Fall Protection; Working Safely at Heights

A Special Insert By

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Introduction

This article will discuss the requirements of fall protection to protect conservators, their employees, and subcontractors from the hazards associated with working at elevated heights. Conservators need to be aware of these requirements in order to effectively evaluate their activities/operations, unsafe conditions, actions or hazards, and some of the preventive or corrective actions that can be taken when considering work that will be performed at elevated heights. Hopefully, readers will use this information as a guide to help in developing site-specific safety plans as they work to ensure workplace and employee safety.

Conservators who consider such work must recognize that they are ultimately responsible for their actions and that their evaluation of the job requirements will determine the means and methods used to accomplish a particular job or task. Additionally, conservators who work with others must ensure that their employees are informed, trained, and competent to perform the task or job in a safe manner.

The information provided here is not meant to be used in lieu of the laws, standards, or regulations that apply. It is important to note that there are two different regulations published by the Federal Occupational Safety and Health Administration (OSHA) that may be applicable, depending upon the work being performed: Standard 29 CFR Part 1926 Sub Part M for Construction Standards and Standard 29 CFR Part 1910 for Industry. It should also be noted that some states such as California have state plans that take precedence. Additionally, local laws and contract documents as well as your own safety policies must be taken into consideration.

There are also other consensus standards generally accepted by the construction industry for working at heights, such as those developed by the American National Standards Institute (ANSI). ANSI Regulation A10.32 covers "Fall Protection Systems for Construction and Demolition" and ANSI A10.33, "Safety and Health Program Requirements for Multi-Employer Projects," includes important information on planning for projects involving work at heights.

Specifically, for each job site, conservators must ensure that employees meet extensive OSHA training requirements under the direction of a *Competent Person*, or someone who is "capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous or dangerous to employees and who has authorization to take prompt corrective measures to eliminate them" (OSHA 29 CFR§ 1926.32). Additionally, all safety work must be done by a *Qualified Person*, or someone who, "... by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training or experience, has successfully demonstrated his ability to solve or resolve problems relating to the subject matter, the work, or project" (OSHA 29 CFR§1926.32).

Planning

Planning is essential! Having no plan is a plan for failure, because accidents are bound to happen unless one specifically plans to avoid them! Planning involves the identification of risks and potential hazards in order to eliminate them or manage those hazards that cannot be eliminated. The means and methods that are used to accomplish the task or job must take into consideration the most effective and safe operational procedures while considering any hazards that need to be managed, any training for workers who will use these procedures, and all types of equipment and safety systems that will be used to achieve the goals.

Preplanning helps to identify hazards that are likely to occur during the work to be performed and assures that each party performing an operation will have the necessary material and equipment on hand when needed. The conservator should be actively involved in the preplanning process. The following practices relating to the preplanning process are drawn from ANSI A.10.33.

"Prior to the start of work the conservator should conduct a physical survey of the job and make a survey of the work to be performed by reviewing drawings, contract documents or scope of work and conducting discussions as applicable with one or more of the following—the Owner, the facility owner, Engineer, Contractor, and the Controlling Employer."

"At the initiation of the construction, maintenance or restoration project, and for critical stages of the work, a hazard analysis shall be conducted and implemented describing potential hazards and actions required in order to provide a safe and healthful workplace."

"A meeting of affected parties shall be held with the Conservator to coordinate and assign responsibility for all items identified in the hazard analysis."

For most projects where work is performed at heights above ground, speed is of essence, and time does not allow a single operation to continue long enough to become safe through trial and error. Pre-phase planning will enable the Conservator to anticipate the hazards and develop an appropriate plan to prevent accidents.

Fall Protection

Once a hazard analysis has been completed, decisions about specific types of fall protection can be made. For fall protection, early planning will always result in more available options and better, more cost-effective solutions. Fall protection solutions are always site- and task-specific. Fall protection is divided into two general categories: **passive solutions** and **active solutions**. Many applications are a combination of the best of both methods.

Both types of solutions must be designed by a *Qualified Person* or engineer, with arrangements for installation, inspection, and repair under the supervision of a *Competent Person*. Training must be site- and task-specific, developed from the manufacturer's instructions by a *Competent Person*, and given under supervision. Note that the use of some fall protection equipment such as scaffolding and ladders does not specifically require the involvement of such individuals, but that their use necessitates many of the same considerations in planning for a job hazard analysis, fall protection plan and evaluation of equipment choices. OSHA specifications for the use of such equipment can be found in 29 CFR 1926 Sub Part M.

Passive Solutions

Some examples of passive fall protection systems include guardrail systems such as on scaffolds, parapets, rooftops and walkways, personal and debris net systems, and guardrail mobile platforms including scissor and aerial lifts. Each of these systems includes multiple considerations and choices in order to provide appropriate protection for both the user and the surrounding environment. More information about these systems can be found in Chapter 3 of *Elevated Work Platforms and Scaffolding*, by Burkhart, McCann and Paine.

Passive solutions, as the name implies, do not require exposed persons to be proactive in protecting themselves from a fall situation. The fall protection equipment or plan is put in place before the potentially exposed workers are allowed to perform their tasks. Passive solutions are usually both designed and engineered by a *Qualified Person* to meet the job specific requirements, or equipment for such a solution is purchased from a manufacturer as a pre-designed system that is installed under the direction of a trained *Competent Person*. During the erection and dismantling of the passive system it is important that, where the hazard exists, a *Job Hazard Analysis* is completed and that workers erecting or dismantling the system have fall protection as needed.

Passive fall protection methods also include the use of ladders and scaffolds, and their use often requires pre-planning, as designed by a *Qualified Person* who is familiar with the specific applications. For example, ladders to be used for work at specific heights will often need to be secured at both top and bottom, and may require additional fall protection to ensure that the worker will not fall from the ladder while performing work at heights. Scaffolds always require careful consideration (by a *Qualified* or *Competent Person*) in their design, erection, and maintenance to protect from falls, falling objects, and other environmental conditions that may cause damage

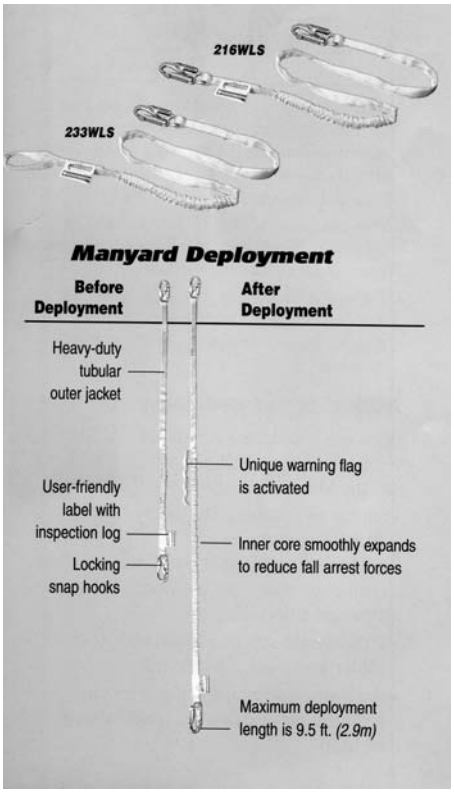
Job Hazard Analysis

Page:_____of_____ Date:_____

Contract No.:_____ Phase No.:_____

Contractor:_____ Location:_____

ACTIVITY/OPERATION	UNSAFE CONDITION, ACTION, OR HAZARD	PREVENTATIVE OR CORRECTIVE ACTION

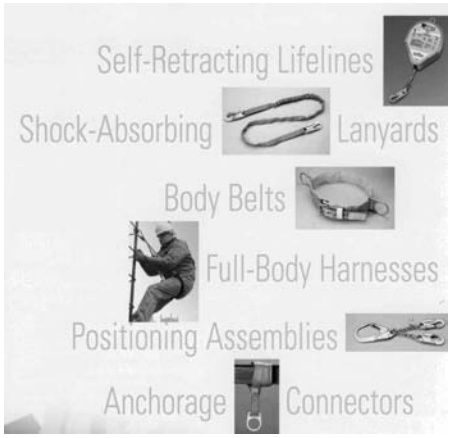


to the employee or the work product. Once erected and approved for use, the scaffold must not be altered by anyone working on it or using it.

Passive solutions, where they can be used, are preferable for eliminating fall hazards and preventing a potentially severe fall. These systems remove most of the human elements that can cause injury (such as having a "bad day" and not properly putting on or using your active fall protection equipment). But, in considering such systems, careful thought must be given to whether it is adequate for the situation and can protect the user in the intended application. For instance, when considering the installation of handrails, guard rails, and platforms, design and installation concerns will center on intended use and the maximum intended loads. In addition, rescue methods and personnel training will need to be pre-determined, where and when it is appropriate.

Active Solutions

Active solutions are systems that require the user to do something to prevent a potential fall. These systems are usually divided into three categories: **fall restraint**, **positioning**, and **fall arrest**. All three systems have similar component parts. Each needs an **anchorage**, a **connector**, and a **full body harness** or in a few cases a body belt. It is important to note that because of the potential for misuse of the equipment, almost all manufacturers and users require the full body harness in all applications. Furthermore, the anchorage and connectors will vary in strength and type depending on the application. Because these choices are critical, equipment for active solutions must be designed and chosen under the supervision of a *Qualified* or *Competent Person*. Any equipment purchased from a manufacturer must also be installed, inspected, and used in accordance with the manufacturer's instructions. Any training for employees or workers must also be done under the supervision of a *Competent Person* and in accordance with the manufacturers' instructions and the task-specific application.



Active fall protection systems address the compatibility of the component parts as well as the ability of the system to adequately protect the user in the intended application.

Anchorages are an important element in the use of active fall protection solutions. All parts of the engineered systems need to conform to OSHA and ANSI Standards and to manufacturers' instructions. Anchorages are either fixed or portable. Fixed anchors are embedded in the structure or attached to the structure or some other suitable fixed point. Portable anchors are removable and can be moved from point to point. Careful consideration needs to be taken to ensure that the user is not exposed to a fall situation during erection or movement of the anchorage. Anchorages should be preplanned and their locations and strength should be known to foreman and workers as part of the site-specific fall protection plan and the training program.

The **connector**, as the name implies, is the means of attaching the anchorage to the harness. Some of the more common connectors are rope or web lines between the anchorages and the harness. Some connectors contain shock absorbers; others are adjustable in length depending on the application. **Retractable lifeline connectors** are sometimes used and keep the line taut to reduce the fall distance of the user. Finally, many systems incorporate **horizonta**l or **vertical lifelines** that allow continuous movement of the user while being fully attached. An example of the latter is the safety line that one should always be attached to when working from a swing stage.

Full body harnesses come in many different varieties for different applications and uses. A suitable harness should be selected by a *Competent Person* for the work to be performed with consideration for the types of active fall protection systems that the worker will be utilizing. Individual harnesses should be sized to the specific individual and worn in accordance with the manufacturer's instructions and the training, as provided by the *Competent Person*. Full body harnesses are used in almost all active fall protection applications and are required by OSHA in all fall arrest applications after January 1, 1998. There are many different harnesses available from many manufacturers. You need to take these three areas into consideration when making your decision on an application: **fall restraint**, **positioning**, or **fall arrest**.

Configurations for Active Fall Protection

Fall restraint systems thwart the restrained worker from reaching the potential fall area and thereby preventing the hazard of a fall. This is accomplished by ensuring that the anchorage and the length of the connector will not allow the worker to reach the fall hazard. This system prevents the user from falling

any distance. Other components typically include a lanyard and may also include a lifeline and other devices. Careful planning, installation, and training are necessary to insure that a fall restraint system works to properly restrain a fall in all conditions of use. When used by workers who have been trained in a location where the system has been properly designed and installed, this is an excellent means of protection.

Positioning systems, sometimes referred to as **positioning device systems**, are used to allow an employee to be supported on an elevated, vertical surface, such as a wall or workstation. This type of system allows the worker free movement to do his/her work while being supported in place, with little or no risk of fall distance. Typical examples of these devices would include rebar chain assemblies, and form-hooks attached to concrete or other formwork. These applications need to be designed by a *Competent Person* and are usually a part of an overall fall protection plan.

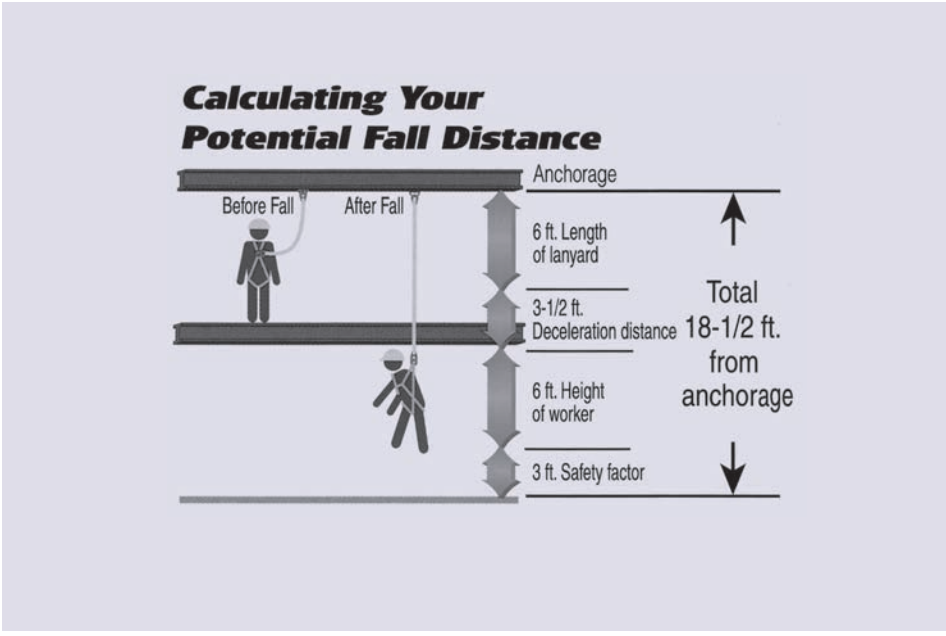
Fall arrest systems are potentially the most dangerous of all fall protection systems because they allow a planned freefall of up to six feet and a force of up to 1,800 pounds applied to the body, but they also allow the greatest flexibility of movement. ***Personal fall arrest systems*** are used to arrest an employee in a fall from a working level. A personal fall arrest system consists of an anchorage, connectors, a full body harness and may include a lanyard, deceleration device, lifeline, or a suitable combination of these. The use of a body belt is prohibited. A *Competent Person* needs to carefully consider alternative choices before using this method, because it can be considered the choice of last resort. When designing such a system, important considerations include reduction of the fall distance and the force that a body might experience during freefall. The planning process must also consider the total fall distance from a working surface and any obstacles or structures that the worker might impact or swing into during the fall.

Depending on the components used in the fall arrest system, substantial total fall distances exist. These distances can be critical if not properly addressed. For example, the distance between floors in a multi-tiered structure is typically 15 feet, and the worker could potentially impact the floor below or the system could fail to arrest his/her fall before impact.

All of the components that make up a system (the anchorage, the connector and the harness) are crucial to its success. For example, if the anchorage serves as a horizontal lifeline (not fixed), then deflection of the line adds fall distance that can be critical in preventing injury. The total extended length, including such parts as the extended shock absorber, will be considered in calculating the total fall distance. Finally, the length of the body from parts such as the "Dee Ring" to the bottom of the feet, including any stretch of the harness, will also be included in total distance determinations.

Rescue Plans

A plan for immediate rescue is imperative because the worker can be safely suspended in a full body harness for only a very short time. Help in designing these systems can be found in the ANSI Standards and in the product specifications of the manufacturers of



fall protection equipment.

Each activity/operation described will lend itself to a combination of different solutions, which are based upon on the means, methods, and culture of each project. At the conclusion of each job, it is important to capture chosen solutions, evaluate them, and make any changes or modifications that will improve future solutions.

Emergency Plan

When working at heights, all potential accidents are emergencies because of the potential for physical harm to those performing the work. The conservator or designated representative "...shall prepare a project specific emergency plan and communication system that describes procedures to be followed in the event of serious injuries, fatalities, structural failures and other emergencies". (ANSI A.10.33 1992) It is the responsibility of each party or contractor to know how to handle any emergency that may arise and to train his employees how to implement the emergency plan.

Summary

For any situation where workers will be required to work at heights, it is important that you explore all aspects of potential hazards and solutions as you make your selections for fall protection systems. Any choices must take into consideration federal, state and local laws and regulations, ANSI and other industry standards, the contract documents, and the owner and/or conservator's requirements. Obviously, your own safety plan, site-specific plan, and culture also affect your final selection or choice of solutions.

Additionally, careful training, reading and understanding of fall protection equipment manufacturers' manuals for design, installation, use, and maintenance are crucial. Pay particular attention to all cautions, warnings, and danger labels and ensure that proper labels are displayed, not damaged or covered.

Wherever possible, workers who will be exposed to a potential fall need to be evaluated to determine that they are in good physical condition and do not have medical limitations that will put them in jeopardy.

Remember, designing the proper fall protection system for proper application is very important; but equally important is proper training of the users. Only workers who have been appropriately trained and informed by a *Qualified* or *Competent Person* should use these systems. Installation, maintenance and disassembly of these systems must also occur under the direction of a *Competent Person*. This will ensure that you have a safe, profitable, and well-run application.

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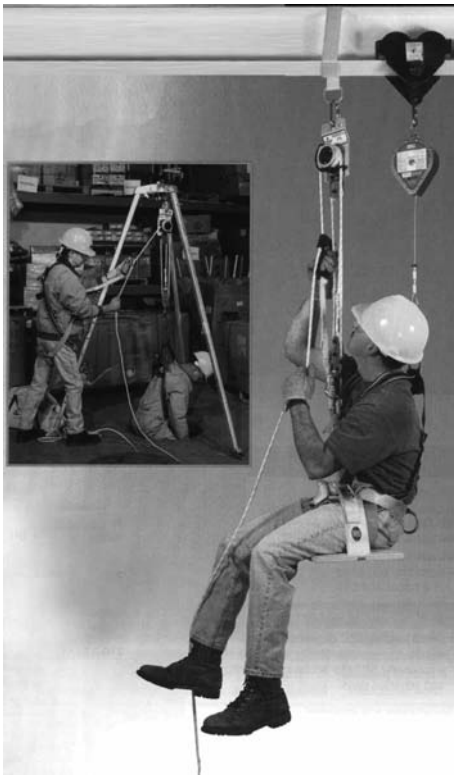
Charts and pictures: Courtesy of Miller Fall Protection, Bacou Dalloz



Project Safety Analysis			
Activity/Operation			
Unsafe Condition, Action or Hazard			
Preventative or Corrective Action			
Discussion:			
ASA Required:	Yes	No	
JSA Required:	Yes	No	
Responsible Supervisor:	_____		
Competent Person:	_____		
Inspection Required:	Yes	No	Frequency:
Approved:	_____		

Sources

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ANSI A10.33: Safety and Health Program Requirements for Multi-Employer Projects

ANSI A.14. Ladder Standards

ANSI Z.359.1 Safety requirements for personal fall arrest systems, sub-systems and components.

ANSI 92 Work Platform Standards

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