

CONSTRUCTION WORKPLACE DESIGN SOLUTION

Roof Hatch Access and Hole Protection

HAZARD: FALLS



This design solution protects against the serious risk of falls through roof hatches. The nature of the risk and control considerations include:

1. Severe fall hazard of up to 15-30 feet exists for the climber accessing the roof hatch up or down if there are no graspable handholds above the top of the ladder or ship's ladder. Absent graspable handholds, only the curb nip edge is available to hold for balance; however, the curb nip edge will not support the body weight. Grab bars should extend 42 inches above the roof level to allow the climber to confidently step to the side 9 inches est. and up over the curb typically 6 inches. Access back into the hatch opening involves stooping and crawling over the curb edge leading with outstretched shoe and holding the curb which may be ½-1 inch wide with no contours for a grip to hold the body. The foot cannot be put laterally on the rung due to the side position of the body therefore subjecting the climber to sliding along the rung. Frequently the rung is close to the wall or curb and will not allow the foot to be placed such that there is seven inches of foot projection space. As a result the foot must often be repositioned to the next rung down which is an extra 12 inches of reach and further destabilization of the climber's body reaching into the hole without body support.
2. Serious risk of a worker toppling into the unguarded opening of the roof hatch and falling as much as 30 feet down the ladder. The roof hatch constitutes a floor or roof opening which should be protected. The use of 42 inch high guardrails around the open sides of the roof hatch reduces the risk of this type of fall. Additionally, hatch access grab bars can be built or added, and access made with an integral swing gate which opens away from the ladder opening. These controls will also help to prevent falls resulting from the curb acting as a tripping point for forward and backward movement when the hatch cover is open.
3. Serious risk of a worker fall due to the roof access ladder and hatch being unsafely mounted on an outside wall without a 42 inch high parapet. Hatches must be relocated to an inside wall for structural support or a guardrail added for protection at the roof edge.

In 2008, 19 workers died as a result of falling through a roof surface (BLS).

The number of roof hatches in the USA on commercial roofs is estimated at eight million (author).

SOLUTION

For new roof hatches, the answer is to specify the roof hatch safety system as soon as possible. The new hatches can provide for a standing access either out onto the roof or into the opening which fits the human condition and walking posture in work situations such as access to and from roofs. Existing hatches can be retrofitted in the same way.



Guardrail, swing gate, and grab bars



Horizontal grab bars

BACKGROUND INFORMATION

Applicable US Safety Regulations

OSHA General Industry standards:

1910.23(a). Ladderway roof and floor opening to be guarded.

1910.23(a)(3)(i). Hinged floor opening cover.

1910.23(a)(2)(ii). Removable railing.

1910.23(a)(8). Cover of standard strength (200 lbs).

OSHA Construction regulations:

1926.502(a)(13). Guardrails, swing gates, offset railings to avoid walking into floor openings.

1926.502(i). Covers used for laying over holes in floors, roofs, etc. must meet 200 lbs strength.

1926.1053(a)(24). Side rails shall extend 42” above the landing served by the ladder.

1926.1053(a)(27). Horizontal grab bars spaced by continuation of rung spacings, or vertical grab bars shall have the same lateral spacing as the side rails*.

OTHER CONSIDERATIONS

- Roof hatches should be installed into roof openings as soon as possible and the roof hatch lid kept closed unless an access is made.
- Roof hatch locks should be compatible with balance and stability such as using an offset platform or rest platform. ANSI A14.3-2008 Section 9.2.1.
- Roof hatch ladder rung centers should be coated with skid resistant material having a wet friction coefficient of 0.5 minimum.
- Roof hatch ladders should be checked for structural strength sufficient for attachment of retractable lifelines for safer access up the ladder and providing a back-up to stability while opening the hatch lock.
- Roof hatch location on interior building walls for support. IBC 2009 Section: 1009.13.2.
- ANSI A14.3-2008 Section 5.3.4.3 requires additional handholds for safety while accessing hatch openings including grab bars that can be grasped.
- * Research conducted by the University of Michigan Center for Ergonomics indicates that free falling arrest is most successful and reliable when holding horizontal handholds and that free falling with vertical handholds is not successful in arresting falls. See article referenced below.

ADDITIONAL INFORMATION SOURCES

University of Michigan Center for Ergonomics, Ann Arbor, MI: Researchers have performed several studies investigating the ability of workers to climb and hold onto various designs of handholds, rungs, and rails. See October 2009 article in the journal *Human Factors*: “Hand/handhold coupling: effect of handle shape, orientation, and friction on breakaway strength,” by Justin Young, Charles Woolley, Tom Armstrong and James Ashton-Miller. Additional articles are forthcoming.

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