TO: Director, National Institute for Occupational Safety and Health

FROM: California Fatality Assessment and Control Evaluation (FACE) Program

SUBJECT: Tile Roofer Supervisor falls from roof of multi-story building and dies in California

SUMMARY
California FACE Report #98CA016

A 38-year old tile roofer supervisor (decedent) died when he fell from the second story of a performing arts building that was being remodeled. The decedent and a co-worker were finishing the installation of twist-tie (riness) wires on the third story of the building. The clay tiles they were installing are tied off to the riness wire. The ends of the wire are held in place by anchors, the tabs of which are bent over when the wire is properly tightened. The decedent was pulling on the riness wire placing his foot against the third story wall for leverage when the wire came loose from the anchor. He fell backwards off the second story roof onto the first story roof and then onto the concrete sidewalk at ground level. The decedent was not wearing fall protection. Upon arrival at the hospital, the decedent's blood alcohol concentration (BAC) was determined to be .167%. The CA/FACE investigator determined that, in order to prevent future occurrences, employers should as part of their Injury and Illness Prevention Programs (IIPP):

- ensure employees working at heights wear personal fall protection or are protected by equivalent means.
- ensure employees do not engage in work practices where they lean/pull toward roof edges.
- ensure employees do not work while under the influence of alcohol.

INTRODUCTION

On October 22, 1998, at 12:51 p.m., a 38-year old male tile roofer supervisor was fatally injured when he fell from a second story roof onto a first story roof and then onto a concrete sidewalk. He was pulling on a twist-tie wire for the clay tiles in an attempt to apply proper tension to them when the wire suddenly released and he fell backwards. The CA/FACE investigator learned of this incident on October 26, 1998 from the local legal office of the Division of Occupational Safety and Health, California Department of Industrial Relations (Cal/OSHA). On October 28, 1998 the CA/FACE investigator traveled to the incident site where he met with the general contractor's project manager, the Cal/OSHA investigator and the employer's estimator. On October 29, 1998, the CA/FACE investigator traveled to the employer's main office accompanied by two National Institute for Occupational Safety and Health (NIOSH) employees. The CA/FACE investigator interviewed the president of the

company and later traveled to the incident site where the CA/FACE investigator and the NIOSH employees met with the project manager and inspected the site of the incident. On November 12, the CA/FACE investigator traveled to the main office to interview the decedent's co-worker.

The employer, a roofing installer, had been in business for 12 years at the time of the incident. The number of employees in the company varies between 6 and 15 with 2 working on site at the time of the incident. The decedent had worked on and off for the company for approximately 2 years. The day of the incident was the decedent's first day at the site.

Company safety responsibilities were defined, with the company's president having overall responsibility. Site foremen have responsibility at the various sites. The company had a written Injury and Illness Prevention Program (IIPP) which contained all of the required elements and a code of safe practices. The decedent was trained in the hazards of the roofing industry by the employer, including fall protection. No documentation of the installation of riness wire was available. A site inspection of the remodeling project was performed by a company manager. Safety meetings were conducted on an as needed basis. Fall protection was required by the employer at the incident site. This requirement was not being followed. However, it is not known if fall protection equipment was available at the site.

INVESTIGATION

The site of the incident is a three-story performing arts building that was being remodeled **(exhibit 1)**. The height from the ground to the edge of the first story roof was 12 feet. The height from the top of the first story roof to the edge of the second story roof was 7 feet, 9 inches. The height from the top of the second story roof to the edge of the third story roof was 3 feet, 8 inches. The pitch of the first story roof was 3.8:12. The pitch of the second story roof was 3.1:12. The first story roof was 11 feet, 10 inches long from the top to the edge. The second story roof was 10 feet, 4 inches from the top to the edge.

The company was hired to install a new red clay tile roof on all three roofs of the building. Prior to the day of the incident, another crew from the same company installed underlayment material on all three roofs. In preparation for installation of the clay tiles, they also installed most of the twist tie (riness) wires to which the clay ties were to be tied **(exhibit 2)**. On the day of the incident, the decedent and one co-worker arrived at the site. They began to inspect the roof to determine what was needed to finish the job. When they found an area on the third-story roof where twist tie wires had not been installed they began to finish the installation.

The installation procedure is to apply chalk lines with a chalked string to the roof. The lines run parallel to one another from the peak of the roof to the edge. The twist tie wires are installed evenly between the chalk lines. The wires are cut to size depending on the length of the roof. The wires are double stranded with each wire being slightly larger in diameter than 1/16 of an inch **(exhibit 3)**. The wire has loops every 6 1/2 inches to facilitate tying off the clay tiles.

The twist tie wires were anchored in position with one anchor at the peak of the roof and the other at the lower edge. There were two types of anchors used on this job. The anchors involved in the incident appeared to be made of brass or bronze and were 2 11/16 inches long and 1 inch wide. Two tabs protrude vertically 5/8 of an inch from the middle of the anchor **(exhibit 3)**. There are two nail holes located on either side of the anchor. Nails, 1 3/8 inches

long, were used to nail the anchors into the roof **(exhibit 3)**. The anchors were placed so the twist wires were approximately 10 inches apart.

The procedure the two employees used to anchor the wires to the roof was for one employee, the co-worker in this case, to wrap the twist wire around the anchor at the peak of the roof, bend the tabs down and then wrap the twist wire back onto itself three turns. The decedent then would pull the wire tight around the anchor tabs of the anchor at the edge of the roof. He would then bend down the tabs and then wrap the twist wire back onto itself three turns.

The employees had installed an unknown number of twist wires on the third story roof. The twist wire they were installing at the time of the incident had already been secured, as described above, to the anchor at the peak of the roof. The decedent pulled on the twist wire to tighten it. He placed his foot against the 3 foot, 8 inch tall outside wall between the 2nd and 3rd stories to gain leverage. As he pulled, the top anchor gave way. The anchor itself bent up in a "V" shape and the tabs pulled back up vertically and bent down toward the edge of the roof **(see diagram 1 and exhibits 4, 5, 6 & 7).**

This caused the decedent to lose his balance and fall backward off the 2nd story roof and onto the first story roof. He continued rolling and fell off the 1st story roof the final 12 feet to the concrete sidewalk below striking his head. Other workers at the site rushed to him. The project superintendent placed a shirt under his head. Witnesses indicate that no first aid was attempted. The project superintendent called 911. Paramedics arrived, treated the decedent, and transported to him to a local hospital where he was pronounced dead at 7:00 p.m.

CAUSE OF DEATH

The certificate of death stated the cause of death to be multiple injuries due to blunt force trauma.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Employers should, as part of their IIPP's, ensure employees working at heights wear personal fall protection or are protected by equivalent means.

Discussion: In this incident, the decedent was not wearing personal fall protection. In this instance, in addition to or in lieu of personal fall protection eave barriers, catch platforms, safety (catenary) lines, guard rails or scaffold platforms could have been used to prevent a fall. Because the decedent was pulling twist wires in a direction toward the ground he was at great risk for falling off the roof. A fall protection plan and use of fall protection would have prevented a fall off the roof if he were to lose his balance, slip or trip. Employers should make fall protection equipment available to the workers. Employers can help ensure full compliance with fall protection plans by implementing a program of training, incentives, and progressive disciplinary measures.

Recommendation #2: Employers should, as part of their IIPP's, ensure employees do not engage in work practices where they lean/pull toward roof edges.

Discussion: In this incident the worker pulled with virtually his entire weight on the twist wire in

a direction toward the roof edge. He fell when the anchor failed. Even if workers are instructed to not use their full weight when tightening these wires, pulling in the direction of the roof's edge may lead to similar falls. Institution of a revised procedure in which the worker's mass is forced away from instead of toward the roof's edge may help prevent future similar deaths.

Recommendation #3: Employers should, as part of their IIPP's, ensure employees do not work while under the influence of alcohol.
Discussion: In this incident the employee had a blood alcohol concentration (BAC) of 0.167%. Research has shown that information processing, attention, and other complex skills are affected at BACs of as low as 0.01 to 0.02%. This implies that the victim's ability to concentrate on and analyze the situation for the amount and direction of tension to apply to the twist wire may have been impaired. Employers can help to ensure employees do not work under the influence of alcohol or other substances through symptom recognition, training, workplace modifications and employee assistance programs (EAPs). Workplace modifications that have successfully curbed alcohol and drug use have targeted some of the conditions that promote substance use/abuse; lax employer policy regarding alcohol/drugs, acceptance of use by coworkers/managers, stressful work conditions, etc. EAPs identify, assess, and refer workers with substance abuse problems.

References:
Barclays Official California Code of Regulations, Vol. 9, Title 8, Industrial Relations, South San Francisco, 1998

For general information regarding fall protection and safety when working on roofs refer to: http.www.dir.ca.gov./title8/1669.html, /1670.html, /1724.html, /1730.html, /3210.html

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FATALITY ASSESSMENT AND CONTROL EVALUATION PROGRAM

The California Department of Health Services, in cooperation with the California Public Health Foundation, and the National Institute for Occupational Safety and Health (NIOSH), conducts investigations on work-related fatalities. The goal of this program, known as the California Fatality Assessment and Control Evaluation (CA/FACE), is to prevent fatal work injuries in the future. CA/FACE aims to achieve this goal by studying the work 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.

NIOSH funded state-based FACE programs include: Alaska, California, Iowa, Kentucky, Maryland, Massachusetts, Maryland, Minnesota, Missouri, Nebraska, New Jersey, Ohio, Oklahoma, Texas, Washington, West Virginia, and Wisconsin.

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Additional information regarding the CA/FACE program is available from:

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