

Fatality Investigation Report

OR2003-01-01

Roofer's family member helping at worksite dies after falling through skylight.

Summary

Release Date: 8/6/03

A 19-year-old family member of a self-employed roofing contractor died when he fell through a skylight to a concrete floor 35 feet below. The victim was assisting the roofer repair water leaks on the flat roof of a commercial warehouse. The incident occurred at the completion of the two-day project. The victim was walking backwards to roll up a torch hose when he apparently tripped or stepped into the skylight. The acrylic plastic domed skylight shattered under his weight and the victim fell approximately 35 feet to the concrete floor. The victim's father immediately called for assistance and notified emergency services. The victim was transported to a local emergency room where he died a short time later.

The OR FACE team was notified by local news media reports on January 28, 2003. Contact was made with both the building owner and the roofing contractor. The roofing contractor was interviewed by phone. The building owner declined an onsite investigation of the incident scene. The OR FACE investigator visited the street location without accessing the building or the roof (incident location), on February 5, 2003. This report is based on the interview with the employer and the onsite walk around of the building.

Based on the findings of the investigation, to prevent similar occurrences, employers should:

- ✓ **Identify and guard known and potential safety hazards to all workers or visitors who access the work site.**
- ✓ **Ensure that buildings with plastic (acrylic) domed skylights are retrofitted with fall prevention (i.e., steel grills) to ensure that the possibility of catastrophic falls is reduced or in the alternative use warning systems to alert workers of an immediate hazard to their life/safety.**
- ✓ **Employers should implement site-specific safety programs to address and reduce work related risks through the integration of safe work practices into routine work activities.**

Investigation

The building involved in the incident is of recent construction (~20-25 years old) and it is single story “tilt panel” construction. It is approximately 40 feet tall from ground to top edge of the building. The building has recently been used as a warehouse storage facility. The roof is flat construction with skylights added for additional lighting for the work areas below. The skylights were installed during construction. All the skylights are acrylic (plastic) domed, according to the roofing contractor. None have barricades or warning lines around them and the domes are not placarded with safety messaging relating to weight bearing and fall potential. Steel grills have not been installed beneath them. The building has a 5’ parapet wall surrounding the entire roof to prevent falls from working at or near the edge.

The building’s owner contacted the roofing contractor to repair several small leaks that had recently developed. The job was estimated take about two days to complete. The roofing contractor was self-employed and was at times accompanied by his son who helped with roof repair work. The work to be done on the day of the incident was not in the immediate vicinity of any skylights. The roofing contractor noted that there were about a dozen skylights on the roof and reasoned that the risk of falling through a skylight was remote. In addition, his assessment included a concern for falls from the roof’s edge.

Weather on the day of the incident was bright and sunny and the roof’s surface was dry and clear.

Immediately preceding the incident the victim and his father had been talking, facing each other. The victim was backing up unrolling the torch’s hose, preparing to roll it up for storage and removal from the site. The father stated that he turned away from his son for “just a moment” to do something and heard a loud noise and immediately turned around in time to see, “the skylight exploding”. His son was not in sight. The father immediately went to the skylight opening and observed his son on the floor of the warehouse, below. A call was initiated for emergency services and the father went to be with his son. The victim’s father was not sure if his son stepped onto the skylight, tripped over something, or simply lost his balance and fell into it.

Cause of death: The medical examiner’s determination at the scene was accidental death due to severe head trauma.

Recommendation/Discussion

Recommendation #1. Employers should communicate known and potential safety hazards to all workers or visitors who access the work site.

Discussion:

Anyone entering the work site must be informed of potential safety hazards. Employers can emphasize their commitment to safety by enforcing a site specific safety plan, to identify and communicate potential safety hazards and methods to eliminate them. Employees have the right to question the safety of any task and they are responsible for following the practices outlined in their employer's safety plan. It is not clear that through the completion of a pre-job site hazard assessment that any statement of concern for the risk of falls through the skylights was made to the worker. The skylights were "not in the immediate vicinity of the roofing work" and there was no reason to think that anyone would be entering the area of the roof where the skylights were installed, according to the employer. The victim fell through a skylight at the close of all work during clean up of the site and in preparation for leaving. He was walking backwards and rolling up a hose used for torch work. In doing this he left the "known" area where he had been working and entered a less familiar area where the skylights presented the fall hazard. There were no visual markers or barriers to identify the working area or the skylight area installed according to the roofing contractor.

Recommendation #2: Buildings with plastic (acrylic) domed skylights should be retrofitted with fall prevention (i.e., steel grills/netting) to ensure that the possibility of catastrophic falls is reduced or in the alternative use of fall prevention and warning systems to alert workers of an immediate hazard to their life/safety.

Discussion: In this incident, the roofing contractor reported that the victim was not looking at where he was walking ("backing up") and may have been distracted by a conversation he was having at the time or desire to complete his work and leave. The installation of a simple visual or physical warning system may have alerted the victim of his departure from his "known" work area and that he was going into an unknown or possible fall hazard area (skylights). An example of this type of system could be as simple as overturned plastic buckets with a length of wood, conduit or some other material placed on top of them (repeated if necessary) and strategically located, to alert workers of the hazard presented by plastic domed skylights. If employees are going to enter and work in areas where falls are a risk secure methods need to be taken to protect them from falls i.e., fall protection or fall prevention. Temporary guardrails should be installed around any skylights in the immediate vicinity of where work is taking place and not removed until all work in these areas is complete.

The 1997 version of the Uniformed Building Code, requires the installation of a steel grill with all acrylic plastic skylights, to prevent workers from falling through them. Polycarbonate or Lexan™, is more commonly used in the manufacturing of skylights today and is better at withstanding sudden changes of weight load and effects of weathering. Increasingly building permits for new construction (commercial buildings) are not being approved unless skylights are constructed with polycarbonate plastics, tempered or reinforced glass. Acrylic "plastics" can still be found and are being used in structures, especially on buildings, and homes, built before 1990. Acrylic domed skylights do provide advantages in that they provide explosion relief and will melt out during a fire creating a chimney effect (a desirable effect in an industrial fire). At minimum, all acrylic domed skylights, (those not incorporating tempered or reinforced glass) should have a steel grill installed

beneath them (or over them) to prevent workers from accidentally falling through them. This is an industry wide issue and must be addressed by building trades organizations, municipal code approval agencies, rental and leasing agencies, Fire inspectors, Safety Officers and housing authorities. Building owners need to decide how to best manage this risk for the older structures. Workers must adjust to the risk and take measures to prevent catastrophic incidents from occurring.



Photo. Skylight (typ.) with outer grids installed to prevent falls through them to the floor, below.

In addition to grills, manufacturers of skylight products need to label them for risk of fall and any weight loading that they carry. Fire inspections, routine insurance inspections and regularly scheduled employer safety program inspections can provide an opportunity to evaluate the ongoing need to ensure maintenance of safety labeling and engineering controls for all installed skylights. Building and business owners can then prioritize risks and how they should be addressed.

Recommendation #3. Employers should implement site-specific safety programs to address and reduce work related risks through the integration of safe work practices into routine work activities.

Discussion:

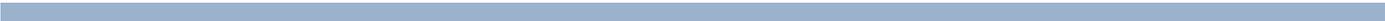
A site-specific safety plan (hazard analysis) serves to identify employer expectations, safe work practices, engineering safety devices or possible personal protective equipment required for a job. Job sites should be evaluated by an experienced worker to identify safety equipment and work practices that will be used to accomplish the work. Any safety issues or concerns should be identified before beginning work and become a part of the site's work plan. As with any administrative change it's not the implementation, but the integration of those expectations, into actions-taken, that will ultimately lead to a reduction in injuries. The owner/contractor acknowledged not having a written safety program or a formal training program. This employer reasoned that as a small operator (usually only himself) a formal safety/training program was not financially feasible and that it would make more sense for him to have a formal training program if he were a larger firm with more employees. Site-specific training is important and can be effective in preventing serious injuries or death.

References

International Conference of Building Officials, “Acceptance Criteria for Plastic Skylights, AC16”.
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For More Information

The Center for Research on Occupational and Environmental Toxicology at Oregon Health & Science University performs Fatality Assessment and Control Evaluation (FACE) investigations through a cooperative agreement with the National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR). 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.

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