

**CONSTRUCTION SAFETY
DESIGN SOLUTION #8
DESIGN CATEGORY: ROOF
HAZARD: FALLS THROUGH
SKYLIGHT
DESIGN SOLUTION: SPECIFY
NON-FRAGILE SKYLIGHTS
AND/OR
SKYLIGHT GUARDS
HAZARD: FALLS**



This design solution protects against the risk of serious falls through skylights during construction, maintenance, and demolition activities over the life of a building. Falls through skylights can result in death or serious injury – from 18 to 36 fatalities a year occurred between 2003 and 2006 (BLS, 2010). Skylight use, also called daylighting, is increasingly associated with green design and energy conservation measures.

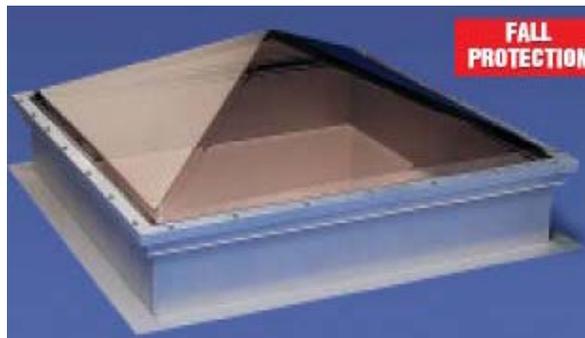
A 51- year-old roofer died from injuries sustained after falling 30 feet through a skylight. The roofer was part of a crew removing tar and gravel built-up roofing. He positioned a wheelbarrow full of gravel alongside a skylight while he talked to one of the company managers. As he turned to resume work, he fell through the skylight onto the concrete floor. Guardrails or skylight screens would have prevented this terrible tragedy.

SOLUTION:

For new skylight installations, use best available criteria to specify products that can withstand the live load associated with a construction or maintenance worker inadvertently stepping on or falling on a skylight. An alternative approach is to specify that guards or screens designed to handle these loads be attached over each skylight, or that a guardrail be provided around the perimeter of the skylight installation. Existing fragile skylight installations can be upgraded by installing screens or guards. Screens are recommended for plastic dome skylights and light transmitting panels as they can degrade over time. (Ellis, 2010).



This photo shows a skylight guard



This photo shows a non-fragile skylight model

BACKGROUND INFORMATION

Applicable US Safety and Health regulations

OSHA General Industry standards (apply to completed buildings):

1910.23(a)(4) – Every skylight floor opening and hole shall be guarded by a standard skylight screen or a fixed standard railing on all exposed sides.

1910.23(e)(8) - 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 slatwork with openings not more than 2 inches wide with length unrestricted. (emphasis added)

OSHA Construction standards (apply to buildings under construction):

1926.501(b)(4)(i) - Each employee on walking/working surfaces shall be protected from falling through holes (including skylights) more than 6 feet (1.8 m) above lower levels, by personal fall arrest systems, covers, or guardrail systems erected around such holes.

1926.502(i)(2) ...[C]overs shall be capable of supporting, without failure, **at least twice the weight of employees, equipment, and materials** that may be imposed on the cover at any one time. (emphasis added)

(NOTE: If the skylight itself meets the cover criteria in 1926.502(i)(2), OSHA will treat the skylight itself as a cover. OSHA does not explicitly specify the type of load (static vs. dynamic) to be imposed for the twice-the-weight requirement.)

Other information

American Society for Testing of Materials (ASTM) working group E06 WK 17797 “Working Group for the Specification of Human Impact Criteria, with Procedure for Testing and Rating Plastic-Glazed Unit Skylights and Related Products used on Commercial Walkable Roofs for Fall-Through Resistance” has been formed to develop procedures and criteria for fall through resistance. ASTM Fall Protection Test Standard Development Work Group (E06.51.25 WK17797) has been charged with developing a skylight fall protection test standard.

EXAMPLES OF PRODUCT OR USE:

The American Architectural Manufacturers Association (<http://www.aamanet.org>) includes skylight information and links to other groups and manufacturers. Several skylight manufacturers offer models engineered to resist impacts exceeding the OSHA criteria (e.g., to 1200 foot pounds).

OTHER CONSIDERATIONS

- Non-fragile skylights may have secondary design benefits related to snow loads, wind loads, and hail resistance.
- Additional construction safety measures are needed during skylight installation to guard against falls through the hole created for the skylight.
- Signs to notify and warn building occupants and maintenance personnel about skylight locations and other roof-related hazards should be posted at roof entry points.
- Heat and smoke vents are normally smaller than skylights and are designed to open automatically in fire situations to vent smoke and heat. Skylight-type precautions may be warranted for larger diameter smoke vents.

LIFE CYCLE SOLUTION BENEFITS

Designing a skylight that can withstand the live load of a person falling on it or that has a guard or screen will eliminate the need for safety precautions when maintenance is done on the roof during the life cycle of the building. Safe skylights can also be a positive feature when considering garden roof tops.

ADDITIONAL INFORMATION SOURCES

- NIOSH, 2004. Preventing Falls of Workers through Skylights and Roof and Floor Openings: <http://www.cdc.gov/niosh/docs/2004-156/>
- BLS, 2008 (As cited in *Should an Impact Resistance Standard Cover All Skylights?* US Glass Network News: <http://www.usgnn.com/newsSkylight20080430.htm>)
- Ellis, N., 2010. Personal communication to OSHA Alliance Workgroup. 3/25/2010.
- NIOSH, 2003. Roofer's Family Member Helping at Work Site Dies After Falling Through Skylight: <http://www.cdc.gov/niosh/face/stateface/or/03or001.html>
- NIOSH, 2006. Truck Driver Killed After Falling Through Unprotected Skylight: <http://www.cdc.gov/niosh/face/stateface/mi/06mi006.html>
- FM Global, 2006. Approval Standard for Skylights: <http://www.fmglobal.com/assets/pdf/fmapprovals/4431.pdf>
- AAMA Skylight Council Position Paper on Fall Protection, 2008: http://www.aamanet.org/upload/Skylight_Council_Position_Paper_rev_Dec_08.pdf

Through the OSHA Alliance Program's Construction Roundtable, the Roundtable participants developed this product for informational purposes only. It does not necessarily reflect the official views of OSHA or the U.S. Department of Labor. May 2010