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Futuristic Fall Protection Now!

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Over one third of fatal hazards in construction are from falls. Buying or constructing a completed multi-story building typically involves receiving several fatal fall hazard "gifts" from the builder, e.g., roof edge falls if there is no parapet wall system; inaccessible overhead utilities access above drop ceilings; window cleaning means without engineered roof anchors; domed skylight failure after exposure to UV in sunlight which can shatter suddenly like eggshells; escalator-exposed belt hoisting of a rider's buttock at 18" per second rate of movement onto the top of the belt (handrail). It is time that these types of hazards be recognized, not left hidden from view, and then purposely eliminated with guards and reduced exposure.

Likewise, in personal fall arrest systems, harnesses have served a purpose; now it is time to consider a new approach, which will cut costs of anchorage points, recognize fall equipment hazards, reduce training costs and promote the work of the structural engineer before a hazard is allowed on the drawing boards or continued as an ongoing threat to human life. One example is remote window cleaning without the window cleaner.

Let's first agree that fall hazards are not going away when we use a full body harness. Fall protection methods often become slackened over time for a number of reasons. For example, harnesses and lanyards can be used and become worn; labeling can become illegible. Attachments can become compromised. OSHA's Interpretation of March 19, 2013, indicates OSHA will enforce 3600 lbs. for snaphook compressive gate strength in both Construction and General Industry. This is a change in strength, up from 220 lbs in a previous OSHA interpretation. Yet nose strength is still too low for the majority of manufacturers and may range from 400 lbs to 2600 lbs. It is hard for us to keep up with equipment and standards changes.

Other examples of built-in failures and unrecognized hazards include fall arrest rope grabs, rail grabs and cable grabs that can be held open under panic conditions when a fall occurs. Also, use of long lanyards and lifelines that do not minimize potential free fall are just for show. Also we should address retractable lanyard installations that allow cutting falls over the edge of a roof decking without shock absorption at the hook end, permitting the cable to tear apart. Also

products, such as hunting tree stands, can be dangerous because they do not anticipate improper hunter actions.

For example, some ladder-tree stand products do not require bolting of the ladder sections together to avoid section separation failure, which occurs when the ladder legs foreseeably sink voluntarily into the earth during climbing. Now consider that instructions for detaching tree-stand parts in the same order as it was erected is a dangerous concept because users may not follow the intended procedure, leaving the stretched-out ladder support bar pushing the top of the stand outward beyond the point of return when the tree ratchet strap is removed first.

So why don't we place safety at the head of construction project and equipment design as primary policy? Guardrails are at the head of the list and, as long as the height of the guardrail exceeds the center of gravity of a person who requires protection, then the goal is achieved and hazards will decrease.

As long as we move in this direction, then much can be achieved. Hazards can be reduced, and there is less reliance on harness-based systems. We should call this approach design-based safety.

Who is qualified for designing fall protection systems using design-based safety? It will be the registered structural engineers who are skilled and experienced in fall protection engineering systems, the so-called *qualified person* (OSHA 1926.32 and ANSI Z359). Product designs call for mechanical engineers to have skills in recognizing hazards that occur during the anticipated use of the product. Under tort laws in the U.S., the duty lies with those engineers responsible for product design and testing. The testing may need to reach beyond industry standards to address predictable user usage, such as the ladder tree-stand over-tensioned support bar and the foreseeable user reaction to the ladder-stand ratchet strap being released first. This is because engineers typically presume that users will intuitively follow the instructions provided with the product. This is simply not the case from the author's 43 year experience on standards committees and field inspections and investigations.

Industries lagging behind safety improvements for fall protection include transportation services, particularly those where driver or operator access to flatbeds or the trailer for loading gives rise to repeated, unacceptable fall hazard exposures. OSHA seems hamstrung with its plethora of interpretations around 1910.23 guardrails. Yet most of these could be withdrawn because railings are going to be a part of the solution for some trailers, tank cars and railcars. For example, a flatbed can have a temporary railing installed around three sides, yet forklifts can load or unload the open side with preplanning. Nets can be used for trailers, in some cases, with careful sag design. Fixed catwalks around large garbage trucks can allow access to truck edge clean-up. Car carriers have very narrow walkways and no independent continuous handholds. Thus, drivers are reliant on gas caps, mirrors, fenders, or wipers for balance. Sometimes the door handle is used, with catastrophic results. Proper continuous handholds should be the first priority with narrow catwalks; guardrails at 42" min., and a second source of fall protection if adequate width catwalks are feasible.

Ladder access should be substituted in general industry by properly designed stairs or well-maintained aerial lifts to avoid fall exposure. If the ladder needs to be made more productive, especially in construction, then the use of lightweight extensions should be considered to allow walk though and provide for the three foot extension above a platform, the lack of which presently is the main cause of 50% of OSHA ladder citations. Horizontal Grab bars and holding rungs is another part of the solution so the hands do not slip down vertical side rails. The goal is better transition safety. Elimination of the recognized hazard is the goal no matter what the hazard or hazard mixture is determined to be.

Summary

The necessary step in a safety program beyond routine use of personal fall arrest systems is design-based safety. This policy allows the safety-trained engineer to recognize hazards in the workplace. Let’s begin the design-based program with a policy for taking the CSP exam soon as possible out of engineering school and including a curriculum of safety, hygiene, human factors, the law, and business principles. It is a start on a hazard-free future. The engineering school should next have a safety chair endowed. This future is making safety a starting point for all safety professionals for an attack on unrecognized design dangers, maintenance hazards and also reasonable predictable behavioral dangers that are not subject to the laws of nature.