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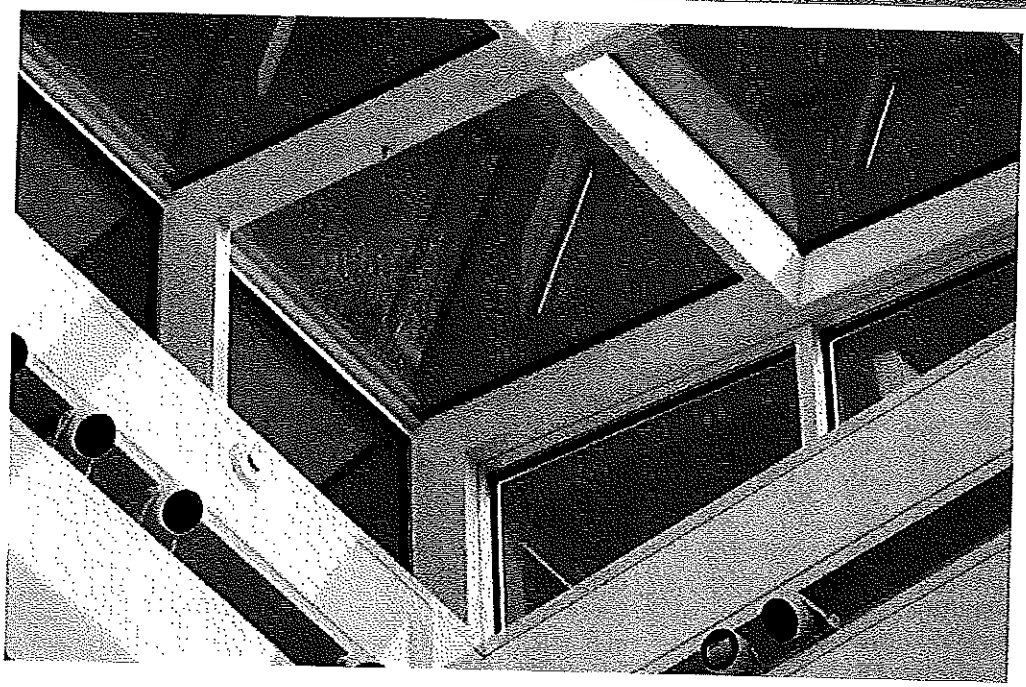

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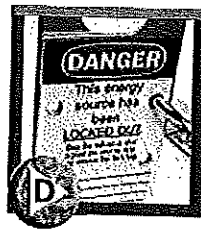

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Skylight Safety in the U.S.

Unofficially, 60 million skylights may exist in the U.S., with up to 2 million added each year.

BY J. NIGEL ELLIS, PH.D., CSP, P.E., CPE

Skylights are the way to be outside in natural light while being inside a building. They bring sunlight and sunshine into a room, which, it is generally agreed, changes the human environment for the better. They brighten workers' lives and attitudes.

Skylights are often small unit panes or bubbles in the ceilings of residence kitchens, sunrooms or bedrooms while large public building skylights can be monumental with hundreds of feet of framed glass, such as the Kimmel Center in Philadelphia or Harrah's Casino swimming pool dome in Atlantic City. For flat roofs in commercial buildings, unit skylights are dominant, and their numbers are growing, especially in California for warehouse construction with the goal of cutting HVAC costs and helping produce greener buildings. Unit skylights are typically domed or bubble design.

The problem with skylights is that they eventually leak and degrade in strength.

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these reports as sufficient for safety when in fact fall-through protection safety has not been evaluated. The process of using harnesses again applies for the lifetime of the building and is inadequate.

OSHA Status in General Industry

OSHA rules for skylights are clear except that a 1984 OSHA interpretation destroyed the meaning of the standard for covering skylights with screens. Instead, the manufacturer can lay a 200-lb sandbag onto the lens statically, and if it holds, then no screen is needed. This has permitted the manufacture and sale of skylights without any screen and without regard to falling impact loads of 95% human weights (presently 267 lb and rising) or sunlight degradation. This interpretation was OSHA rulemaking by interpretation and possibly illegal under the OSH Act.

Human Impact Considerations

Testing

The biggest issue has been to come up with a drop test weight, called an impactor, that represents the human body anticipated impacts. The second issue has been to address the variation in weight of persons on a roof.

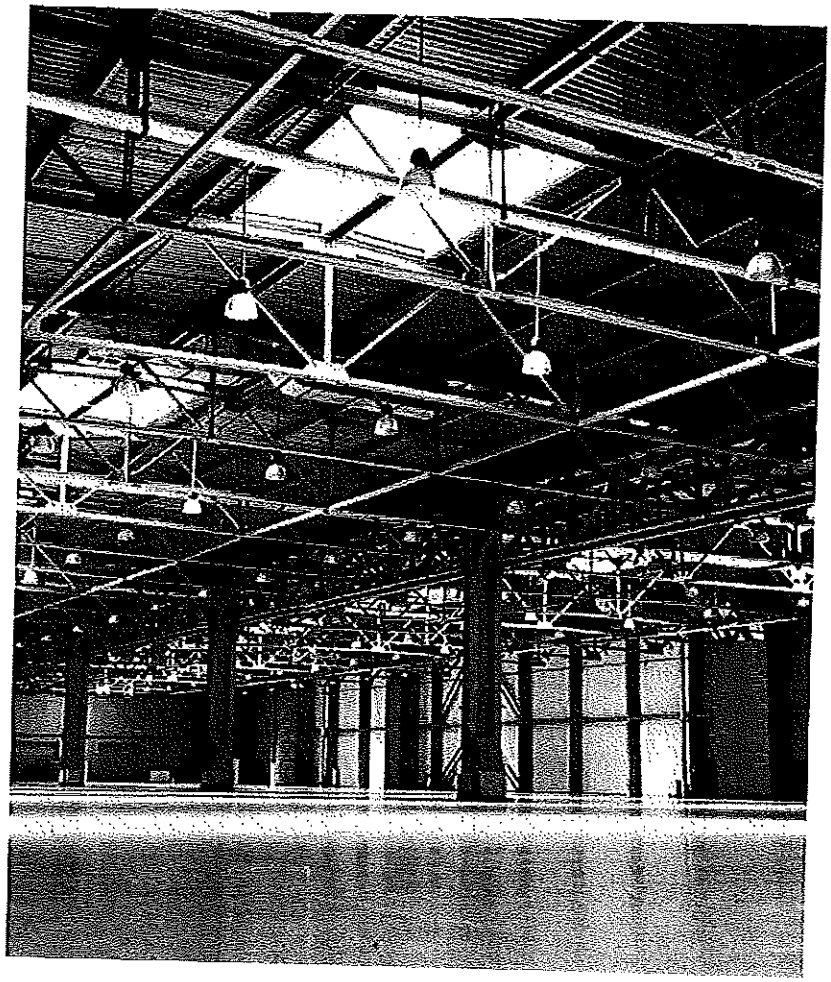
The typical human impact onto a skylight from a crouched position falling forward is with wrists, which have electronically been evaluated to be 5.5 in in diameter and produce the same result whether one or two wrists impact. The subsequent impact is with the shoulder. One other scenario is a trip from walking backward on the curb of a domed skylight and either the buttock or shoulder impacting. The study has produced a recommendation from the University of Michigan Biomechanics Lab that a 267-lb conical bag filled with lead shot and a polyurethane foam nose and intermediate vinyl lining provides the near equivalence to a human falling. The bag dimension is presently 5.5 in. nose diameter and 18 in. at its widest point. The data, including a drop distance of 37.5 in. to the skylight surface less curb height, were in a proposal to the ASTM E06.50.25 committee for new skylights in May 2009.

Degradation Due to Weathering

After reviewing the Dade County Miami requirements for a weather-tested skylight, it is evident that the maximum lifetime of skylight material is 5 years after undergoing a test program of 1 year. The anticipated goal is 20-year lifetime for any section of roof material, including steel decking, plywood and OSB-supported structural roof enclosures.

Solutions to Existing Skylight Fall-Through Hazards

Provide a screen on top of or a guardrail or other barrier around the skylight depending on geometry and cost. Many screen suppliers exist, including almost all manufacturers of skylights and metal buildings.

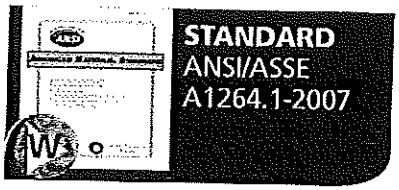


New Skylights

The architect of record should comply with OSHA and industry standards and not just with building code requirements. Architects should take responsibility for ordering the proper safety components of all buildings that owners will need to comply with OSHA 1910.23 and other standards, such as Safety Requirements for Workplace Walking/Working Surfaces and Their Access; Workplace Floor, Wall and Roof Openings; Stairs and Guardrails Systems (ANSI/ASSE A1264.1-2007). Purchasers of metal buildings should insist in their written orders to contractors that all OSHA construction standards 1926.500-503 and recognized voluntary standards, such as Safety Requirements for Temporary Roof and Floor Holes, Wall Openings, Stairways and Other Unprotected Edges in Construction and Demolition Operations (ANSI/ASSE A10.18-2007) be complied with before the building is turned over to the owner and the equivalent in general industry standards so as not to embarrass the owner when the C/O is issued.

Existing Skylights

Building owners must budget for skylight protection now, probably using metal screens for unit skylights.



There should be no objection to adding screens because of the low profile surface view from outside and fiberglass hiding the screen view from the inside. There may be some objection to natural light skylights if the screen can be seen through the skylight from below, but from my experience, the effect is small from the inside and is not noticeable from the parking lot.

Solutions to Construction Industry Skylight-Related Falls

a) Falls through skylight or HVAC opening. Use temporary frames and nets to place over the openings and be secured.

b) Falls through temporary covered openings. Use single-piece ¾-in plywood secured adequately.

c) Falls through skylight material. Cover with plywood box or screen installed at the same time as the skylight frame and secure adequately.

d) Color differences and wording "HOLE" "DO NOT REMOVE" in fluorescent spray paint with large 6-in. capital lettering help provide attention and notice. Use a template if necessary for clarity.

e) Address worker falls only and not vehicle impacts (suggest use of tracks and not wheeled Bobcats to distribute loads).

f) Provide two means of fall protection for roof or floor opening to accommodate the work trades that must legitimately remove a cover before filling with ducting or piping.

Maintenance firms treat skylights as sources of leaks only needing leak repair when checking an inspection checklist; they do not evaluate for critical structural weakness or degradation.

Conclusion

To address the U.S.'s leading roofing problem, we must protect workers on roofs, who, in addition to employees, are typically independent contractors who may walk close to skylights. Building owners should immediately develop programs for skylight screening instead of waiting for a fatality to act. This investigator is always gloved when he handles the full-body harness of a worker who is found on the inside floor of the building where the fall occurred. It occurs several times each year with unfailing regularity. It is time to stop the passive killer—roof skylights whose danger is never recognized until it is too late. ✪

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Facts on Aligning the Hazard Communication Standard to the GHS

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ria for classification of health and physical hazards, as well as classification of mixtures.

•**Labels.** Chemical manufacturers and importers will be required to provide a label that includes a harmonized signal word, pictogram, and hazard statement for each hazard class and category. Precautionary statements must also be provided.

•**Safety Data Sheets.** Will now have a specified 16-section format.

•**Information and training.** The GHS does not address training. However, the proposed HCS will require that workers are trained within two years of the publication of the final rule to facilitate recognition and understanding of the new labels and safety data sheets.

Number of workers affected by the proposed HCS. Over 40 million workers.

Affected Industries. Over 5 million workplaces.

Impact of the proposed HCS. The costs associated with compliance with the proposed revisions to the HCS would generally be incurred by the affected industries as one-time transition costs over the phase-in period of three years. The cost includes reclassification of all chemicals, additional training of workers on the new label elements and SDS format, and familiarization of the modified HCS standard. Aside from the transition costs, the ongoing annual compliance costs associated with the proposed revisions to the HCS generally are expected to be the same or lower than under the existing standard.

Annualized compliance costs of the proposed standard. Approximately $97 million per year.

•OSHA estimates that the cost of classifying chemical hazards in accordance with the GHS criteria and revising safety data sheets and labels to meet new format and content requirements would be $11 million a year on an annualized basis for an estimated 90,000 establishments.

•OSHA estimates that training for workers to become familiar with new warning symbols and the revised safety data sheet format under GHS would cost $44 million a year on an annualized basis for all affected workplaces.

•Although not a requirement in the proposed rule, OSHA estimated annualized costs of $42 million a year for management to become familiar with the new GHS system and to engage in other management-related activities as may be necessary for industry's adoption of GHS.