and used within design specifications.

Discussion: The two-point suspension scaffold in this incident had not been designed for the purpose it was being used for. After being modified for abrasive blasting and loaded with men and equipment, the scaffold weighed over three times its rated capacity. With the majority of the weight distributed to one side of the scaffold, the supporting rope was overloaded and broke. This in turn overloaded the hoist, shearing the hoist drive shaft and causing the scaffold to collapse. In addition, the scaffold was moved using a method that was not recommended by the manufacturer of the hoists. This apparently was done to save time moving the scaffolds, as was substituting the rope for the metal cable to support the scaffold. To prevent future incidents, it is recommended that all work projects should be carefully planned to ensure that the proper equipment is available and used within the specifications it was designed for. Changes in work practices (such as changing the method of moving the scaffold) should also be consistent with manufacturer's directions and load weight specifications.

Recommendation #2: Employers should ensure that all scaffold safety devices are in place and operational.

Discussion: In this case, the required cable overspeed braking devices were not installed on the scaffold hoists. This device would have sensed that the cable was passing too quickly through the hoist and applied a brake which would have prevented the cable from passing through the hoist and causing the collapse. The employer must ensure that these devices are in place and operational on all scaffolds.

Recommendation #3: Employers should ensure that appropriate fall protection is provided and used by all employees working at elevations.

Discussion: The victim was not tied off to the available safety lines attached to the main suspension cable, leading to his being thrown from the scaffold as it collapsed. Although the co-worker was saved by tying off to the scaffold, he also would have died if the scaffold had fallen to the ground. The use of a safety belt and lanyard which is attached to a separate safety line required by the OSHA standard 29 CFR 1926.451(i)(8) for use on two-point suspension scaffolds. Properly used, this type of fall protection would have prevented the workers in this incident from falling when the scaffold collapsed.

Recommendation #4: Employers and employees should conduct a job hazard analysis to identify and correct potential hazards.

Discussion: In this incident, the rigger had trouble hooking onto the safety lines as the scaffold moved further away from them. To prevent this and the other problems discussed above, both the employer and the employee should conduct a job hazard analysis of the worksite. This analysis would have identified these and other potential problems and allowed an opportunity to correct them.

REFERENCES

Code of Federal Regulations 29 CFR 1926, 1991 edition. US Government Printing Office, Office of the Federal Register, Washington DC

ATTACHMENTS

NIOSH ALERT: Preventing Worker Injuries and Deaths Caused by Falls From Suspension Scaffolds. DHHS (NIOSH) Publication #92-108, August 1992. NIOSH Publications Dissemination, 4676 Columbia Parkway, Cincinnati OH.

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