

**California Department of Public Health
Occupational Health Branch**

**FATALITY ASSESSMENT AND CONTROL EVALUATION PROGRAM
(CA/FACE)**

**A Heating, Ventilation, and Air Conditioning (HVAC) Contractor
Dies When He Falls Through a Skylight
Case Report: 16CA005**

SUMMARY

A heating, ventilation, and air conditioning (HVAC) contractor was working alone inspecting an air conditioning (AC) unit on a flat roof of a converted warehouse when he fell through an unguarded skylight to the concrete floor below. He died 19 days later from his injuries. The skylight did not have any protective screen or guarding mechanism at the time of the incident. The contractor was an owner operator and did not have any written policies, procedures, or safety documents. The CA/FACE investigator determined that, in order to prevent future incidents, HVAC contractors working in close proximity to skylights should:

- Perform a daily jobsite hazard analysis to be aware that skylights pose a risk even if adjacent work is of short duration.
- Ensure that building owners install skylight safety nets, screens, covers, or guardrails around skylights within six feet of HVAC equipment.

INTRODUCTION

On Wednesday, July 27, 2016, at approximately 2:30 p.m., a 33-year-old male HVAC contractor died when he fell approximately 20 feet through a skylight while working alone on an adjacent rooftop AC unit. Notification of the incident was received on August 16, 2016, from the Cal/OSHA weekly update. On Friday, September 16, 2016, the father of the victim (former company owner and co-worker) was interviewed by telephone. On Thursday, October 27, 2016, the CA/FACE investigator visited the incident site, interviewed managers of the company occupying the warehouse, and took photographs of the incident scene.

EMPLOYER

The victim in this incident was the owner operator of a licensed and insured HVAC business. He took over the business from his father in 2014. The business itself had been established over 30 years ago and consisted of one individual (the victim).

WRITTEN SAFETY PROGRAMS AND TRAINING

The company did not have a written Injury and Illness Prevention Program (IIPP), and there were no written policies or procedures for any of the tasks performed or equipment used.

WORKER INFORMATION

The victim in this incident was a 33-year-old male who was the owner operator of the HVAC company. The victim was a high school graduate who went to work with his father after graduating from high school.

INCIDENT SCENE

The scene of the incident was a converted warehouse that was being used as a dance and martial arts studio. The warehouse was constructed in 1972 and was approximately 130 feet long by 60 feet wide. There were six skylights on the roof. The AC equipment was located approximately five feet from the adjacent skylight. In order to encourage more enrollments, the owner of the dance studio decided to expand within the warehouse, adding theme rooms for different age groups. The construction of the theme rooms was almost complete. The owner of the dance studio asked the victim for an estimate to install additional air ducts from the air conditioning unit on the roof to each room below.

INVESTIGATION

On the day of the incident, the victim arrived at the facility and toured the dance and martial arts studio with the owner who showed him the nearly completed theme rooms. The victim told the studio owner that he would have to inspect the entire AC system to determine if it was possible to add additional ducting. They walked over to the electrical panel for the building and the victim started checking the circuits. The dance studio owner then left him to return to the front desk.

After completing a survey of the electrical panel, the victim climbed up a fixed exterior ladder on the back side of the warehouse to gain access to the flat roof of the building. He then traversed over to one of the AC units to inspect the components to determine whether additional duct work was possible. Another contractor was working below (inside the warehouse), completing the finishing touches on the theme rooms. He stated that all of a sudden he heard a scream and a crashing noise that came from one of the other theme rooms. He hurried over to the room and found the victim lying on the concrete floor underneath the broken skylight. He then went to the front office to inform the owner and called 911. Both the owner and contractor stayed with the victim until emergency medical services arrived. The victim was transferred to a local hospital where he succumbed to his injuries 19 days later.

CONTRIBUTING FACTORS

Occupational injuries and fatalities are often the result of one or more contributing factors or key events in a larger sequence of events that ultimately result in an injury or fatality. The CA/FACE team identified the following items as contributing factors in this incident that ultimately led to the fatality:

- A daily job hazard analysis of the work place was not performed.
- Working in close proximity to an unprotected skylight.
- The skylight was not designed to support the weight of a worker.

CAUSE OF DEATH

The cause of death, according to the death certificate, was traumatic brain injury.

RECOMMENDATIONS

In order to prevent future incidents, HVAC contractors working on flat roofs with skylights should:

Recommendation #1: Perform a daily jobsite hazard analysis to be aware that skylights pose a risk even if adjacent work is of short duration.

In this incident, the victim was performing work that was of short duration with limited exposure to the skylight hazard. The time involved in installing safety devices may have exceeded the length of time needed on the roof to inspect the HVAC equipment. The victim may not have thought that he needed to ensure that the skylights were protected given the short-term nature of his work, and that the skylight would not hold his weight if he fell onto it. When the CA/FACE investigator visited the incident scene several weeks later, the involved skylight had been replaced. The manufacturer and age of the original skylight is not known but may have been installed several years prior to the incident. It is unclear if the original skylight had a manufacturer's label regarding design specifications or a warning about safeguards. In the absence of uniform manufacturer design standard, all skylights may pose a risk in the event of a fall onto the cover – notwithstanding the work is of short duration. If a job hazard analysis had been performed in this incident, the victim may have brought the lack of skylight safeguards to the attention of the building owner and taken adequate risk controls prior to inspecting the HVAC unit.

Recommendation #2: Ensure that building owners install safety nets, screens, covers, or guardrails around skylights within six feet of HVAC equipment.

Discussion: In this incident, the skylight in close proximity to the AC unit created a serious safety hazard. Although the job was of short duration, the victim was still at risk in the event he fell onto the skylight cover. The skylight's plexiglass fixture can and should be designed to serve the function of providing ambient outdoor light into a building, while having sufficient strength to support at least twice the weight of employees, equipment, and materials that may be imposed on the cover at any one time. Architects, engineers, and employers should work together to ensure that skylight fixtures specified in the building plan meet this strength requirement. These skylight fixtures should be permanent and of sufficient strength to protect workers who access the roof from inadvertently falling through them. Until adequate design requirements are in place and skylights installed to protect workers from falling through them, HVAC contractors may not know if the skylights in their work area can support their weight. Therefore, HVAC contractors need to ensure that safety nets, screens, covers, or guardrails are in place around skylights in the immediate work area. Had the building owner installed these protective barriers around the skylights, this incident could have been prevented.

EXHIBITS



Exhibit 1. The flat roof of the warehouse showing the skylights and AC units.

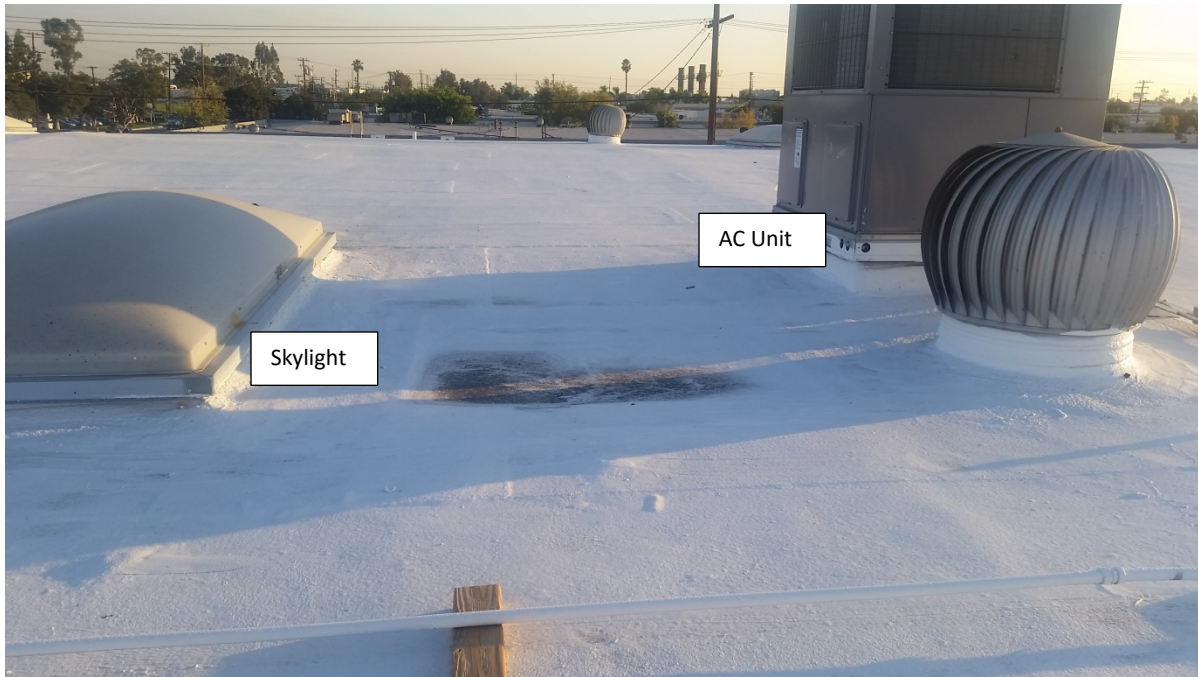


Exhibit 2. The incident scene.



Exhibit 3. The dance studio theme room skylight opening involved in this incident.

REFERENCES

General Industry Safety Orders Article 2. Standard Specifications. §3209. Standard Guardrails. §3212. Floor Openings, Floor Holes and Roofs. (b) (e) 4

Construction Safety Orders Article 24. Fall Protection. §1632. Floor, Roof, and Wall Openings to Be Guarded. §1670. Personal Fall Arrest Systems, Personal Fall Restraint Systems and Positioning Devices.

Skylight Fall Protection (search 'skylight'):

<http://www.aamanet.org/general.asp?sect=1&id=291>

New Test Method for Human Impact on Commercial Skylights

<http://www.astm.org/DATABASE.CART/WORKITEMS/WK17797.htm>

Preventing Falls of Workers through Skylights and Roof and Floor Openings -

<http://www.cdc.gov/niosh/docs/2004-156/>

Preventing Worker Deaths and Injuries from Falls Through Skylights and Roof Openings -

<http://www.cdc.gov/niosh/90-100.html>

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FATALITY ASSESSMENT AND CONTROL EVALUATION PROGRAM

The California Department of Public Health, in cooperation with the Public Health Institute and the National Institute for Occupational Safety and Health (NIOSH), conducts investigations of work-related fatalities. The goal of the CA/FACE program is to prevent fatal work injuries. 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: California, Iowa, Kentucky, Massachusetts, Michigan, New Jersey, New York, Oregon, and Washington.

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

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