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How to Specify and Purchase Fall Protection Systems to Get What You Really Need.

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So You Need a Fall Protection System

Perhaps you think that fall protection is really simple, and that all you need to ask for are some anchorages for people to tie off to, or perhaps you can simply specify that, "A fall protection system must be provided." Unfortunately, when you don't ask for the right things, or the right expertise, you can end up with systems that meet your specification but don't meet your needs.

Understand that fall protection has many solutions. Humans have been using fall protection systems for thousands of years, mostly in ways that don't involve workers tying off to anchor points.

The Hierarchy of Fall Protection Abatements

Some ways of providing fall protection are better than others, and the best practice is to consider possible mitigations following a hierarchy of controls from the least to greatest risk solutions.

Passive fall protection is considered the best approach, because workers are protected without having to know or do anything in particular, or to even recognize that the hazard exists:

1. The best solution is to *eliminate the hazard* by designing or modifying the facility or process so that no one has to work at height, so there are *no* opportunities for anyone to fall. Examples include (re)locating equipment and systems to ground level or well away from locations where fall hazards exist. Valves, mechanical units, drains, are all examples of items or systems that can generally be (re)located away from fall hazards.
2. When we cannot eliminate the hazard, our next choice is to *guard the hazard,* by creating barriers that prevent someone from reaching the hazard. By far, the most common fall protection system is erecting a guardrail along edges from which we don't want people to fall.
3. Sometimes, the work activity is at locations where we cannot reasonably eliminate the fall hazard and cannot protect it with guarding. In this case, the least preference for passive protection is a *safety net.* Since this form does not prevent a fall, it must "catch" the worker at some height below the work surface and above the level that we don't want the worker to

strike. These systems must deal with the energy generated by the falling worker, so there remains a significant risk of injury before or when we stop the fall.

Active fall protection requires users to take deliberate actions to protect themselves, such as wearing personal protective equipment (PPE) and following specific procedures. There are two main classes of active fall protection:

4. *Travel restraint* is the preferred type of active fall protection because it prevents falls by "restraining" the user from being able to reach the fall hazard. It typically involves connecting the worker to an anchorage system with a short enough lifeline to prevent them from reaching the hazard. Because the fall cannot occur, the risk of injury is very low.
5. *Fall arrest systems* cannot prevent the fall, but can "catch" the worker before they can strike the ground or next lower level. This is the most difficult form of fall protection to implement because it requires the system to safely dissipate fall energy within the available clearance below the surface from which the worker(s) may fall. Similar to nets, there is always a risk of injury when using these systems. Furthermore, once we stop the fall, we must promptly and safely rescue workers suspended from the system.

The regulators may direct use of "passive" guardrails in work areas that are permanent and regularly occupied. Otherwise, the employer will decide what form of fall protection to use.

Where Do We Begin?

Knowing What Your Regulations Require

Regulations usually dictate:

- The threshold (minimum) heights, above which fall protection is required. These can vary from about 2 to 10 feet, depending on the jurisdiction.
- Design requirements for the strength and geometry of the applicable systems and equipment for both passive (guardrails and nets) and active (travel restraint and fall arrest) systems.
- For active fall protection, the maximum impact forces, written procedures and worker training, the criteria for the PPE, and so on.
- In fall arrest systems, falls must be stopped within a specified distance. Some regulations want the fall safely stopped within available clearance, while others specify a maximum free fall and deceleration distance.
- Finally, regulators usually require proper rescue planning and systems prior to commencing work involving fall arrest or safety net systems.

United States

In the United States, there are two primary sections of the federal OSHA regulations dealing with fall protection: (1) 29 CFR 1910 deals with safety in general industry (for permanent work locations) and; (2) 29 CFR 1926 deals with safety in the construction industry (temporary work locations). There are other sections in the OSHA regulations related to fall protection for particular occupations; however, most situations are covered by the following:

- Section 1910.23, Guarding floor and wall openings and holes"
- Section 1910.66 Appendix C, Personal Fall Arrest System; Occupational Safety and Health Standards, Subpart F, Powered Platforms, Manlifts, and Vehicle-Mounted Work Platforms.
- Section 1926.502, Subpart M, "Fall protection systems criteria and practices; Safety and Health Regulations for Construction.

The states of California, Oregon, Michigan & Washington have their own OSHA regulations mostly based on, but sometimes more strict than, the federal OSHA regulations.

It is important to understand that the U.S. OSHA regulations outline performance characteristics of some aspect of fall protection equipment and systems and do not reference the ANSI Z359 or any other fall protection standard. Fortunately, the ANSI standards are generally written to meet and exceed the OSHA regulations. There are some conflicts, but if the regulators see value in new practices, they may issue interpretation letters that effectively adopt the new practices. One important example is that OSHA has issued interpretation letters allowing more than 6 ft free falls and 3.5 ft deceleration distances, provided the fall is stopped within the available clearance and impact forces on the worker are controlled within the acceptable limits.

Canada

In Canada, each province and territory, as well as the federal government, have distinct regulations for occupational health and safety. Federal regulations typically apply to federal employees as well as utilities and transportation companies that move people and goods across provincial borders. Otherwise, most employers operate under provincial regulations.

Rather than listing all 13 sets of regulations, it is appropriate to simply note the following:

- There are marked differences between what is required in each Canadian jurisdiction.
- Most regulations refer to fall protection standards published by the Canadian Standards Association (CSA), and some also permit equipment certified to the American National Standards Institute (ANSI) and even European Norme (EN).

What Do the Standards Have to Offer?

As indicated above, the ANSI standards in the United States, while not cited by the regulators, are intended to provide fall protection systems to meet what OSHA wants.

In Canada, the standards carry more weight because they are usually cited in the regulations. Once adopted into a regulation, a standard becomes legally enforceable.

Because the ANSI Z359 and CSA Z259 standards are updated more often than the regulations; they are more up to date with evolving fall protection practices.

Although the regulators have the last say, and can choose to forbid any practices, equipment and systems, it is *extremely* rare for them to reject consensus standards such as ANSI Z359 or CSA Z259. Generally, as new standards are published, “interpretation” letters and “acceptance of equivalent level of protection” are issued to deal with conflicts that may arise.

It is important to know that the regulators cannot prosecute you for following a best practice contained in these standard,s unless they can prove that what you are doing is more dangerous than what is specified in the regulations. The experts involved in writing these standards generally develop them to reflect the latest technologies and ways of thinking.

Thus, specifying that systems meet applicable standards often provides better protection for your workers than simply citing that a fall protection system will meet the regulations.

Specifying Fall Protection Systems

Step 1: Ask yourself, "What type of system do I need?"

Before you write a specification for a fall protection system, you must decide what you need. You might consider retaining a qualified expert to investigate the fall hazards and explain the pros and cons of your options:

- Begin by looking at what tasks your workers or contractors will be doing at height. This can be done for a specific fall hazard. However, the best long-term results come from identifying and assessing a complete inventory of *all* your fall hazards. This helps you properly prioritize and plan your abatements.
- Follow the hierarchy of fall protection outlined above, to explore your options for each fall hazard or the one(s) you are dealing with at this time.
- Choose the option(s) you are going to implement. The regulators do not mandate what solutions you must use, so choose what works best for you. Consider both the initial implementation cost as well as long-term costs that may accrue for maintenance of your system(s), particularly active fall protection where the cost of equipping, training and supervising workers will add up over time.

Step 2: Ask yourself, "What standards should I cite to get what I want?"

Engineering Out the Hazard

ANSI Z590.3, "Prevention Through Design" (PtD) could be cited in your specification. Unfortunately, it outlines only general philosophies and rules for any aspect of safety rather than addressing the specifics of fall protection. There are no published compendiums of best practices for fall situations. The process outlined in this standard generally boils down to, "Think! Can we do this task some way without being exposed to the hazard?" and that, "The least expensive time to eliminate hazards is on the drawings, before the facility gets built."

Guarding

Temporary guarding (for construction purposes) can be specified according to the OH&S regulations applicable to your jurisdiction (e.g., OSHA 1910.23 in the U.S.).

Often, however, facility owners are looking for permanent systems since they know that access to the hazardous zone will re-occur at some interval and should be permanently protected. Permanent guarding must generally meet the applicable building code for your jurisdiction (e.g., the UBC or NBC).

Be careful when purchasing non-penetrating (ballasted) guardrailing systems that are offered for use on roofs. Many claim to meet the building codes for permanent guardrailing, and although some of them may meet the strength requirements when set up in specific configurations, they usually deflect a long way (often several feet) before they can resist the design loads in the building codes. When you are considering these systems, we recommend specifying that,"The installers shall test the installation using the forces specified in the building codes to prove that the system will not deflect more than 3 inches for the load applied at any point along the top rail of the guardrail."

Safety Nets

These are rarely used, but the same standard covers these systems in both Canada and the U.S. It is appropriate to cite ANSI A10.11, "Safety Nets Used During Construction, Repair and Demolition Operations."

Travel Restraint and Fall Arrest Systems
These are very different systems, one preventing the fall and the other catching the fall; however, they use the same equipment and are well covered by some relatively new standards.

ANSI Z359.6 in the U.S. and CSA Z259.16 in Canada are virtually identical, providing professional Engineers with guidance for "the Design of Active Fall Protection Systems". Both standards require a professional engineer to analyze and certify how systems perform.

Although simply citing either standard automatically requires design and inspection by a professional engineer, the facility owner must specify details that the engineer needs to know:

- Location(s) of the required system(s).
- The type of system (travel restraint or fall arrest).
- Number of users, and what the heaviest worker will weight (the default is 310 lbs).
- Type of work being performed.
- In a fall arrest system, the height of the work platform above the next lower levels so the engineer can determine if there is enough clearance.
- Whether safe access to and from the system is to be part of the design, or if it will be developed by others.
- Whether the designer of your fall protection system will develop the required written fall protection and, as applicable, rescue plans.
- Whether the fall arrest system must include rescue (this may not be required if your company already has its own rescue team, system or plan).
- You must provide drawings of the existing structure(s) to which the fall protection system will be anchored. If these are not available, the project scope should include inspecting, measuring, and even testing of the existing structures to assess capacity to carry the fall protection loadings..
- For a new facility, ensure that the fall protection engineer provides the forces that will be anchored to the new structures to the facility designers.
- If an active fall protection system is being retrofitted onto an existing facility, specify that the fall protection engineer must confirm that the existing structures can carry the forces from the new system or otherwise provide your own structural engineer to do this. (Amazingly, many fall protection "installation" companies offer engineering sign-off, but the drawings usually certify the system itself and include a caveat that the facility owner is responsible for ensuring that the structure(s) to which the fall protection systems are anchored are strong enough).

Window Washing
Window washing systems are similar to but different from fall protection systems. They include anchorages that may be used for fall arrest, but the same anchors can alternatively be used to connect the workers' suspension or their swing-staging systems. If the fall protection systems you need are for window washing, then you should *not* specify the standards for "Design of Active Fall Protection Systems" listed above, but must instead specify:

- ANSI/IWCA I-14.1, "Window Cleaning Safety" in the U.S.; or
- CSA Z271-10, "Safety Code for Suspended Platforms" in Canada

Conclusions

The proper specification for fall protection systems to be designed and installed by others is not too difficult. You must know what your regulations require, what the systems are required to be used for, and you must cite the appropriate standards.