Fall Protection

Ironworker Falls, Survives

Buck Rockafellow worked as an ironworker at 22 years old. After a short 2 years of experience, he had a life-changing accident.

He was working on the third story of a building. His cousin, who was working on the same project, called him for lunch. Rockafellow started making his way around the building. He temporary unclipped his fall protection and took a small leap – about a foot and a half.

His footing slipped on the wet and oily surface. He fell 33 feet.

Rockafellow broke 18 bones, collapsed a lung, broke his pelvic bone in 3 places, and dislocated 3 fingers. Miraculously, Buck survived. Even more miraculously, he walked again.

Most workers that fall from such great heights aren't so lucky. **Wearing fall protection properly, no matter how uncomfortable or heavy, would have prevented this accident.**

NEED TO KNOW

Falls are one of the oldest causes of injuries and death in the workplace.

A worker is most at risk if working at heights of four feet or more; above running machinery, water and hazardous liquids, or exposed to an opening in a work surface. Fall protection equipment can mean the difference between life and death.

Working at heights is any work where a person could fall a distance and be injured. This event might include, for example, falling from a step ladder, off of a roof, or through an unguarded hole in the ground or floor. Fall protection may also be required when working above an open-top tank, bin, hopper, or vat.

Personal Fall Arrest System (PFAS) are designed to prevent workers from falling off communication towers, scaffolds at high rise construction sites, or the roof of a house.

Many workers receive little no fall protection training, use the wrong fall

protection, or, use the equipment improperly, and, sometimes do not use fall protection at all.

OSHA requires employers to provide employees for fall protection according to the fall hazards that exist on the job.

All hazards are to be addressed by using the following hierarchy of controls:

1. Eliminate the hazard
2. Substitutions
3. Engineering Controls
4. Administration controls, and
5. Personal Protective Equipment

This, if the first (1) to (4) controls are not adequate to protect against the fall hazard, then **PEAS** must be used.

If it has been determined that the employee must wear a harness and lanyard, there must **be training in the hazards present** when working at heights and at what heights fall protection is required. **Then the employee must be trained to use and inspect** this critical piece of personal safety equipment.

BUSINESS/REGULATORY

Falls are among the most common causes of serious work-related injuries and deaths. Employers must set up the work place to prevent employees from falling off of overhead platforms, elevated work stations or into holes in the floor and walls.

Employers must set up the work place to prevent employees from falling off of overhead platforms, elevated work stations or into holes in the floor and walls. **OSHA** requires that fall protection be provided at elevations of four feet in general industry workplaces, five and six feet in the construction industry, six feet in the construction industry and eight feet in longshoring operations. In addition, OSHA requires that fall protection be provided when working over dangerous equipment and machinery, regardless of the fall distance. In Canada, the minimum standard for construction is 10 feet or 3 meters.

To prevent employees from being injured from falls, employers must:

- Guard every floor hole into which a worker can accidentally walk (using a railing and toe-board or a floor hole cover).
- Provide a guard rail and toe-board around every elevated open sided platform, floor or runway.
- Regardless of height, if a worker can fall into or onto dangerous machines or equipment (such as a vat of acid or a conveyor belt) employers must provide guardrails and toe-boards to prevent workers from falling and getting injured.
- Other means of fall protection that may be required on certain jobs include safety harness and line, safety nets, stair railings and hand rails.

OSHA requires employers to:

- Provide working conditions that are free of known dangers.
- Keep floors in work areas in a clean and, so far as possible, a dry

condition.
- Select and provide required personal protective equipment at no cost to workers.
- Train workers about job hazards in a language that they can understand.

When you learn that falls are, historically, the leading cause of fatalities in the construction industry, the reason for OSHA Fall Protection regulations becomes self-evident. But in addition to the direct effect of a hazard on a worker, the costs associated with workplace injury, including workers' compensation payments, can be among the most devastating to an employer's bottom line. These things come together to emphasize the need to prevent falls before they happen.

For general industry, OSHA requires fall protection beginning at a height of four feet. In construction, fall protection is required above six feet. Protection must also be provided any time an employee must work above hazardous equipment or machinery, regardless of the distance. Employers are responsible to determine the locations where fall protection is required, make sure that proper protection systems are provided, and finally to implement employee training in their use.

Compliance with OSHA Fall Protection regulations requires the right tool for the right job.

Why Does OSHA Have a Standard for Fall Protection?

Historically, falls are the leading cause of fatalities in construction, accounting for about one-third of all fatalities in the industry.

OSHA recognizes that incidents involving falls are generally complex events, frequently involving a variety of factors. Consequently, the standard for fall protection deals with both the human and equipment-related issues in protecting workers from fall hazards.

What is Subpart M?

Subpart M lays out the requirements and criteria for fall protection in construction workplaces. For example, it applies when workers are working at heights of 6 feet or more above a lower level. It also covers protection from falling objects, falls from tripping over or falling through holes, and protection when walking and working around dangerous equipment without regard to height. Subpart M provisions do not apply, however, to workers inspecting, investigating, or assessing workplace conditions prior to the actual start of work or after all construction work has been completed**. The provisions of Subpart M can be found in Title 29 Code of Federal Regulations (CFR) Subpart M – Fall Protection, 29 CFR 1926.500, 29 CFR 1926.501, 29 CFR 1926.502, and 29 CFR 1926.503. OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION 2**

What are Employers' Responsibilities to provide Fall Protection?

Initially, employers must assess the workplace to determine if walking or working surfaces have the necessary strength and structural integrity to safely support the workers. Once it is determined that the work surfaces will safely support the work activity, the employer must determine whether fall protection is required (using the requirements set forth in **29 CFR 1926.501**) and, if so,

select and provide workers with fall protection systems that comply with the criteria found in **29 CFR 1926.502.**

When must employers provide Fall Protection? The 6-foot rule.

Subpart M requires the use of fall protection when construction workers are working at heights of 6 feet or greater above a lower level. It applies at heights of less than 6 feet when working near dangerous equipment, for example, working over machinery with open drive belts, pulleys or gears or open vats of degreasing agents or acid.

What construction areas and activities does Subpart M cover?

The standard identifies certain areas and activities where fall protection or falling object protection may be needed. For example, it might require fall protection for a worker who is: on a ramp, runway, or another walkway; at the edge of an excavation; in a hoist area; on a steep roof; on, at, above, or near wall openings; on a walking or working surface with holes (including skylights) or unprotected sides or edges; above dangerous equipment; above a lower level where leading edges are under construction; on the face of formwork and reinforcing steel; or otherwise on a walking or working surface 6 feet or more above a lower level. The standard may also require fall protection where a worker is: constructing a leading edge; performing overhand bricklaying and related work; or engaged in roofing work on low-slope roofs, precast concrete **FALL PROTECTION IN CONSTRUCTION 3** erection, or residential construction. In addition, the standard requires falling object protection when a worker is exposed to falling objects.

What kinds of Fall Protection should employers use?

Generally, fall protection can be provided through the **use of guardrail systems, safety net systems, or personal fall arrest systems.** OSHA refers to these systems as conventional fall protection. Other systems and methods of fall protection may be used when performing certain activities. For example, when working on formwork, a positioning device system could be used. **OSHA** encourages employers to select systems that prevent falls of any kind, such as guardrails designed to keep workers from falling over the edge of a building.

Examples of Fall Protection Requirements for Certain Construction Activities
Leading Edges – 29 CFR 1926.501(b)(2)

Each worker constructing a leading edge 6 feet or more above a lower level must be protected by guardrail systems, safety net systems, or personal fall arrest systems. **29 CFR 1926.501(b)(2)(i**). Exception: When the employer can demonstrate that it is infeasible or creates a greater hazard to use these systems, the employer must develop and implement a fall protection plan which meets the requirements of **29 CFR 1926.502(k).** See the section below on Fall Protection Plans. Workers must be protected by guardrail systems, safety net systems, or personal fall arrest systems, even if they are not engaged in leading edge work, if they are on a walking or working surface that is 6 feet or more above a level where leading edges are under construction. **29 CFR 1926.501(b)(2)(ii**).

Overhand Bricklaying and Related Work – 29 CFR 1926.501(b)(9)

When workers perform overhand bricklaying and related work 6 feet or more above

a lower level:

- They must be protected by guardrail systems, safety net systems, or personal fall arrest systems, or
- They must work in a controlled access zone (CAZ).

All workers reaching more than 10 inches below the level of the walking or working surface on which they are working must be protected by a guardrail system, safety net system, or personal fall arrest system.

STATISTICS

According to the **Center for Construction Re-search** and training (CPWR) in a 33yr period from 1982 to 2015, falls accounted for nearly half of all construction workers deaths. More than half of the workers killed lacked access to fall protection.

NIOSH Fatality and Control Evaluation program researches found fatality reports for 768 construction industry fatalities.

Researchers after analyzing the incidents concluded that between 1982 and 2015 that:

- 42 percent (325) of the fatalities involved falls.
- 54 percent of the workers killed had no access to a personal fall arrest system and 23 percent had access to a PFAS but did not use it.
- Most of the workers with no access to PFAS worked for residential building contractors and contractors in the roofing, siding and sheet metal sectors.
- 107 of the 325 falls were from 30 feet or higher.
- 20 percent of the 768 deaths occurred in the victims first two months on the job.

Tower climbing, an obscure field with no more than 10,000 workers in 2012, has a mortality rate roughly 10 times that of construction. In the last nine years, alone, nearly 100 **tower climbers** have been killed on the job. Alarmingly, more than half of them were working on cell sites. An investigation led by ProPublica and PBS “Frontline” shows that the convenience of mobile phones has come at a hefty price: Between 2003 and 2011, 50 climbers died working on cell sites, more than half of the nearly 100 who were killed on communications towers.

Cell phone carriers’ outsource this dangerous tower climber jobs to subcontractors, a practice increasingly common in risky businesses from coal mining to trucking to nuclear waste removal. Due to this aspect, cell phone carriers’ connection to **tower climbing deaths** has remained invisible. In the Occupational Safety and Health Administration’s database of workplace accident investigations, you will not find a single tower climber fatality listed (Day, 2012).

For each tower-related fatality from 2003 to 2012, in accident after accident deadly missteps often resulted because climbers were shoddily equipped or received little training before being sent up hundreds of feet. To make matters worse, to satisfy demands from carriers or large contractors, tower hands sometimes worked overnight or in dangerous conditions.

Time pressure often leads tower hands to use a technique called free-climbing, in which workers don't attach their safety harnesses to the tower. This allows them to move up, down and around more quickly, but leaves them without fall insurance. In more than half of the tower fatalities examined, workers were, in fact, free-climbing, even though government safety regulations strictly forbid it. It is very appealing and most climbers eventually give in to it.

In **2016**, 697 workers died in falls to a lower level, and 48,060 were injured badly enough to require days off of work. A worker doesn't have fall from a high level to suffer fatal injuries; 134 workers were killed in falls on the same level in **2016**, according to *Injury Facts*. Construction workers are most at risk for fatal falls from height – more than seven times the rate of other industries – but falls can happen anywhere, even at a "desk job."

NSC data for 2016 includes falls from height and falls on the same level, by industry:

- Construction: 24,700 injuries, 384 deaths
- Manufacturing: 22,040 injuries, 49 deaths
- Wholesale trade: 10,250 injuries, 21 deaths
- Retail trade: 29,830 injuries, 29 deaths
- Transportation and Warehousing: 23,490 injuries, 46 deaths
- Professional and business services: 22,090 injuries, 111 deaths
- Education and health services: 43,660 injuries, 18 deaths
- Government: 63,350 injuries, 44 deaths

PREVENTION

Personal Fall Arrest System (PFAS)

When working at height, danger of a fall is obvious; however, many workers receive little or no fall protection training, use the wrong fall protection equipment (or use their equipment improperly) or, in some cases, fail to use fall protection equipment at all. It is every company's responsibility to prepare their employees for safely working at heights, and that preparation must include understanding the fall protection challenges of the job and how the challenges can be mitigated to get the job done safely.

Towers serve multiple functions, including supporting telecommunications networks. Each year, thousands of new towers are erected, mostly for cell phones, and as workers climb to build or maintain them, they are at risk of a fall. The tallest towers that have licensed construction permits in the United States now are over 2,000 feet tall. Tower work often requires employees to climb and move from one area of the tower to another, increasing the risk of falling at significant heights.

Personal fall arrest system are one way to protect workers from falls. They consist of a body harness anchorage and connector. When using PFASs, workers must ensure they are using components from the same manufacturer to ensure the system works as it should. If not, any substitution or change must be evaluated and tested to ensure it meets the standard.

Osha requires fall protection be provided at elevations of four feet in general industry workplaces, five and six feet in the construction industry. In Canada, the minimum standard for construction is 10 feet or 3 meters.

The procedures for implementation of (PFASs) is setout as follows:

Fall clearance

A common fall protection challenge involves calculating required fall clearance and choosing the correct equipment. The importance of knowing what the required clearance for a particular fall arrest system is obvious. If you know what the required clearance distance is and you allow for it, you help minimize the potential for injury in the event of a fall. But if you do not know what the required clearance is or you miscalculate, the results of a fall can result in serious injury and may require a rescue operation.

Choosing equipment

To start, there are four essential pieces of fall protection equipment tower workers should have in their **"Tool Box": Anchorage Connectors, Body Support, Connecting Components And Rescue Systems.**

Although many workers use a system that incorporates a shock absorbing lanyard, these systems typically require approximately 18 feet of fall clearance. Some ladder safety systems and self-retracting lifelines can reduce this number significantly and therefore are much safer and are preferred.

One example is a tie-back, self-retracting lifeline attached directly to the worker's dorsal D-ring. A tie-back, self-retracting lifeline (SRL) features unique snap hooks with high gate strength designed specifically for tie-back use. With this type of hook, the end of the lifeline can be wrapped around the structure and tied back into itself, eliminating the need for a separate anchorage connector. These systems feature inertia-activated brakes, which lock quickly and stop a falling worker within a matter of inches. With a tie-back SRL, it still is important to consider fall clearance, but it is recommended that workers account for approximately 6 feet, compared to the more restrictive 18 feet that is recommended for 6-foot, shock-absorbing lanyards.

Mobile rope grabs and static wire rope grabs are temporary devices and can be installed or removed at any point along the lifeline. The rope grab utilizes a cam lever as well as a friction-sensitive brake to lock the rope grab onto the lifeline in the event of a fall. A static wire rope grab employs a wedging action that grips and locks onto the cable if the worker slips. For fixed connection work, a scaffold choker or tie-off adapter provides a safe and easy anchor point.

When selecting a body support harness, consider comfort, quality and durability. Since tower workers likely will be wearing the harness for long periods of time, harnesses with hip padding, mesh lining and soft edging features will help keep workers comfortable while working at height. Further, there now are harnesses specifically made for tower climbing with built-in work seats and other specialized features.

There are many different types and options for connecting components, so think about the level of mobility the worker will need and the logistics of the work environment. Shock-absorbing lanyards and self-retracting lifelines both provide excellent protection in the event of a fall. Look for connectors that provide 100 percent tie-off capability, allowing the worker to stay protected while they move from one location to another. When work positioning is required, a rebar

assembly limiting free fall distance to 2 feet or less can provide a safe connection to many kinds of structures.

For work requiring vertical mobility, the choice of anchorage connector could be a ladder safety system, a mobile rope grab or a static wire rope grab. Ladder safety systems attach to permanent, fixed ladders and provide optimal fall protection and freedom of movement for workers. A tensioned cable runs the length of the entire climbing structure, with a top and bottom bracket serving as fixed anchors for the cable. To climb, a worker connects the front D-ring of his harness to a safety sleeve on the cable, which automatically follows his movements up the fixed ladder. If the climber slips, the sleeve locks onto the cable and prevents the worker from falling.