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FACE

Fatality Assessment and Control Evaluation Program

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Fifteen -Year-Old Laborer Dies After Falling Through a Skylight—Florida

SUMMARY

On January 17, 2001, a 15-year-old male laborer (the victim) died from injuries he sustained when he fell through a skylight to the lower ground level approximately 23 feet, 9 inches below. The company's president allowed the company's handyman to find someone to help him repair leaks in a flat roof over the company's three-sided warehouse. The handyman enlisted the help of his 15-year-old neighbor and brought him to the worksite. Neither the handyman nor laborer had received training in fall protection methods and no means of fall protection had been provided by the employer. They worked on the roof for approximately 6 hours, patching cracks with tar and gravel, and were nearly done with repairs, when the victim fell through an unguarded skylight. The handyman did not see the victim fall. Immediately following the incident, a worker inside the warehouse reported the incident to office personnel who immediately called 911. Personnel from the sheriff's office and emergency medical services (EMS) responded within 5 minutes. EMS personnel administered cardiopulmonary resuscitation (CPR) and transported the victim via ambulance to a local hospital emergency room were he was pronounced dead upon arrival. NIOSH investigators concluded that, in order to help prevent similar occurrences, employers should

Skylight through which the victim fell.

- ***conduct a site inspection prior to beginning roofing work to identify all potential fall hazards present , and take appropriate steps to ensure that identified hazards are eliminated or controlled prior to the commencement of work activities***

- ***develop, implement, and enforce a comprehensive written safety program for all workers which includes training in hazard recognition, including but not limited to fall hazards, and the avoidance of unsafe conditions***

Fatality Assessment and Control Evaluation (FACE) Project

The National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR), performs Fatality Assessment and Control Evaluation (FACE) investigations when notified by participating states (North Carolina, Pennsylvania, South Carolina, Tennessee, and Virginia); by the Wage and Hour Division, Department of Labor; or when a request for technical assistance is received from NIOSH-funded state-level FACE programs in Alaska, California, Iowa, Kentucky, Massachusetts, Minnesota, Missouri, Nebraska, New Jersey, Ohio, Oklahoma, Texas, Washington, West Virginia, and Wisconsin. The goal of these evaluations is to prevent fatal work injuries in the future 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. The FACE program does not seek to determine fault or place blame on companies or individual workers. For further information visit the FACE website at **www.cdc.gov/niosh/face/faceweb.html** or call toll free 1-800-35-NIOSH.

- ***contact the U.S. Department of Labor, Employment Standards Administration, Wage and Hour Division, as well as the State agency responsible for child labor in their State, for guidance in complying with child labor laws which prohibit certain types of work by workers less than 18 years old.***

Additionally,

- ***building owners should consider installing permanent railings around skylight perimeters or protective covers over individual skylights to guard against falls through skylights by maintenance or other personnel who must access the roof***

- ***designers/manufacturers of skylights should evaluate load capacities of current designs and consider strengthening skylight components and incorporating safeguards, such as protective screens, into skylight designs***

- ***government agencies, school officials, and health and safety organizations should continue their efforts to inform the public about child labor laws, and parents should become familiar with occupations which are prohibited for minors.***

INTRODUCTION

On January 17, 2001, a 15-year-old male laborer (the victim) died from injuries he sustained when he fell through a skylight to ground level, approximately 23 feet 9-inches below. On January 22, 2001, officials of the Wage and Hour Division of the U.S. Department of Labor notified the NIOSH Division of Safety Research (DSR) of this fatality. On January 24, 2001, a DSR occupational safety and health specialist met with personnel from the Wage and Hour Division. The case was reviewed with personnel from the sheriff's and county coroner's offices and with the OSHA compliance officer who investigated the case. The handyman, who brought the victim to the work site, and the victim's mother were interviewed. The DSR investigator traveled to the site but the employer declined an interview and access to the incident site. Official photographs taken by the county sheriff's department shortly after the incident were reviewed. Official reports from OSHA, the sheriff's department, and medical examiner's office were reviewed.

The company manufactured pre-cast concrete ornamental objects. At the time of the incident, the employer had been in business at the present location for approximately 20 years and employed 20 full-time employees, a part-time handyman (coworker), and the victim. The handyman had worked for the company on an occasional basis over the past 4 years. He was a retired mechanical engineer who was experienced in construction work. It was the victim's first day at the worksite; he had no previous work experience and had accompanied his neighbor, the handyman, to the worksite. The victim was a Romanian citizen who was in the United States with his family on a visitor's visa. He spoke several languages, including English. The company had a safety program that primarily applied to plant safety. The program did not include training in fall protection. This was the first fatality experienced by the employer.

INVESTIGATION

The incident occurred on the flat roof of a three-sided open warehouse that was used to store equipment and ornamental concrete objects manufactured by the employer. The company's handyman had requested and obtained approval to fix a section of the warehouse roof located above an out-of-service forklift parked inside the warehouse. He had been asked to repair the forklift and wanted to fix the roof first so rain would not leak through the roof and onto him when he performed the forklift repairs. The roof of the warehouse was approximately 23 feet 9 inches above ground level and was 152 feet long by 92 feet wide. According to official OSHA findings, there was obvious and severe damage to the roof and ceiling of the warehouse. Ten unguarded skylights spaced intermittently over the roof appeared to be old and deteriorated. The exact age of the building was unknown, but the present owner had stated that it was at least 20 years old and that the skylights had not been replaced. The skylights were the non-opening type and had no warning labels or manufacturer information affixed to them. Examples of the skylights, including the skylight involved in the incident, are depicted in photographs 1 and 2.

Photo 1: This photograph illustrates the warehouse roof with 3 of the 12 skylights that were located on the roof. An X is placed on the skylight the victim fell through.

One day prior to the incident, the handyman purchased several 5-gallon buckets of tar and spent approximately 6 hours patching the warehouse roof. On the following morning, January 17, 2001, at approximately 7 a.m., the handyman picked up his 15-year-old neighbor (the victim) and drove to the worksite. They unloaded materials needed for roof repairs from the handyman's truck. According to the OSHA report, the handyman then used a series of ladders and walkways to gain access to the roof over the warehouse. He first climbed a 12 ½-foot steel ladder to access a tin roof over a cement

Photo 2: This photograph illustrates a close-up taken from the roof of the skylight through which the victim fell.

building attached to the warehouse. He walked 8 to 9 feet on the tin roof until he reached a fixed ladder on an adjacent cement silo. He climbed the fixed ladder, stepped over onto a steel ledge on the silo, then stepped over onto the roof of the warehouse (Photo 3). Official OSHA findings indicate that the handyman was shown this roof access route by the supervisor. Once on the warehouse roof, the handyman held onto one end of a rope, letting the opposite end fall to the victim. The victim tied his end of the rope around a series of buckets of tar, gravel, and equipment. The handyman used the rope to hoist each item to the roof. After all the materials and equipment had been hoisted to the roof, the victim joined the handyman on the roof using the same access route as that used by the handyman. Roof repairs were expected to take 1 to 2 days. The two workers spent the morning patching cracks in the roof with tar and gravel. They came off the roof at approximately 12:30 p.m., went off-site for lunch, and then returned to the job site. The handyman returned to the roof. The victim remained in the handyman's truck until approximately 2 p.m., then he climbed to the roof. At approximately 3:15 p.m., the handyman told the victim they were done with the repairs and that he should throw anything they no longer needed to the ground while he used a leaf blower to finish cleaning off another part of the roof. While waiting for the handyman to finish his work, the victim either sat or fell back onto the skylight, which broke, causing him to fall through to the ground, 23 feet, 9 inches below. The handyman did not see the victim fall, but upon hearing the sounds produced when the skylight dome shattered, climbed off the roof to help the victim. Five workers who were working inside the warehouse looked up when they heard cracking sounds above, and saw the victim as he fell through the skylight to the dirt floor below (Photo 4). One of the workers ran to get a supervisor while another ran to the office which was located approximately 100 yards away, to report the injury. Office personnel immediately called 911.

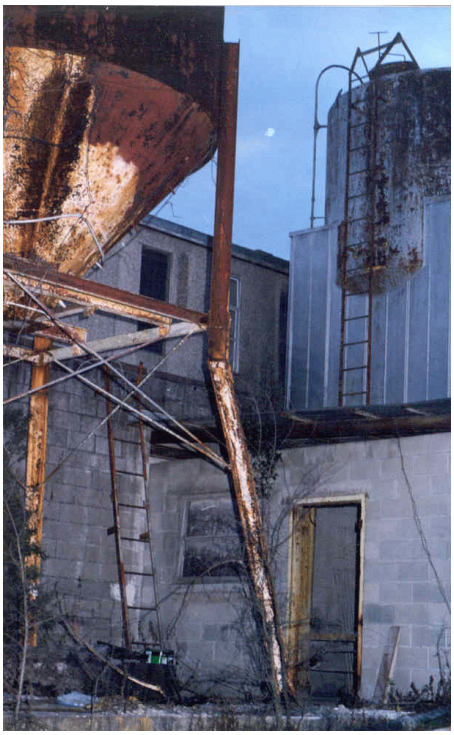

Photo 3: This photograph illustrates the ladders workers used to gain access to the roof.

Photo 4: This photograph illustrates the broken skylight viewed from the floor of the warehouse. An X marks the area where the victim landed after falling through the skylight.

Personnel from the sheriff's office and from emergency medical services (EMS) responded within 5 minutes. EMS personnel administered cardiopulmonary resuscitation (CPR) and transported the victim via ambulance to a local hospital emergency room were he was pronounced dead upon arrival.

CAUSE OF DEATH

The official cause of death was listed as multiple injuries, which included a fractured skull, broken ribs, and a punctured and lacerated lung.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Employers should conduct a site inspection prior to beginning roofing work to identify all potential fall hazards present, and take appropriate steps to ensure that identified hazards are eliminated or controlled prior to the commencement of work activities.

To protect workers from falls, a "competent person"* should conduct a hazard assessment prior to starting work in order to identify fall hazards and eliminate or control them before work begins (e.g. provide an adequate skylight cover, such as a properly sized and installed screen, metal grill work, or plywood cover that could withstand, at minimum, 200 pounds of downward pressure, to prevent employees from falling into or though a skylight or opening; provide barrier protection (railings/ guardrails) to prevent workers from falling through skylights or openings or over roof edges; provide adequate fall protection at all other exposed areas on the roof surface). According to OSHA regulations (29CFR 1926),[1] employers are required to protect employees from falling when working from heights greater than 6 feet above the next lower level. Protection against falling through skylights can be accomplished by covering the skylight with an adequate cover or by installing protective barriers around them. A personal fall arrest system (PFAS) can also be used. When a PFAS is used, extreme care must be given to the correct choice of harness, lanyard, and anchor point so that the worker is adequately protected given the fall distance present.

Additionally, OSHA regulations require employers to provide fall protection for employees engaged in any type of roofing activities where workers work near unprotected edges 6 feet or more above the level immediately below. Some acceptable methods to protect employees on a roof of this type (flat or low-sloped) include utilizing

- guardrail systems
- safety net systems
- PFAS

Employers are responsible for selecting and ensuring the use of adequate fall protection for the hazards present.

* According to OSHA, a competent person is 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 authorization to take prompt corrective action to eliminate them (29CFR 1926.32).

Recommendation #2: Employers should develop, implement, and enforce a comprehensive written safety program for all workers which includes training in hazard recognition, including but not limited to fall hazards, and the avoidance of unsafe conditions.

A comprehensive safety program should be developed that includes training in hazard recognition and the avoidance of unsafe conditions. Employers should not allow workers to perform work on their company's worksite until proper hiring procedures have been completed and appropriate safety training has been provided for the tasks to be assigned.

OSHA regulations require employers to train workers to recognize and avoid unsafe conditions that may be present in their work environment and to provide training on the regulations applicable to their work (e.g., 29 CFR 1926).[1] When employees are working in jobs that expose them to fall hazards, the employer's safety training must contain a component that specifically addresses how to minimize worker exposure to fall hazards (29CFR 1926.500-503). Employers are to assure that each employee has been trained, as necessary, by a "competent person," qualified in the following areas:

- the nature of fall hazards in the work area
- the correct procedures for erecting, maintaining, disassembling, and inspecting fall protection systems to be used
- the use and operation of guardrail systems, PFAS, safety net systems, warning line systems, safety monitoring systems, controlled access zones, and other protections to be used
- the limitation on the use of mechanical equipment during the performance of roofing work on low-sloped roofs
- the correct procedures for handling and storage of equipment and materials and erection of overhead protection
- the role of employees in the fall protection plans
- the applicable regulations contained in OSHA's subpart M—Fall Protection (29CFR 500-503). For further information see the OSHA website at http://www.osha.gov.[2]

Employers can obtain additional information pertaining to preventing falls though skylights and roof openings in a NIOSH Alert on this topic (DHHS, NIOSH Publication No. 90-100).[3] Additional information pertaining to worker deaths by falls from elevation is contained in a NIOSH publication on this topic (DHHS, NIOSH Publication No. 2000-116).[4] These publications are available through NIOSH by calling 1(800) 356-4674 or by visiting the NIOSH website at http://www.cdc.gov/niosh/90-100.html and http://www.cdc.gov/niosh/00-116pd.html.

Recommendation #3: Employers should contact the U.S. Department of Labor, Employment Standards Administration, Wage and Hour Division, as well as the State agency responsible for child labor in their State, for guidance in complying with child labor laws which prohibit certain types of work by workers less than 18 years old.

Before employers hire workers less than 18 years old, they should contact the U.S. Department of Labor, Employment Standards Administration, Wage and Hour Division for information on the type of work youths are allowed or not allowed to perform under the Fair Labor Standards Act (FLSA). Information on the FLSA can be obtained by visiting the DOL ESA website at http://www.dol.gov/dol/esa/public/whd_org.htm[5] These employment standards are listed and explained in WH-1330[6] and summarized in DOL Fact Sheet No. 43.[5] Offices of Federal and State child labor departments can be located by using the telephone directory government pages.

Employers are not permitted to hire workers less than 18 years old to perform roofing work. Hazardous Order No. 16 prohibits youths from work in roofing operations because of the associated hazards. Employers should ensure that workers less than 18 years old are not assigned to perform prohibited work. Employers should also meet with their workforce to explain that young workers are at increased risk for injury at work and reinforce the importance of assigning youths to appropriate work tasks.

Additionally, building owners should consider installing permanent railings around skylight perimeters or protective covers over individual skylights to guard against falls through skylights by maintenance or other personnel who must access the roof.

Unprotected skylights present a fall hazard to anyone who must access the area in which skylights are located. Building owners should consider installing permanent guardrails around the perimeter of the skylight or protective covers, such as screens or metal grills, over individual skylights to eliminate the hazard of falling through the skylights. Guidance for installing permanent railings around skylights is outlined in 29CFR1910.23 (e)(2) (i through v).[7] In summary, the railing must be installed so that it can withstand a load of at least 200 pounds applied in any direction at any point on the top rail.

Requirements for standard skylight screens are provided in 29CFR 1910.23 (e)(8)[7] as follows:
"Skylight screens shall be of such construction and mounting that they are capable of withstanding a load of at least 200 pounds applied perpendicularly at any one area on the screen. They shall also be of such construction and mounting that under ordinary loads or impacts, they will not deflect downward sufficiently to break the glass below them. The construction shall be of grillwork with openings not more than 4 inches long or of statwork with openings not more than 2 inches wide with length unrestricted."

Designers/manufacturers of skylights should evaluate load capacities of current designs and consider strengthening skylight components and incorporating safeguards, such as protective screens, into skylight designs.

Designers/manufacturers of skylights should evaluate the materials used to fabricate skylights, and also evaluate current skylight designs, to determine the feasibility of increasing the load capacity. If an individual falls against a skylight or skylight screen, the load transferred to the skylight or screen from his impact can be several times his body weight. For example, a 200-pound individual could

easily transmit a load of 400 to 500 pounds at impact by tripping and falling onto the skylight or skylight screen. As a result, load capacity should be carefully evaluated to provide a margin of safety in the event of an inadvertent fall against a skylight. Additionally, a metal grid or screen could be developed as an integral part of the skylight fixture and installed over the skylight. There are several models of skylight screens available that can be retrofit over existing skylights. A grid or screen would add additional exposure protection against falling through skylights. Manufacturers should also consider placing warning decals on the frames of the skylights they produce, identifying the hazard of sitting or stepping on skylights, and consider writing fall-hazard warnings into their installation instructions. The American Architectural Manufacturers Association (AAMA) has developed several voluntary standards which could be used by manufacturers to improve the load-bearing capacity of the skylights they manufacture. AAMA voluntary standards are available on the world wide web at http://global.ihs.com[8] [Disclaimer: Mention of the name of any company or product or website address does constitute endorsement by NIOSH].

Government agencies, school officials, and health and safety organizations should continue their efforts to inform the public about child labor laws, and parents should become familiar with occupations which are prohibited for minors.

Federal, State, and local government employment and regulatory agencies should continue working together with employers, school officials and health and safety organizations to inform the general public about the types of work youths are prohibited from performing because of concerns about their safety and well-being, or because the work is recognized as especially hazardous. It has been reported in the literature that employers, parents, and teens are often unaware of work activities prohibited by child labor laws.[9]

Government agencies have produced documents designed to inform the public about safe work for youths. This effort should continue. Examples include a DOL document entitled "Work Safe This Summer: Employer's Guide to Teen Worker Safety"[10] and a NIOSH Alert, "Preventing Death and Injuries of Adolescent Workers."[11] The DOL document can be obtained by contacting an area DOL Wage and Hour Division Office or by visiting the DOL website at http://www.dol.gov/opa/summer/guide/ideas.htm. The NIOSH Alert can be obtained by contacting the NIOSH Education and Information Division at 1(800) 356-4674 or by visiting the NIOSH website at http://www.cdc.gov/niosh/childlab.html.

Before giving consent for their children to work, parents should contact the U.S. Department of Labor, Employment Standards Administration, Wage and Hour Division, and the State child labor agency, to obtain information regarding appropriate work assignments for young workers, to discuss any task assignment issues, learn about the youth work permit requirements and process, and obtain written child labor information. Documents mentioned earlier in this report, WH 1330 and DOL Wage and Hour Fact Sheet 43, offer useful summary information about tasks that are permissible and those that are not permissible for specific age groups. When parents are more aware of the age-specific types of work their children are permitted to perform, they will be in a better position to help their children make appropriate employment decisions. Once their children are employed, parents

should communicate regularly with them about the work they are doing. Whenever parents have concerns about safety and heath protection and safety training, they should contact an area OSHA office for information.

REFERENCES

1. Code of Federal Regulations 2000 edition. 29CFR Parts 1926. U.S. Government Printing Office, Office of the Federal Register, Washington, D.C.

2. DOL OSHA information pertaining to fall protection is available at http://www.osha.gov

3. NIOSH [1989]. NIOSH alert: request for assistance in preventing worker deaths and injuries from falls though skylights and roof openings. Cincinnati, OH: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 90-100. Also available on NIOSH website at http://www.cdc.gov/niosh/90-100.html

4. NIOSH [2000]. Worker deaths from falls. Cincinatti, OH: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2000-116. Also see at the NIOSH website at http://www.cdc.gov/niosh/00-116pd.html

5. DOL ESA information pertaining to child labor is available at http://www.dol.gov/dol/esa/public/whd_org.htm

6. DOL [2001]. Child Labor Requirements in Nonagricultural Occupations Under the Fair Labor Standards Act, Washington, DC: U.S. Department of Labor, Employment Standards Administration, Wage and Hour Division, WH-1330, revised March, 2001.

7. Code of Federal Regulations 2000 edition. 29CFR Parts 1910. U.S. Government Printing Office, Office of the Federal Register, Washington, D.C.

8. Information on voluntary load bearing specifications for plastic skylight domes can be found at American Architectural Manufacturer's Association Standard 1600 and is available for purchase at http://global.ihs.com.

9. National Research Council, et al. [1998]. Protecting youth at work: health, safety, and development of working adolescents and children in the United States. Washington, DC: National Academy Press.

10. Work Safe this Summer: Employers Guide to Teen Worker Safety. Available at http://www.dol.gov/opa/summer/employer.htm

11. NIOSH [1995]. NIOSH Alert: preventing deaths and injuries of adolescent workers. Cincinnati, OH: US Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS, Publication No. 95-125. Also see at the NIOSH website at http://www.cdc.gov/niosh/childlab.html.

INVESTIGATOR INFORMATION

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