

PERSONAL FALL PROTECTION EQUIPMENT

USE AND SELECTION GUIDE



INTERNATIONAL
SAFETY EQUIPMENT
ASSOCIATION



FOREWORD

A comprehensive fall protection program prevents injuries, saves lives and makes good business sense.

In almost every industry, there are areas where workers are subjected to fall hazards. The 635 fatal falls in 2010 resulted in billions of dollars in workers-compensation costs. According to Liberty Mutual, the leading private provider of workers' compensation insurance in the United States, on-the-job injuries cost employers nearly \$1 billion per week in payments to injured employees and their medical providers.

Developing and implementing comprehensive fall protection programs in the workplace can prevent many of these injuries and fatalities.

Once fall hazards have been identified by a competent person, fall hazard elimination should be considered first. This is typically known as "engineering out the hazard" and consists of redesigning the working environment and the work processes and procedures. If this is impractical due to extensive modifications and cost, fall prevention should be considered next.

Fall prevention may be handled in a number of ways. Scaffolds, handrails, barriers and movable platforms can be constructed to protect workers employed at heights.

Where these devices are impractical, personal fall protection equipment such as full body harnesses, lanyards and retractable lifelines may be used. The Occupational Safety and Health Administration (OSHA) requires personal fall protection for workers at various heights depending on the job.

The International Safety Equipment Association has prepared this use and selection guide to provide practical, hands-on guidance for fall protection users and administrators in their selection, use, maintenance and inspection of fall protection equipment. Information in this guide is based on OSHA regulations and ANSI standards pertaining to fall protection, and was provided by members of the ISEA Fall Protection Group.

The guide is available online as a pdf file on ISEA's Web site, www.safetyequipment.org. It may be accessed online, or downloaded without charge. The guide will be updated periodically, and the effective date will be shown on this page. If you download the guide, check back periodically to ensure you have the latest edition.

For additional information on specific personal fall protection equipment, contact the manufacturer of the fall protection used in your workplace.

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1. PURPOSE AND SCOPE

PURPOSE The purpose of this user's guide is to:

- Provide guidance to users on the need for proper fall protection planning to either remove the fall hazard, prevent access to the fall hazard, restrict worker movement at the fall hazard, or provide the proper fall arrest equipment;
- Illustrate fall protection systems;
- Familiarize fall protection equipment users with the appropriate OSHA and ANSI standards pertaining to their use.
- Assist in the proper selection, care, use and inspection of fall protection equipment.

For specific applications, users should always consult the individual manufacturer's guidelines.

SCOPE These guidelines are written for all personal fall protection equipment users. This includes those responsible for establishing and administering an employer's fall protection program. Everyone involved needs to be knowledgeable about fall protection.

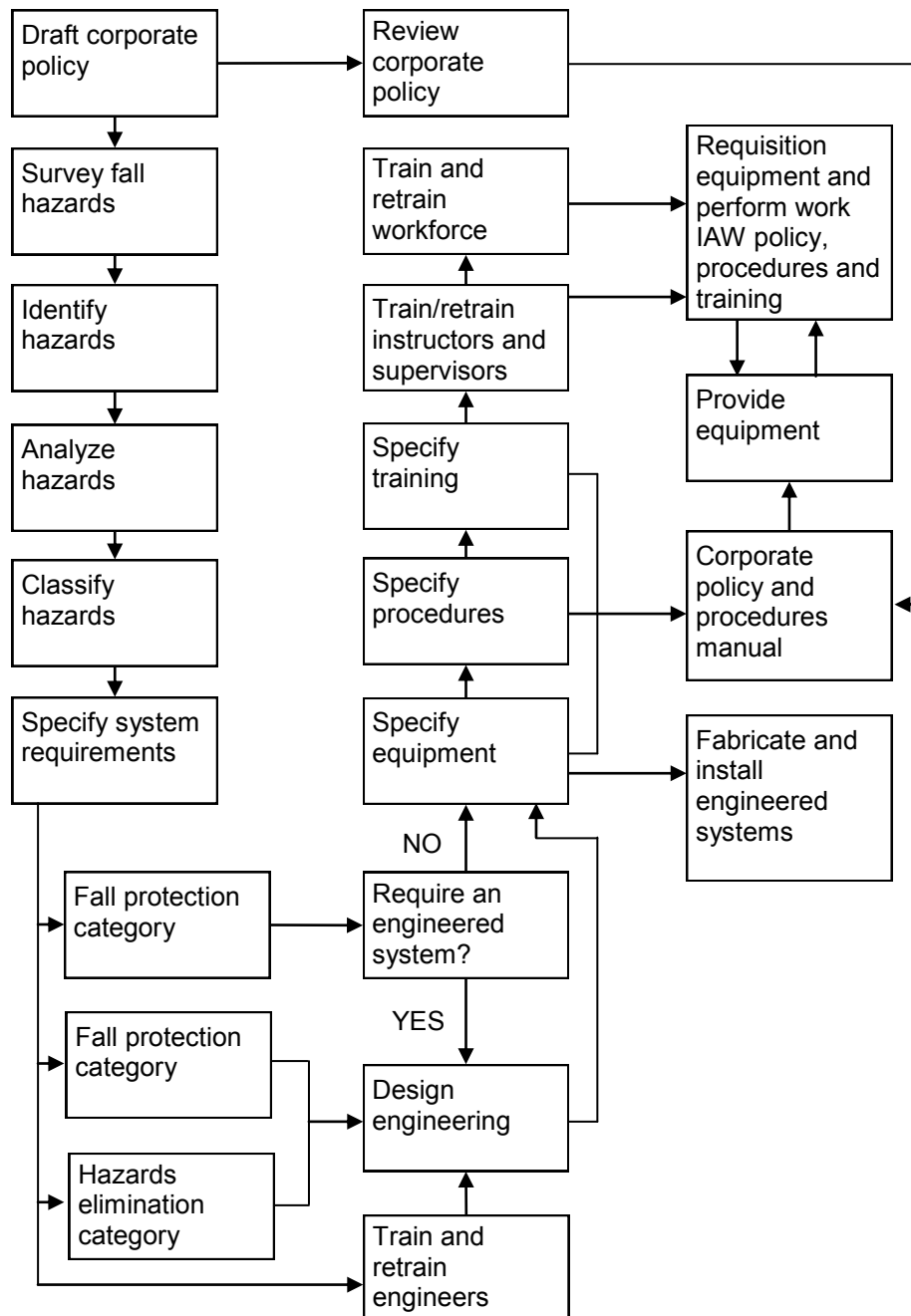
- Section 2 provides an overview of an enterprise program for safety at heights.
- Section 3 describes the components of a personal fall protection system.
- Section 4 goes into greater detail, listing typical components for various work scenarios and applications.
- Section 5 provides guidelines for planning the use of fall protection systems.
- Section 6 details how to inspect the components of a fall protection system.
- Section 7 gives guidelines for cleaning, maintenance and storage.
- Section 8 contains definitions for terms used in fall protection.
- Section 9 provides a list and links to OSHA and consensus standards.
- Section 10 is a directory of members of the ISEA Fall Protection Group.
- Section 11 contains links to additional sources of information on fall protection standards and regulation.

2. DEVELOPING A CORPORATE PROGRAM FOR SAFETY AT HEIGHT

HOW DO I GET STARTED?

It is the employer's responsibility to develop a fall protection program that complies with mandatory regulations. The most effective programs are those where employers work closely with their workers to identify fall hazards and to jointly develop a comprehensive fall protection program that either eliminates fall hazards or provides appropriate protection against them. Employees must also use equipment in the manner described by the manufacturer.

The following is an example flow chart of a corporate program for safety at height.



UNDERSTANDING REGULATIONS AND STANDARDS

It should be noted that regulatory agencies have steadily increased fines for noncompliance and negligence. Citations can be avoided by establishing an appropriate, compliant fall protection program, which includes a complete worker training program.

The Occupational Safety and Health Act (OSHA) under Title 29 of the Code of Federal Regulations (29 CFR) assures and enforces safe and healthful working conditions for general industry, construction and the maritime trades. Under the Act, employers have the duty of providing their workers with a place of employment free from recognized safety and health hazards. It's the law.

Employers should obtain copies of the regulations that apply to their work activities and begin a fall protection regulations file. See section 10 for a listing of Occupational Safety and Health Administration (OSHA) regulations that deal with fall protection. There may also be fall protection regulations that are unique to your state or municipality. It is the employer's responsibility to know and understand the applicable regulations.

In addition to government regulations, there are voluntary consensus standards that address fall protection equipment and practices. American National Standards Institute (ANSI) and the Canadian Standards Association (CSA) voluntary consensus standards specify product performance and testing criteria for personal fall arrest equipment. Unlike OSHA regulations, these standards are not enforceable as law; however, many parts of OSHA rules are adopted from ANSI standards. Relevant ANSI standards are listed in section 10.



HAZARD IDENTIFICATION

A well-conceived fall protection program begins with identification of all fall hazards in the workplace. As a general rule, any time a worker is at a height greater than 4 feet (1.2m), a fall hazard exists according to OSHA. Where a fall hazard exists, there are two acceptable options: eliminate the hazard, or provide protection against it.

Where hazards can be eliminated, to the employer must do so. It may be possible to eliminate or prevent the fall hazard by changing work procedures, redesigning the working environment, installing a guardrail, or using passive fall protection. When this is not possible, use of personal fall protection may be required. Fall protection can be a restraint system to keep the worker from reaching an area where there is a fall hazard, or a personal fall arrest system to allow the worker to work at height.

WRITTEN FALL PROTECTION PLAN

Following hazard identification, a written site-specific program should be developed with detailed work procedures to protect employees. The plan should state what fall prevention and protection measures are to be used, how they are to be used, a rescue plan, and who is responsible for overall supervision and training. This program need not be elaborate, but should cover the basic elements and should be clearly conveyed and understood by all participants.

PRODUCT SELECTION

The employer must know the types of fall protection products that are available, and decide which would be most suitable for the workplace. By understanding how fall protection products operate and knowing the differences in product functions, the employer can select products that are best suited for workers and the hazards they face. Section 4 provides guidelines for product selection.

TRAINING

All workers must be trained under careful and competent supervision before using any fall protection products. Live hands-on training for all users is essential to help understand the capabilities and limitations of their personal protective equipment. Training promotes confidence and should be conducted as an initial introduction and repeated periodically for review and additional practice. Manufacturer's user instructions, warnings, cautions and equipment limitations should be reviewed and understood by the employees. Training should be site-specific and may need to cover more topics than are listed here.

Workers must be able to:

- Identify potential fall hazards
- Determine which products to use in specific work environments
- Demonstrate proper anchoring procedures
- Inspect and maintain fall protection equipment
- Demonstrate procedures and the proper wearing of fall protection equipment

The following is a suggested list of training objectives:

- Recognize fall hazards, and eliminate the hazard where possible.
- Know the three parts of a fall arrest system: Anchorage, Body Support, and Connection.
- Select the proper equipment for each application.
- Consider environmental and other workplace factors.
- Avoid incompatible connections to prevent snap hook roll-out and/or burst-out. (See illustration in section 6).
- Determine and reduce free fall distances.
- Understand how to lower the maximum arresting force.
- Properly fit a harness.
- Select an appropriate anchor point.
- Implement a pre-determined rescue plan.
- Inspect and maintain equipment.
- Understand the limitations and requirements of the equipment.
- Understand the consequences of not following, or understanding manufacturer's instructions



ROLE OF COMPETENT AND QUALIFIED PERSONS

The **competent person** and **qualified person** are key terms in a fall protection hazard abatement program. OSHA defines these terms somewhat differently for general industry than for construction, as evident in the citations below:

General Industry: OSHA 29 CFR Part 1910

Competent person is defined as "...a person who is capable of identifying hazardous or dangerous conditions in the personal fall arrest system or any component thereof, as well as in their application and use with related equipment."

Qualified person is defined as "...one with a recognized degree or professional certificate and extensive knowledge and experience in the subject field who is capable of design, analysis, evaluation and specifications in the subject work, project, or product."

Construction: OSHA 29 CFR Part 1926

Competent person is defined as "...one 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."

Qualified person is defined as "...one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training and experience, has successfully demonstrated his/her ability to solve or resolve problems related to the subject matter, the work, or the project."

To cover variations in the definitions of a competent person in the field of safety at heights, the person in this important role should meet these minimum qualifications:

- Be able to identify existing or predictable hazardous or dangerous conditions related to the workplace, work processes and the safety at heights program.
- Be able to establish controls on identified existing or predictable fall hazards according to the hierarchy of controls.
- Understand how to select, inspect, use, store and maintain personal equipment for fall protection.
- Be able to identify existing or predictable hazardous or dangerous conditions in a personal fall arrest system, and any component thereof.
- Have the authority of take prompt corrective measures to control existing or predictable fall hazards and unsafe fall protection equipment conditions.
- Be able to train workers at risk of falling from heights in accordance with standards and regulation.
- Apply a working knowledge of applicable standards and regulations.

3. COMPONENTS OF A PERSONAL FALL ARREST SYSTEM

There are three vital components that make up a complete fall protection system. These are the ABC's of fall protection:

- **A**nchorage.
- **B**ody support.
- Means of **C**onnection.

Each one must be in place and properly used to provide maximum worker protection.

While each of these components is vital to worker safety, the connecting device is the critical link in assembling a safe fall protection system since it bears the greatest force during a fall. Careful consideration must be given to the selection, materials, construction and inspection/maintenance of fall Protection equipment before, during and after a connecting device has been selected.



ANCHORAGE/ ANCHORAGE CONNECTOR

An anchorage, as defined by OSHA, is a secure point of attachment for lifelines, lanyards or deceleration devices. ANSI Z359 defines anchorage as a fixed structural component such as a beam, girder, column or floor that can support the forces exerted in arresting a fall, and introduces the term “anchorage connector” to refer to the component by which the connecting device is coupled to the anchorage. It may be a beam anchor, cross-arm strap, D-bolt, hook anchor, tripod, davit or other secure device that serves as a point of attachment for lifelines, lanyards or deceleration devices.

Anchorage and anchorage connectors must be independent and capable of supporting 5,000 lb per employee attached, or designed, installed and used under the supervision of a qualified person as part of a complete personal fall arrest system which maintains a safety factor of at least two. They must also be located high enough for a worker to avoid contact with a lower level should a fall occur.

BODY SUPPORT

A body support, or body wear, is the component that is worn on or around the torso. Body belts and full body harnesses are the two most common body supports.

Body Belt

A body belt is a belt that circles the waist and is used for worker positioning and fall prevention. A body belt may be supplied with D-rings on the hips and/or middle of the back. A body belt must NEVER be used for personal fall arrest.

Full Body Harness

A full body harness is a body support device that distributes fall arrest forces across the shoulders, thighs and pelvis. Full body harnesses have a center back fall arrest attachment for connection to the fall arrest connecting device and may have other D-rings for use in worker positioning, fall prevention, suspension or ladder climbing.

- The only form of body wear acceptable for fall arrest is the full-body harness.
- Full body harnesses should be selected based on work to be performed and the work environment.
- Front D-rings on full body harnesses are used only for ladder-type fall arrestors, work positioning, travel restraint or rescue. Side D-rings are for positioning only.



MEANS OF CONNECTION

The connecting subsystem is the critical link which joins the body wear to the anchorage/ anchorage connector. It can be an energy-absorbing lanyard, fall limiter, self-retracting lanyard, rope grab, or retrieval system. Connecting means will vary depending on whether the worker is equipped for personal fall arrest or work positioning and travel restriction.

Connecting Means for Personal Fall Arrest

The connecting means for personal fall arrest is often a lanyard equipped with an energy-absorbing element to reduce the energy transmitted to the user's body in the event of a fall. Self-retracting lifelines or fall limiters reduce free-fall distance as well as reducing energy loads from a fall. Go to section 5.3 for guidance on calculating fall clearance.

Connecting Means for Positioning and Travel Restriction

The connecting means for positioning and travel restriction is often a simple lanyard, constructed of rope, web or wire rope. These may also include specialized positioning assemblies for rebar work, constructed of chain or web. All positioning devices are intended to reduce the potential for free fall to a distance of less than two feet. Restraint lanyards are specified in length to prevent the user from reaching a fall hazard zone.



4. SELECTION OF PERSONAL FALL PROTECTION EQUIPMENT

FALL ARREST As a general rule, it is recommended that a fall arrest system be used any time when working at an elevated level and exposed to a fall hazard. Trigger heights (for example, 4 feet for general industry workplaces, and 6 feet for construction) are dictated by specific standards for the applicable industry. The following is recommended:

- **Anchorage** - Support structure capable of supporting 5,000 lb per employee attached, or designed, installed and used under the supervision of a qualified person as part of a complete personal fall arrest system which maintains a safety factor of at least two.
- **Anchorage Connector** - Anchor sling, I-beam trolley, or other anchorage connector.
- **Body Support** - Full body harness.
- **Connecting Means** - Energy-absorbing lanyard or self-retracting lanyard, and lifeline and fall arrester.



WORK POSITIONING

A work positioning system is used to hold a worker in place while allowing a hands-free work environment at elevated heights. The free fall must be limited to 2 feet or less. A fall arrest system should be used in conjunction with a work positioning system when the user is at an elevated height. The following is recommended:

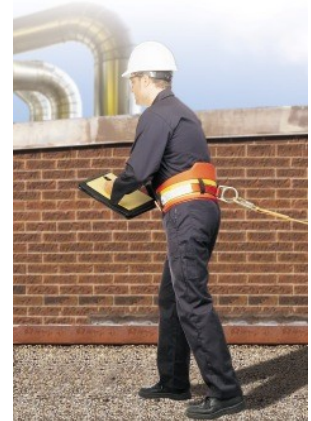
- **Anchorage** - Support structure such as a ladder or vertical rods.
- **Body Support** - Full body harness or body belt with D-rings for attachment of work positioning equipment.
- **Connecting Means** – Anchor bolt, trolley, carabiner or rebar assembly.



RESTRAINT

A restraint system will prevent the worker from reaching a location where a free fall hazard exists. The following is recommended:

- **Anchorage** - Support structure.
- **Anchorage Connector** - Anchor sling, roof anchor system.
- **Body Support** - Full body harness or body belt with back-mounted D-ring.
- **Connecting Means** – Positioning lanyard.



**SUSPENSION/
PERSONNEL
RIDING
SYSTEMS**

Suspension systems are used widely in the window washing and painting industries and are designed to lower and support a worker vertically while allowing a hands-free work environment. The following is recommended:

- **Anchorage** - Support structure.
- **Anchorage Connector** - Anchor sling, tripod or davit.
- **Body Support** - Full body harness.
- **Connecting Means** - Vertical lifeline ascender/descender and backup vertical lifeline with rope grab.



**RETRIEVAL/
RESCUE**

The retrieval system is primarily used in confined space applications where workers must enter tanks, manholes, etc. and may require retrieval from above should an emergency occur. The following is recommended:

- **Anchorage** - Support structure.
- **Anchorage Connector** - Tripod or davit.
- **Body Support** - Full body harness.
- **Connecting Means** - Self-retracting lifeline with retrieval capabilities and a personnel rated hoist when ladder access is not available.



**LADDER
CLIMBING**

Flexible Line Fall Arrest Systems

- **Anchorage** - Permanent ladder meeting the requirements of OSHA 29 CFR 1910.27.
- **Anchorage Connector** – Fixed wire rope lifeline with intermediate supports and a mobile fall arrester.
- **Body Support** - Full body harness equipped with front or hip D-rings for attachment to ladder climbing fall arrest system.
- **Connecting Means** - Connecting hardware, such as a locking carabiner, compatible with the fall arrester and body support harness.



**PERMANENT
FIXED
LADDERS**

Rigid Rail Fall Arrest Systems

- **Anchorage** -Permanent ladder meeting the requirements of OSHA 29 CFR 1910.27.
- **Anchorage Connector** - Rigid rail or track with mobile fall arrester.
- **Body Support** - Full body harness equipped with front or hip D-rings for attachment to ladder climbing fall arrest system.
- **Connecting Means** - Connecting hardware, such as a locking carabiner, compatible with the fall arrester and body support harness.



**LADDER
CLIMBING**

**TEMPORARY,
PORTABLE
LADDERS**

Rope Grab Systems

- **Anchorage** - Overhead structural member of suitable size, shape and strength to support the fall arrest system.
- **Anchorage Connector** - Vertical lifeline, synthetic rope or wire type, with “rope grab” mobile fall arrester.
- **Body Support** - Full body harness equipped with back mounted D-ring for fall arrest.
- **Connecting Means** - Lanyard or energy-absorbing lanyard as specified by the manufacturer of the rope grab fall arrester

Other:

Other suitable fall arrest systems for use with temporary, portable ladders, include self-retracting lanyards in place of the rope grab fall arrester and lifeline. We do not recommend self retracting lifelines (SRL) when a cage fixed ladder is present since in the event of a fall, the cage will act as an obstruction, preventing the SRL from working.



**EVACUATION/
CONTROLLED
DESCENT
SYSTEMS**

- **Anchorage** - Support structure.
- **Anchorage Connector** – Tie-off sling is an option.
- **Body Support** - Full body harness with either front or shoulder mounted D-ring.
- **Connecting Means** - Controlled descent device.



Selection of Personal Fall Protection Equipment - Summary Table

Task	Anchorage	Anchorage Connector	Body Support	Connection Means
General Fall Arrest	Support structure capable of supporting 5,000 lb per employee attached, or designed, installed and used under the supervision of a qualified person as part of a complete personal fall arrest system which maintains a safety factor of at least two	Anchor sling, I-beam trolley, or other anchorage connector	Full body harness	Energy-absorbing lanyard or self-retracting lanyard, and lifeline and fall arrester
Work Positioning	Support structure such as a ladder or vertical rods		Full body harness or body belt with D-rings for attachment of work positioning equipment	Anchor bolt, trolley, carabiner or rebar assembly
Restraint	Support structure	Anchor sling, roof anchor system	Full body harness or body belt with back-mounted D-ring	Positioning lanyard
Suspension/ Personnel Riding System	Support structure	Anchor sling, tripod or davit	Full body harness	Vertical lifeline ascender/descender and backup vertical lifeline with rope grab
Retrieval/Rescue	Support structure	Tripod or davit	Full body harness	
Ladder Climbing – Permanent Fixed Ladders – Fixed Line Fall Arrest Systems	Permanent Ladder meeting the requirements of OSHA 29 CFR 1910.27	Fixed wire rope lifeline with intermediate supports and a mobile fall arrester	Full body harness equipped with front or hip D-rings for attachment to ladder climbing fall arrest system	Connecting hardware, such as a locking carabiner, compatible with the fall arrester and body support harness
Ladder Climbing – Permanent Fixed Ladders – Rigid Rail Fall Arrest Systems	Permanent ladder meeting the requirements of OSHA 29 CFR 1910.27	Rigid rail or track with mobile fall arrester	Full body harness equipped with front or hip D-rings for attachment to ladder climbing fall arrest system	Connecting hardware, such as a locking carabiner, compatible with the fall arrester and body support harness
Ladder Climbing – Temporary, Portable Ladders – Rope Grab Systems	Overhead structural member of suitable size, shape and strength to support the fall arrest system	Vertical lifeline, synthetic rope or wire type, with "rope grab" mobile fall arrester	Full body harness equipped with back mounted D-ring for fall arrest	Lanyard or energy-absorbing lanyard as specified by the manufacturer of the rope grab fall arrester
Evacuation/ Controlled Descent Systems	Support structure	Tie-off sling is an option	Full body harness with either front or shoulder mounted D-ring	Controlled descent device

5. PLANNING THE USE OF SYSTEMS

FIRST STEPS

Begin by performing a hazard identification and evaluation of your work site. Then plan the system(s) before starting work. Consider all possible paths of user movement and all factors that could affect the user's safety before, during and after a fall anywhere along these paths. All hazards identified in the workplace assessment must be addressed and suitable controls planned and implemented.

A qualified person must select the components, materials, anchorage and anchorage connectors to match the system application, the work, workplace hazards and the environment. Consider the following points when planning the system(s):

- **Warnings** – Always read all instructions and warnings contained on the product and packaging before using any fall protection equipment.
- **Inspection** – All fall protection equipment must be inspected prior to each use.
- **Training** – All workers should be trained by a competent person in the proper use of fall protection products.
- **Regulations** – Understand all federal, state or provincial and local regulations pertaining to fall protection before selecting and using the equipment.
- **Rescue Planning** – Minimizing the time between a fall occurrence and medical attention of the worker is vitally important. A thorough rescue program should be established prior to using fall protection equipment.
- **Product/System Preferences** – If there are any doubts about which fall protection products to use, contact your preferred fall protection manufacturer for assistance.
- **System Components** – Only components that are fully compatible with one another should be used. Fall arrest systems are designed and tested as complete systems and should be used in this way.
- **Equipment Removal** – After a fall occurs, all components of the fall arrest system should be removed from service.
- **Sharp Edges** - if work must be performed near unavoidable sharp edges, plan to protect against cutting by use of heavy padding or other means of covering the sharp edge.

ANCHORAGES AND ANCHORAGE SYSTEMS

Determine the necessary locations of anchorages to assure that the user will be continuously connected when exposed to hazards of falling. Select anchorages that are stable and have the strength required. Carefully select the locations of the anchorages to:

- Reduce possible free fall distance.
- Prevent swing fall hazards.
- Provide clear space in the potential fall paths to avoid striking an object.

Do not select anchorage locations that will require the user to work above the anchor as this will increase the potential free fall and total fall distances. Plan the types of anchorage connectors you will need.

FREE FALL DISTANCE, TOTAL FALL DISTANCE, AND SYSTEM ELONGATION

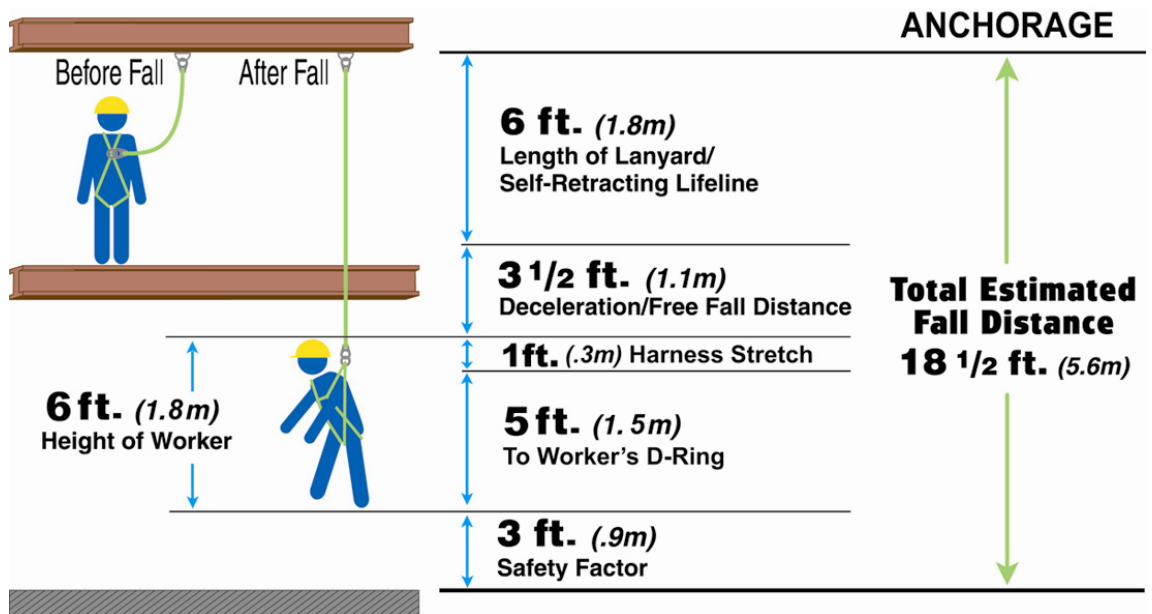
Personal fall arrest systems must be selected and rigged to ensure that potential free fall distances will never exceed 6 ft (1.8 m) as required by OSHA. See manufacturer’s instructions for connecting subsystems to determine the deceleration distance and elongation that must be taken into consideration.

Total fall distance is the sum of free fall distance and deceleration distance. Dynamic elongation of the system (temporary elastic stretch of connecting components and subsystems) and the worker’s height must be added to total fall distance and the user must allow for clearance. It is prudent to allow for an additional safety factor of 3 ft (1 m) below the fallen worker’s feet.

Potential fall distance must be calculated to determine how to rig the system, and selection of the appropriate type of connecting device. For example, when using a 6-foot lanyard, the illustration below shows a typical calculation of total estimated fall distance. For the example shown:

- When fall clearance is under 18.5 ft (5.6m), an alternative solution such as a shorter lanyard length, or a different connecting device such as a self-retracting lanyard or fall limiter, is needed to reduce the total fall distance.
- When fall clearance is over 18.5 ft (5.6m) there is sufficient total fall distance available and the 6 ft lanyard is acceptable to use. Note that energy absorbing lanyards can expand up to 3.5 ft (1.1m). Consult manufacturer’s instructions.

Note: Never tie a knot in any lanyard to make it shorter, as it reduces the strength by more than 50%. Instead, purchase an adjustable lanyard and adjust it to proper working length.

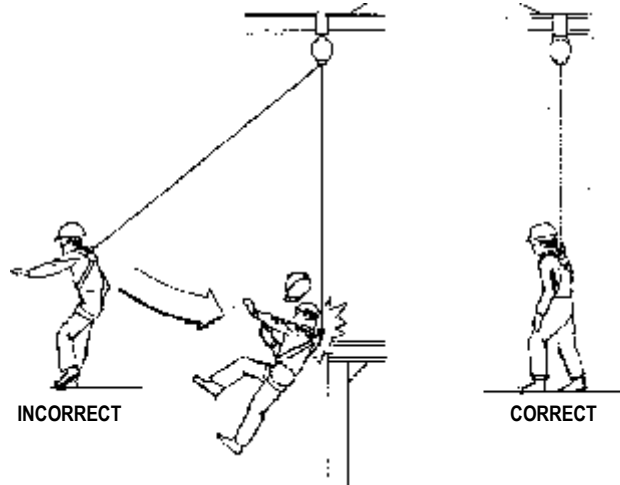


USER MOVEMENTS

Identify all necessary movements of the user and the materials and equipment needed to perform the planned work. The plan should ensure there is no crossing or tangling of connecting subsystems of two or more workers. Make certain users do not clamp, knot or otherwise prevent the connecting subsystem from functioning properly. Establish controls to prevent these occurrences.

**PENDULUM
(SWING) FALLS**

Swing falls can occur when the system is not anchored directly above the user. The force of striking an object in a pendular motion can cause serious injury. Always minimize swing falls by working as directly below the anchorage point as possible.



**CLEAR SPACE
IN FALL PATH**

Make certain that enough clearance is available in all potential fall paths to prevent striking an object. The amount of clearance needed depends upon the type of connecting subsystem used, and the location of the anchorage. Consult the manufacturer's instructions for the particular connecting subsystem or component for clearance needed.

**RESCUE AND
EVACUATION**

The user must have a rescue plan and the means at hand to implement it. The plan must take into account the equipment and special training necessary for a prompt rescue under all foreseeable conditions. If the rescue is from a confined space, the provisions of OSHA regulation 1910.146 and ANSI Z117.1 must be followed. Although a rescue plan and the means to implement it must always be in place, it is a good idea to provide means for user evacuation without assistance of others. This will usually reduce the time to get to a safe place and reduce or prevent risk to rescuers.



6. INSPECTION OF FALL PROTECTION EQUIPMENT

Fall protection equipment must be visually inspected before each use. Regular inspection by a competent person for wear on the equipment should be performed at least every 6 months. Severe service or wear will require more frequent inspections.

Inspection procedures should be written and each inspection should be documented. It is also important to follow any specific instructions that are provided with the equipment at the time of purchase. Instructions should be stored in a location where they are readily available to the users.

Inspect all equipment according to the manufacturer's instructions. If required by the manufacturer, return the equipment to the manufacturer for inspection, repair, or recertification.

Remove equipment from service if a stress indicator or warning system has been activated. Follow manufacturer's instructions for disposition of the equipment.

If a fall has been arrested, remove all components of the system from service and follow the manufacturer's instructions for disposal.

HARNES AND BODY BELT INSPECTION

To inspect your harness or body belt, perform the following procedures.

- **Webbing** – Grasp the webbing with your hands 6 in. (152mm) to 8 in. (203mm) apart. Bend the webbing in an inverted “U” as shown. The surface tension resulting makes damaged fibers or cuts easier to detect. Follow this procedure the entire length of the webbing, inspecting both sides of each strap. Look for frayed edges, broken fibers, pulled stitches, cuts, burns and chemical damage.
- **D-Rings/Back Pads** – Check D-rings for distortion, cracks, breaks, and rough or sharp edges. It should pivot freely. D-ring back pads should also be inspected for damage.
- **Attachment of Buckles** – Inspect for any unusual wear, frayed or cut fibers, or broken stitching of the buckle or D-ring attachments.
- **Tongue/Grommets** – The tongue receives heavy wear from repeated buckling and unbuckling. Inspect for loose, distorted or broken grommets. Webbing should not have additional punched holes.
- **Tongue Buckles** – Buckle tongues should be free of distortion in shape and motion. They should overlap the buckle frame and move freely back and forth in their socket. Roller should turn freely on frame. Check for distortion or sharp edges.
- **Friction and Mating Buckles** – Inspect the buckle for distortion. The outer bars and center bars must be straight. Pay special attention to corners and attachment points at the center bar.
- **Quick-Connect Buckles** – Inspect the buckle for distortion. The outer bars and center bars must be straight. Make sure dual-tab release mechanism is free of debris and engages properly.



LANYARD INSPECTION

When inspecting lanyards, begin at one end and work to the opposite end, slowly rotating the lanyard so that the entire circumference is checked. Additionally, follow the procedures below.

Hardware

- **Snaps** - Inspect closely for hook and eye distortions, cracks, corrosion, or pitted surfaces. The keeper (latch) should seat into the nose without binding and should not be distorted or obstructed. The keeper spring should exert sufficient force to firmly close the keeper. Keeper locks must prevent the keeper from opening when the keeper closes.
- **Thimbles** - The thimble must be firmly seated in the eye of the splice, and the splice should have no loose or cut strands. The edges of the thimble must be free of sharp edges, distortion, or cracks.



Lanyards

- **Wire Rope Lanyard** – While rotating the wire rope lanyard, watch for cuts, frayed areas, or unusual wearing patterns on the wire. Broken strands will separate from the body of the lanyard.
- **Web Lanyard** – While bending webbing over a pipe or mandrel, observe each side of the webbed lanyard. This will reveal any cuts or breaks. Swelling, discoloration, cracks and charring are obvious signs of chemical or heat damage. Observe closely for any breaks in stitching.
- **Energy-Absorbing lanyard** - Examine as a web lanyard (described above). However, also look for the warning flag or signs of deployment. If the flag has been activated, remove this energy--absorbing lanyard from service.
- **Rope Lanyard** – Rotate the rope lanyard while inspecting from end-to-end for any fuzzy, worn, broken or cut fibers. Weakened areas from extreme loads will appear as a noticeable change in original diameter. The rope diameter should be uniform throughout, following a short break-in period.
- **Energy- Absorber Pack** – The outer portion of the pack should be examined for burn holes and tears. Stitching on areas where the pack is sewn to D-rings, belts or lanyards should be examined for loose strands, rips and deterioration.

An energy-absorbing lanyard or self-retracting lifeline is composed of only one strength member (i.e., webbing, rope, steel cable). Substandard design, poor quality workmanship, excessive exposure to UV light or chemicals, physical damage, improper storage or inadequate inspection can lead to lanyard/lifeline failure.

SELF-RETRACTING LIFELINE INSPECTION

To inspect your self-retracting lifeline, perform the following procedures.

- **Check Housing** – Before every use, inspect the unit's housing for loose fasteners and bent, cracked, distorted, worn, malfunctioning or damaged parts.
- **Retraction and Tension** – Test the lifeline retraction and tension by pulling out several feet of the lifeline and allow it to retract back into the unit. Always maintain a light tension on the lifeline as it retracts. The lifeline should pull out freely and retract all the way back into the unit. Do not use the unit if the lifeline does not retract.

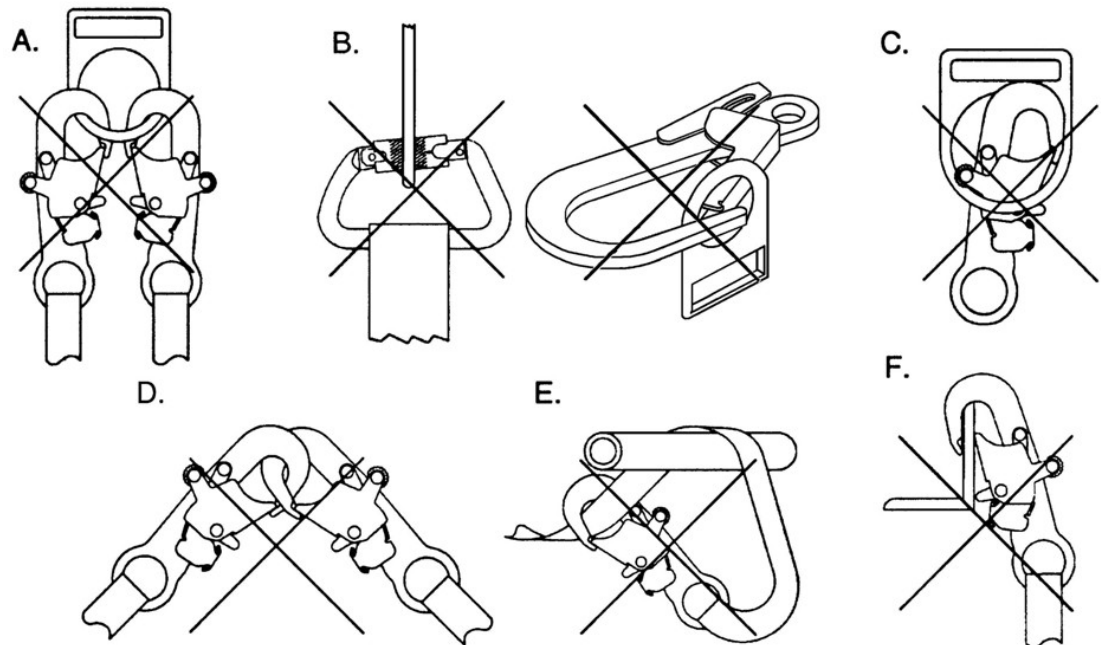
- **Lifeline** - The lifeline must be checked regularly for signs of damage. Inspect for cuts, burns, corrosion, kinks, frays or worn areas. Inspect any sewing (web lifelines) for loose, broken or damaged stitching.
- **Braking Mechanism** – The braking mechanism must be tested by grasping the lifeline above the impact indicator and applying a sharp steady pull downward which will engage the brakes. There should be no slippage of the lifeline while the brakes are engaged, once tension is released, the brakes will disengage and the unit will return to the retractable mode. Do not use the unit if the brakes do not engage.

Check the hardware as directed under lanyard inspection (page 18). The snap hook load indicator is located in the swivel of the snap hook. The swivel eye will elongate and expose a red area when subjected to fall arresting forces. Do not use the unit if the load impact indicator has been activated.

EXAMPLES OF IMPROPER CONNECTIONS

Just as a chain is only as strong as its weakest link, the integrity of a fall protection system depends on proper connection of all its components. The following are some examples of improper connections:

- Do not attach two or more snap hooks or carabiners to a single D-ring.
- Do not load a carabiner or snap hook at the gate.
- Ensure that connections are compatible and secure.
- Do not attach two snap hooks or carabiners together.
- Do not tie back on a lanyard unless specifically designed to do so by the manufacturer.
- Ensure that the snap hook is closed and locked.



7. CLEANING, MAINTENANCE AND STORAGE

Basic care of your fall protection equipment will prolong the durable life of the unit and will contribute toward the performance of its vital safety function. Proper storage and maintenance after use are as important as cleansing the equipment of dirt, corrosives or contaminants.

- **Nylon or Polyester** – Remove all surface dirt with a sponge dampened in plain water. Squeeze the sponge dry. Dip the sponge in a mild solution of water and commercial soap or detergent. Work up a thick lather with a vigorous back and forth motion; then wipe with a clean cloth. Hang freely to dry, but away from excessive heat.
- **Housing** – Periodically clean the unit using a damp cloth and mild detergent. Towel dry.
- **Drying** – Equipment should dry thoroughly without close exposure to heat, steam or long periods of sunlight.

When not in use, fall protection equipment should be stored in a cool, dry and clean place out of direct sunlight. Avoid areas where heat, moisture, light, oil, chemicals (or their vapors) or other degrading elements may be present.

Equipment that is damaged or in need of maintenance should NOT be stored in the same area as usable equipment. Heavily soiled, wet or otherwise contaminated equipment should be properly cleaned and dried prior to storage.

Prior to using equipment which has been stored for long periods of time, a formal inspection by a competent person should be performed.

8. DEFINITIONS

Anchorage: A secure point of attachment for lifelines, lanyards, or deceleration devices.

Anchorage Connector: A component or system used to join the connecting device (lanyard, lifeline or deceleration device) to the anchorage.

Arresting Force: The force transmitted to the body when a fall is arrested. Also known as Fall Arrest Force.

Body Belt: A strap that is secured around the waist and is used for positioning or restraint only. Body belts are not used for fall arrest. Also known as safety belt.

Body Harness: A design of straps which is secured about a person in a manner to distribute fall arresting forces over at least the thighs, pelvis, waist, chest and shoulders, with provisions for attaching it to other components of a personal fall arrest system. Also known as a *full body harness*.

Body Support: Personal protective equipment worn by a worker, such as a body belt or body harness.

Buckle: An integral connector used to attach straps or webbing segments together or to themselves.

Carabiner: A connector component generally composed of a trapezoidal or oval shaped body with a normally closed gate or similar arrangement which may be opened to permit the body to receive an object and, when released, automatically closes to retain the object. Carabiners used in personal fall protection should be self-closing and self-locking and only be capable of opening with two consecutive actions by the user.

Confined Space: An enclosed area that is large enough and so configured that an employee can bodily enter and has the following characteristics: Its primary function is something other than human occupancy, has restricted entry and exit, and may contain potential or known hazards

Connector: A mechanism or device used to join together components of a personal fall arrest system (for example a carabiner) or parts of a component within the system (such as a D-ring on a body harness).

Continuous Fall Protection: A fall protection system that is designed so that there is no unprotected exposure to an elevated fall hazard.

Deceleration Device: A device that absorbs or dissipates energy during a fall arrest.

Deceleration Distance: The additional vertical distance a falling person travels, excluding lifeline elongation and free fall distance, before stopping, from the point at which the deceleration device begins to operate. It is measured as the distance between the location of a person's body harness attachment point at the moment of activation (onset of fall arrest forces) of the deceleration device during a fall, and the location of that attachment point after the person comes to a full stop.

D-Ring: An integral “D” shaped connector commonly found on body wear and some anchorage connectors which allows for attaching a connecting device (lanyard, lifeline, or deceleration device).

Energy- Absorber: A component of a personal fall arrest system which allows dissipation of energy by extending deceleration distance reducing fall arrest forces.

Energy- Absorbing Lanyard: A specially designed lanyard that elongates during a fall to significantly reduce fall arrest forces.

Fall Indicator: A safety device or warning flag which serves to let a user know that a component of a personal fall arrest system has been involved in a fall, or has been exposed to equivalent forces, and should be removed from service.

Fall Limiter: A self-retracting lifeline/lanyard with a quick-activating braking system that limits a free fall. Refer to *self-retracting lifeline/lanyard*.

Fixed Anchorage: A stationary anchor point that is capable of supporting at least twice the maximum potential force of the fall arrest system.

Free Fall: The act of falling before the personal fall arrest system begins to apply force to arrest the fall.

Free-Fall Distance: The vertical displacement that a person falls before the fall arrest system begins to arrest the fall.

Friction Buckle: An integral connector whereby the webbing passes over the knurled bar and back down between the knurled bar and frame to adjust and tighten webbing straps.

Full Body Harness: See *body harness*

Hardware: Buckles, D-rings, snap hooks and associated connectors which are used to attach components of a personal fall arrest system or parts of a component within the system.

Ladder Climbing Safety Device: A device that is connected to a harness and fall arrester to prevent a fall from ladders.

Lanyard: A flexible line of rope, wire rope/cable, or webbing which generally has a connector at each end for securing a body belt or body harness to a lifeline, deceleration device or anchorage.

Lanyard Ring: a component of a body harness that allows the user to attach a lanyard when not in use so that it is not hanging freely.

Lifeline: A line provided for direct or indirect attachment to a body belt, body harness, lanyard, or deceleration device. Such lifelines may be horizontal or vertical in application.

Lower Level: An area or surface to which a person can fall.

Locking Snap Hook: A snap hook that includes a locking mechanism which will keep the hook closed and locked until manually unlocked and opened.

Mating Buckle: An integral connector whereby a center bar is pushed through a square link. Webbing is then tightened for proper fit.

Maximum Arrest Force: The peak force on the body during arrest of a fall by the fall arrest system. Also known as *peak fall arrest force*.

Orthostatic Intolerance: Refer to *suspension trauma*.

Personal Fall Arrest System: An arrangement of components that together will arrest a person in a fall from a working level. It typically consists of an anchorage, connecting device and body harness, and may include a lanyard, deceleration device, lifeline or a combination of these.

Personal Fall Limiter (PFL): A self-retracting lanyard with a quick-activating braking system that limits a free fall. In addition, a PFL offers versatility through dual operation by either attaching directly to the harness back D-ring for use as a personal fall limiter, or can be used as a traditional retractable lifeline.

Personal Lowering Device/Controlled Descent Device: A device that provides a means of lowering an individual from a height at a controlled rate of descent

Quick-Connect Buckle: For leg and chest harness straps that interlock similar to a seat belt for easy use and features a dual-tab release mechanism to prevent accidental opening.

Retractable Lifeline: See *self-retracting lifeline/lanyard*.

Roll Out: A process by which a snap hook, carabiner or similar device unintentionally disengages from another component to which it is attached.

Rope Grab: A deceleration device that travels on a lifeline and automatically engages the lifeline and locks so as to arrest a fall.

Self Retracting Lifeline/Lanyard: A deceleration device containing a drum-wound line which can be slowly extracted from or retracted onto the drum under slight tension during normal worker movement, and which, after onset of a fall, automatically locks the drum and arrests the fall. Refer to *fall limiter*.

Snap hook: A self-closing device with a keeper, latch or other similar arrangement that will remain closed until manually opened. Snap hooks used in personal fall protection should be self-closing and self-locking and only be capable of opening with two consecutive actions by the user.

Strap: A length of webbing.

Stretchable Harness: A full-body harness constructed from webbing that is a blend of nylon, polyester, and a specially-formulated elastomer that stretches. Includes provisions for attaching a lanyard, lifeline or deceleration device.

Sub-Pelvic Strap: A full-body harness strap, which passes under the buttocks without passing through the crotch, which is designed to transmit forces applied during fall arrest or post-fall suspension to the sub-pelvic part of the body.

Suspension Trauma (Orthostatic Intolerance): A condition that may occur when a person falls and remains suspended both vertical and sedentary for a period of time. Blood pools in the veins of the legs, which could result in unconsciousness. If a person is not rescued quickly, permanent damage and possibly death may result.

Swing Fall: A pendulum-like motion that can result from moving horizontally away from a fixed anchorage and falling.

Tie-Back Lanyard: A flexible line of heavy-duty, abrasion-resistant webbing designed to be used as the connecting device and anchorage connector with a specially-engineered snap hook able to withstand 5,000 lb. (22 kN) on the body and gate.

Total Fall Clearance Distance: The maximum vertical distance that a worker could potentially fall and still avoid contact with a lower level.

Total Fall Distance: The maximum vertical distance between a full body harness attachment point and the lowest extremity of the body before and after the fall is arrested including lanyard extension and/or deceleration distance.

Tongue Buckle: An integral connector similar to a standard belt buckle whereby a webbing strap is inserted through the buckle placing the buckle tongue through the appropriate grommet hole. Also known as a *grommet buckle*.

Trailing Rope Grab: A rope grab which moves freely up and down the lifeline with hands-free operation.

Vertical Lifeline: A component, element or constituent of a lifeline subsystem which consists of a vertically suspended flexible line with a connector at the upper end for fastening it to an overhead anchorage or anchorage connector and along which a fall arrester travels.

9. REGULATIONS AND STANDARDS

**OSHA
REGULATIONS
TITLE 29
OF THE CODE
OF FEDERAL
REGULATIONS**

On May 24, 2010, OSHA proposed to revise the walking-working surfaces standards and the personal protective equipment standards. The proposal will update OSHA's fall protection regulations to include new technology.

The proposed rule will also reorganize and coordinate regulations for personal protective equipment and fall protection. Additionally, the proposed rule will make consistent fall protection regulations for construction, maritime, and general industry standards.

OCCUPATIONAL SAFETY AND HEALTH STANDARDS FOR GENERAL INDUSTRY

Subpart D, Walking/Working Surfaces

- Fixed Ladders, Ladder Safety Devices [1910.27 \(d\) \(5\)](#)
- Safety Requirements for Scaffolding, Boatswain's Chair [1910.28 \(j\) \(4\)](#)

Subpart F, Powered Platforms, Man lifts, and Vehicle-Mounted Work Platforms

- Powered Platforms and Building Maintenance [1910.66](#)
- Personal Fall Arrest Systems [1910.66 Appendix C](#) (Mandatory)

Subpart J, Permit-Required Confined Space [1910.146](#)

Subpart R, Special Industries

- Telecommunications [1910.268](#)
- Electric Power Generation, Transmission and Distribution [1910.269\(g\)\(2\)](#)

SAFETY AND HEALTH STANDARDS FOR CONSTRUCTION

Subpart E, Personal Protective Equipment

- Body belts, Lifelines and Lanyards [1926.104](#)
- Safety Nets [1926.105](#)

Subpart L, Scaffolding

- Fall Protection [1926.451\(g\)](#)

Subpart M, Fall Protection

- Scope, Application and Definitions [1926.500](#)
- Duty to Have Fall Protection [1926.501](#)
- Fall Protection Systems Criteria and Practices [1926.502](#)
- Training Requirements [1926.503](#)

Subpart R, Steel Erection

- Fall Protection [1926.760](#)

Subpart V, Power Transmission and Distribution

- Linemen Body Belts, Safety Straps and Lanyards [1926.959](#)

Subpart X, Ladders

- Ladders [1926.1053](#)

SAFETY AND HEALTH REGULATIONS FOR MARINE TERMINALS & LONGSHORING

Shipyards Employment, Personal Fall Arrest Systems [1915.159](#)

Shipyards Employment, Positioning Device Systems [1915.160](#)

Marine Terminals, Employee Protection [1917.112\(b\)](#)

Longshoring, Deck Loads [1918.33\(b\)](#)

Longshoring, Fall Protection [1918.85\(j\) & \(k\)](#)

**RELEVANT
CONSENSUS
STANDARDS**

AMERICAN NATIONAL STANDARDS

Personal Fall Protection Safety Requirements
for Construction and Demolition Operations[ANSI/ASSE A10.32-2012](#)
Ladders - Fixed - Safety Requirements [ANSI A14.3-2008](#)
Safety Requirements for Confined Spaces[ANSI/ASSE Z117.1-2009](#)

ANSI/ASSE [Z359 STANDARDS](#)

Definitions and Nomenclature Used for Fall Protection
and Fall Arrest[Z359.0-2012](#)
Safety Requirements for Personal Fall Arrest Systems,
Subsystems and Components (see note)..... Z359.1-2007
Minimum Requirements for a Comprehensive Managed
Fall Protection Program..... Z359.2-2007
Safety Requirements for Positioning and Travel Restraint Systems Z359.3-2007
Safety Requirements for Assisted Rescue and Self-Rescue
Systems, Subsystems and Components Z359.4-2013
Specifications and Design Requirements for Active Fall Protection Systems Z359.6-2009
Qualification and Verification Testing of Fall Protection Products [Z359.7-2011](#)
Full Body Harnesses Z359.11-2014
Connecting Components for Personal Fall Arrest Systems Z359.12-2009
Personal Energy Absorbers & Energy-Absorbing Lanyards Z359.13-2013
Self-Retracting Devices for Personal Fall Arrest and Rescue Systems..... Z359.14-2014
Single Anchor Vertical Lifelines & Fall Arrestors for Personal
Fall Arrest Systems Z359.15-2014

Note: ANSI/ASSE Z359.0 and ANSI/ASSE Z359.7 are available as free downloads; follow the links provided.

ANSI/ASSE Z359.1-2007 being replaced by a series of standards for various components and systems. During this transition, new standards are appearing with requirements that conflict with, and supersede corresponding requirements in Z359.1. Users should contact ASSE to determine current requirements.

[CANADIAN STANDARDS](#)

Body Belts and Saddles for Work Positioning
and Travel Restraint CSA Z259.1-05 (R2010)
Self-Retracting DevicesCAN/CSA-Z259.2.2-14
Descent Control Devices CSA Z259.2.3-12
Fall Arresters and Vertical Rigid Rails..... CSA Z259.2.4-12
Fall Arresters and Vertical Lifelines.....CAN/CSA-Z259.2.5-12
Full Body Harnesses CSA Z259.10-12
Energy Absorbers and Lanyards..... CSA Z259.11-05 (R2010)
Connecting Components for Personal
Fall Arrest Systems (PFAS) CSA-Z259.12-11
Flexible Horizontal Lifeline Systems..... CSA Z259.13-04 (R2014)
Fall Restrict Equipment for Wood Pole ClimbingCAN/CSA-Z259.14-12
Anchorage Connectors.....CAN/CSA-Z259.15-12
Design of Active Fall-Protection Systems CSA Z259.16-04 (R2014)

Revised February 2015

10. ISEA FALL PROTECTION MANUFACTURERS

The following companies are members of the ISEA Fall Protection Group. For information on fall protection products and systems from ISEA members, check the online [Buyers Guide](#) at www.safetyequipment.org.

3M COMPANY

Personal Safety Division
3M Center, 235-2NW-70
St. Paul, MN 55144
Ph: 800-423-4630
Fax: 800-560-1275
www.3M.com/FallProtection

BUCKINGHAM MANUFACTURING CO., INC.

P.O. Box 1690
Binghamton, NY 13902
Ph: 800-937-2825
Fax: 607-773-2425
www.buckinghammfg.com

CAPITAL SAFETY

3833 SALA Way
Red Wing, MN 55066
Ph: 800-328-6146
Fax: 651-388-5065
www.capitalsafety.com
Home of the **DBI-Sala**, **Protecta**
and **Uniline** Brands

ELK RIVER, INC.

P.O. Box 1770
Cullman, AL 35056-1770
Ph: 800-633-3954
Fax: 256-739-3105
www.elkriver.com

FALLTECH

1306 S. Alameda Street
Compton, CA 90221
Ph: 800-719-4619
Fax: 323-752-5613
www.falltech.com

KLEIN TOOLS, INC.

P.O. Box 599033s
Chicago, IL 60659-9033
Ph: 800-553-4676
Fax: 847-677-4476
www.kleintools.com

LATCHWAYS PLC

Hopton Park
Devises, Wiltshire SN10 2JP
UK
Ph: +44 (0)1380 732700
Fax: +44 (0)1380 732701
www.latchways.com

MSA

1000 Cranberry Woods Drive
Cranberry Township, PA 16066
Ph: 800-MSA-2222
Fax: 800-967-0398
www.MSAsafety.com

MURDOCK WEBBING CO., INC.

27 Foundry Street
Central Falls, RI 02863
Ph: 401-724-3000
FAX 401-722-9730
www.murdockwebbing.com

MILLER BY HONEYWELL

P.O. Box 271
1345 15th Street
Franklin, PA 16323
Ph: 800-873-5242
Fax: 800-892-4078
www.millerfallprotection.com

RTC FALL PROTECTION

Division of Sellstrom Manufacturing Co.
2050 Hammond Drive
Schaumburg, IL 60173
Ph: 800-323-7402
Fax: 847-358-8564
www.fallprotection.com

WERNER COMPANY

93 Werner Road
Greenville, PA 16125
Ph: 888-523-3371
Fax: 888-456-8459
www.us.wernerco.com

11. FOR MORE INFORMATION

Occupational Safety and Health Administration
200 Constitution Avenue, NW
Washington, DC 20210
www.osha.gov

The OSHA Web site has access to fall protection regulations, directives and interpretations, plus compliance aids and other information. A good place to start is the Fall Protection Safety and health Topics page at <http://www.osha.gov/SLTC/fallprotection/>.

Information on voluntary standards can be obtained by contacting:

American National Standards Institute
25 West 43rd Street
New York, NY 10036
Phone: 212/642-4900
www.ansi.org

Do not call ANSI to ask about a specific standard. Questions and requests for interpretation must be directed to the standards developing organization. For fall protection standards (A10.32, Z117, Z359) the secretariat is:

American Society of Safety Engineers
1800 E. Oakton Street
Des Plaines, IL 60018-2187
Phone: 847/699-2929
www.asse.org

For questions about Canadian standards, contact:

CSA Standards
5060 Spectrum Way, Suite 100
Mississauga, Ontario
Canada, L4W 5N6
(800) 463-6727
www.csa.ca

ISEA is the trade association for personal protective equipment and technologies:

International Safety Equipment Association
1901 North Moore Street, Suite 808
Arlington, VA 22209
Phone: 703/525-1695
www.safetyequipment.org