



Safety in Roof Design

Work related injuries (WRI) for which workers received compensation have decreased significantly since the late 1980's.¹ The decline is largely attributable to the efforts of employers and employees, in collaboration with governments, to increase awareness in the area of workplace health and safety, provide safety training and education, and stringent occupational health and safety regulation. However, construction remains a relatively dangerous activity, accounting for approximately one quarter of all reported WRI. A considerable number of these accidents involve falls from heights.

The Workers Compensation Board of B.C. reported that between 1989 and 1999, 45% of fatalities in B.C. workplaces caused by falls from elevations were in construction. According to the Workers Compensation Board of Manitoba, falls from heights was a major cause of the 105 construction fatalities that occurred between 1995 and 2010. The Infrastructure Health and Safety Association of Ontario cites falls as the leading cause of fatal accidents in the construction industry.

Although recent fatality and injury statistics suggest that there has been significant improvement in construction, particularly in the Industrial/Commercial/Institutional (ICI) sector, more effort is required to achieve the ultimate goal of eliminating injuries and deaths resulting from falls from heights.

In all jurisdictions of Canada, present regulations clearly hold the employer responsible for developing and implementing fall protection programs that comply with mandated regulations. The laws require employees to work safely and cooperate with the employer by following the health and safety rules specific to the job. Although, under current regulations, roof designers are not accountable for fall protection, CRCA believes that a roof's design features can impact the risk of falls and resultant injury.

It should be recognized that there has been an escalation in roof top activity and, consequently, roof traffic due to their use as platforms for solar and other energy producing equipment; the integration of daylighting with roofing; construction of vegetative and reflective roofing systems, and the use of roofs as amenity spaces. These and other innovations in roof construction have generally resulted in more frequent access to the roof by workers, maintenance personnel and building occupants, and consequently, an increase in the risk of falls from heights.

Judicious design can mitigate these risks without necessarily increasing construction costs. This can be accomplished in a variety of ways. Firstly, the roof should be designed so that roof traffic is limited. Where roof top traffic is required, the adverse effects can be minimized by selecting high quality and durable materials. Evidence indicates that durable products may require less maintenance and repair over the life of the roof. Where roof access is required for maintenance

of equipment, or in the case of vegetative roofs—the plantings, carefully designed walkways and access points will help restrict traffic to designated areas, and reduce the risk of falls.

Anticipating where roof traffic is likely to occur and providing for fall protection, will substantially improve worker safety. Wherever possible, roof access should be provided by interior staircases, or ladders through roof hatches. In the case of the latter, hatches should be installed well away from roof edges and be designed with guard rails. On low-rise buildings, where interior access is unavailable, permanent ladder tie-off anchors strategically placed at perimeters can allow ladders to be safely placed for mounting and dismantling the roof.

Parapet walls of sufficient height are effective means for ensuring worker safety at roof perimeters. Roof designers should specify parapet walls, wherever practical.² Alternatively, properly designed, permanently fixed guard rails at roof edges can provide effective fall protection.

Where it is not desired, or practical to install parapets or permanent guard rails, alternative design measures can be implemented to provide fall protection. Inserts for guard rails installed in the initial construction can allow for easy installation and dismantling of guard rails as required and need not detract from the aesthetics of the building design. Strategically located anchor points allow for the securement of various fall protection measures, including fall arrest systems, travel restraint systems, and safety nets.

With the proliferation of “green” roofing systems, access to the roof will become increasingly necessary and frequent. Although roof designers are not currently directly accountable for roof top safety, they can significantly influence the level of risk of injury from falls by designing roofs with safety in mind.³ It should be recognised that throughout a building's lifecycle many individuals will access the roof, including roofing workers, building maintenance personnel, inspectors, building occupants, and other construction personnel.

Roof top safety should be the responsibility of all involved in the design, build and long-term maintenance of the roof. We appeal to all designers and specifiers to consider this aspect of roofs in their initial design, and help our industry achieve the goal of zero construction fatalities from falls from roofs.

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1. Human Resources and Skills Development Canada, <http://www4.hrsdc.gc.ca/.3ndic.1t.4r@-eng.jsp?iid=20>.
 2. An added benefit of parapets is that they can significantly enhance the roof's wind uplift resistance.
 3. Designing roofs with safety in mind, GK Saunders, Building Research Establishment, 2004.

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