24 Hour Fall Protection

Table of Contents

DUTIES AND RESPONSIBILITIES

EMPLOYERS

Employers shall appoint a program administrator who has the knowledge, experience, training and authority to direct, manage, and evaluate the employer's fall protection program.

Employers shall identify and document fall hazards and eliminate or control every existing or new fall hazard in their employees' workplace environment. If out in the field, then this is typically done using a Job Hazard Analysis and/or Fall Protection Plan unique to the job's hazards.

Employers shall inform each authorized person about any foreseeable fall hazard before the authorized person is exposed to the fall hazard.

Employers shall provide training necessary for the (authorized person) employee to operate any active fall protection system used by company.

Employers shall provide competent persons to supervise employees who are exposed to fall hazards.

PROGRAM ADMINISTRATOR

A person authorized by their employer to be responsible for managing the employer's fall protection program.

A program administrator is responsible for the development, implementation, monitoring, and evaluation of the managed fall protection program. Typically this person is the Safety Director.

The program administrator shall:

Have a working knowledge of current fall protection regulations, standards, fall protection equipment and systems which are used by the employees.

Advise and providing guidance to managers, employees, and other departments such as purchasing, engineering, and human resources on all matters pertaining to their managed fall protection program.

Establish and assign duties and responsibilities to individuals who are overseeing the program and provide them with the necessary resources to accomplish those duties and responsibilities.

Establishing and implementing a procedure to identify and eliminate or control new and existing fall hazards using a hierarchy of controls.

Developing fall protection and rescue procedures where fall protection systems are used.

Providing or ensure training programs for all authorized, competent, and qualified persons are provided with specific training.

Participate in the investigation of all incidents related to falls from any height, either personally or through persons qualified, to investigate them, by reviewing incident reports; taking corrective action to eliminate causes; making necessary reports to management.

Measuring and evaluating the effectiveness of the managed fall protection program by conducting periodic program evaluations, and making improvements accordingly.

> The ANSI Z490.1 standard defines a competent training professional as a person prepared by education, training, or experience to develop and implement various elements of a training program.

From EM385 1-1

Fall Protection Program Manager (Program Administrator per ANSI Z359.2). The Program Manager is responsible for the overall development, implementation, monitoring and evaluation of the Fall Protection Program. This person can also function as a QP, CP, CP trainer, QP trainer and/or competent rescue trainer if so trained. The Program Manager shall:

a. Be trained appropriately, as described in Section 21.C;
b. Advise and provide guidance for managers, employees and others on all matters pertaining to their Fall Protection Program;
c. Establish all duties and responsibilities required by the Fall Protection Program and assign them to individuals who are trained and qualified to perform them;
d. Verify personnel are provided with resources to accomplish their responsibilities;
e. Establish and implement a procedure to identify and eliminate or control new and existing fall hazards;
f. Ensure the proper development and implementation of the fall protection and prevention plan (written Fall Protection Procedures, per ANSI Z359.2) and rescue plan (written Rescue Procedures, per ANSI Z359.2).
g. Provide/ensure appropriate level of training is received by End Users (Authorized Persons per ANSI Z359.2), CP, QP, and others as required;
h. Participate in investigation of all mishaps (near misses, incidents or accidents) related to falls from heights (personally or by designation of persons qualified to perform the investigation);
i. Measure and evaluate the effectiveness of the Fall Protection Program by conducting periodic program evaluations and making improvements as necessary.

QUALIFIED PERSON

A person with a recognized degree or professional certificate and with extensive knowledge, training and experience in the fall protection and rescue field who is capable of designing, analyzing, evaluating and specifying fall protection and rescue systems to the extent required by these standards.

Responsible for supporting the fall protection program. Areas of expertise may include system design, horizontal lifeline design, structural analysis, calculation of impact forces and clearances, testing, anchorage certification, methods of control, equipment selection, and compliance with applicable regulations and standards.

ANSI states that, “A qualified person’s role is as a technical resource to all people involved in a fall protection program.”

Knowledgeable of applicable fall protection regulations, standards, equipment and systems, physical sciences, engineering principles, and mandatory requirements for fall protection equipment and systems used by their employer.

Supervise the design, selection, installation, and inspection of certified anchorages and horizontal lifelines.

When supervising the design, installation or selection of a fall arrest anchorage, the qualified person shall calculate the forces generated by an arrested fall, the total loading, and the deflection of the fall arrest anchorage; the impact on the structural members to which the fall arrest system is attached; and shall determine a safe location for the anchorage.

The qualified person shall meet the qualifications of a competent person.

From EM385 1-1

Qualified Person for Fall Protection. The QP is responsible for technical support of the Fall Protection Program. The QP shall:

a. Have advanced understanding and knowledge of the requirements, equipment and systems, physical sciences, and engineering principles that affect equipment and systems for fall protection and rescue;
b. Be qualified to select proper fall protection and rescue equipment;
c. Supervise the design, selection, installation and inspection of certified anchorages and horizontal lifelines;
d. Be trained to the applicable level, as described in Section 21.C.

COMPETENT PERSON

An individual designated by the employer to be responsible for the immediate supervision, implementation and monitoring of the employer’s managed fall protection program who, through training and knowledge, is capable of identifying, evaluating and addressing existing and potential fall hazards, and who has the employer’s authority to take prompt corrective action with regard to such hazards.

Responsible for the immediate supervision, implementation, and monitoring of the managed fall protection program.

Knowledgeable through experience and training of applicable fall protection regulations, standards, equipment and systems, and mandatory requirements for fall protection equipment and systems used by their employers.

Conduct a fall hazard survey to identify all fall hazards before employees are exposed to those hazards.

Identify, evaluate, and impose limits on the workplace activities to control fall hazard exposures and swing falls and communicate these to all employees who utilize the fall protection system.

Prepare, update, review and approve written fall protection procedures including rescue. The Fall Plan is to include:

- Fall protection procedures
- Fall protection systems
- Anchorage locations
- Connectors and
- Other fall protection equipment

Verify that fall protection systems have been installed and inspected in compliance with this standard and with all applicable federal, state and local regulations.

Establish the clearance requirements for each fall protection system and verify that available clearance is adequate before authorized persons are permitted in the workplace.

Verify that rescue of employees can be accomplished in a timely manner by rescue persons.

Participate in the investigation of all incidents related to falls from heights.

Remove from service all personal fall arrest systems and components that are damaged or subjected to arresting forces using the manufacturer’s instruction as guidelines.

The competent person shall periodically inspect all fall protection equipment at the frequency required by the manufacturer and applicable regulations.

From EM385 1-1

Competent Person for Fall protection

The CP is responsible for the immediate supervision, implementation and monitoring of the Fall Protection Program. The CP shall:

a. Be trained to the applicable level, as described in Section 21.C;
b. Conduct a fall hazard survey to identify all fall hazards before End Users are exposed to those hazards;
c. Identify, evaluate and impose limits on the workplace activities to control fall hazard exposures and swing falls and communicate all limitations to all employees authorized to utilize the fall protection system;
d. Have the authority to stop the work immediately if it is determined to be unsafe and take prompt corrective measures to mitigate fall hazards;
e. Prepare, update, review and approve fall protection and prevention plans as directed by the Program Manager.
f. Review procedures as workplace activities change to determine if additional practices, procedures or training need to be implemented;
g. Ensure a rescue plan has been developed for all activities;
h. Specify in the fall protection and prevention plan, the fall protection systems, anchorage locations, connecting means, body supports and other equipment that End Users are required to use when exposed to a fall hazard;
i. Supervise the selection, installation, use and inspection of non-certified anchorages;
j. Verify End Users who work at heights are trained and authorized to do so;
k. Review, periodically and as needed, fall protection and prevention plan/rescue plan and procedures, to insure the End User is adequately informed about the fall protection and prevention plan/rescue plan and procedures for workplace activities;
l. Ensure prompt rescue of End Users can be accomplished via the rescue plan and procedures to be used;
m. Participate in investigation of all mishaps related to falls from heights;
n. Ensure all damaged or deployed fall protection equipment, is removed from service immediately;
o. Inspect all fall protection equipment at the frequency required by the manufacturer.

AUTHORIZED PERSON (EMPLOYEE)

A person assigned by the employer to perform duties at a location where the person will be exposed to a fall hazard.

Have a working understanding of and follow the employer's policy and procedures and the instructions of the competent person regarding the use of fall protection and rescue systems.

Bring to the competent person's attention all unsafe or hazardous conditions or actions that may cause injury to either themselves or any other authorized person before proceeding with their workplace activities.

Properly use, inspect, maintain, store, and care for their fall protection equipment and systems.

Inspect, before use, all fall protection equipment they use for defects or damage; shall notify the competent person of those defects and damage; and shall avoid using such equipment.

COMPETENT RESCUER

An individual designated by the employer who by training, knowledge and experience is capable of the implementation, supervision and monitoring of the employer's fall protection rescue program.

This be fulfilled by local emergency services, in-house professionals, competent or qualified persons or contract services providing the program administrator deems that they meet the requirements

Anticipate the foreseeable potential for planned rescue and develop rescue procedures and methods accordingly before the authorized persons start their workplace activities at heights.

Have a working knowledge through experience and training of current fall protection and planned rescue regulations, standards, equipment and systems.

Prepare, update, review and approve the planned rescue procedures assigned by the program administrator before the authorized persons start their workplace activities at heights.

Verify that all authorized rescuers have been adequately trained and are proficient at performing rescue.

Identifies the resources necessary to conduct a safe and effective rescue from heights and verify that those resources are available for a prompt rescue event.

Knows the hazards associated with rescue from heights and the required procedures necessary to mitigate the hazards within the area of the rescue.

Verifies that the rescue equipment is protected against damage by

workplace conditions.

Authorized Rescuer

A person assigned by the employer to perform rescue from fall protection.

Performs or assist in workplace rescues.

Have experience, training and a working knowledge in the selection, use, storage and care of all equipment necessary to perform a rescue.

Verify that a rescue procedure has been developed for any workplace where that authorized rescuer has been authorized to perform a rescue and shall review that procedure before fall hazards are encountered in the workplace.

Inspect the rescue equipment according to procedures developed by the competent rescuer and verify that all rescue equipment is properly protected, in proper working condition, and safe for rescue use.

Be knowledgeable of current hazards that may endanger the rescuer during rescue operations. The authorized rescuer shall consider their safety first in determining the method for performing the rescue.

Qualified Person Trainer

A qualified person who meets the requirements of these standards and who is also qualified to provide fall protection training.

Have a working knowledge of applicable fall protection regulations, standards, fall protection equipment and systems, physical sciences, and engineering principles.

Meet the minimum requirements for a qualified person.

Be familiar with the typical fall hazards and the equipment used in the industry they are instructing. The training provided by the qualified person trainer shall be customized to that specific industry.

Evaluate the fall protection knowledge and skills of the qualified persons.

Competent Person Trainer

An individual who by training, knowledge and experience is capable of conducting competent person training.

Have a working knowledge of applicable fall protection regulations, standards, equipment and systems.

Be familiar with the typical fall hazards and the equipment used in the industry he or she is instructing. The training provided by the competent person trainer shall be appropriate to that specific industry.

Evaluate the fall protection and rescue knowledge and skills of the competent persons.

Competent Rescue Trainer

An individual who by training, knowledge and experience specific to fall rotection rescue is capable of conducting rescue training.

Every authorized rescuer shall receive their working knowledge of personal fall arrest and rescue equipment and procedures through a practical hands-on demonstration of skill.

Training for authorized rescuers shall include physical demonstrations by trainees on how to inspect, anchor, assemble, and use the fall protection and rescue equipment used in locations where they work.

Training shall include at least the following information:

- fall hazard recognition;
- fall hazard elimination and controls methods;
- applicable fall protection and rescue regulations;
- the responsibilities of designated persons under this standard;
- how to use written fall protection and rescue procedures;
- inspection of equipment components and systems before use.

Authorized rescuer update training shall be conducted at least every two years to stay current with the fall protection and rescue educational requirements.

Authorized rescuers shall be evaluated at least annually to ensure competency of the duties assigned. This evaluation shall include a written examination and an observation of performance that covers all equipment that the person is authorized to operate.

Authorized rescuers should demonstrate their working knowledge of personal fall arrest and rescue equipment and procedures through a practical hands-on demonstration of skill.

General Requirements

Written fall protection procedures are required whenever one or more employees are routinely exposed to any fall hazard that is protected by active fall protection systems.

Written fall protection procedures shall specify the fall protection equipment and systems used to protect employees from each fall hazard and shall document the proper way to operate the specified fall protection equipment and systems, including installation, inspection, use, and dismantling.

Fall Hazard Survey Report (Risk Assessment Anaylysis)

A fall hazard survey report shall be prepared for each fall hazard to which an authorized person may be exposed. The report shall identify one or more methods to eliminate or control each identified fall hazard.

The fall hazard survey shall be conducted by a competent person or a qualified person who is familiar with, and has access to, information about local work processes, environment, policy and best industry practices, and who collects input from the actual work team familiar with their workplace activities.

The fall hazard survey report shall identify all current and predictable workplace paths of authorized persons, all fall hazards along such paths, and the locations and distances to all obstructions in potential fall paths.

The fall hazard survey report shall identify environment factors that may affect the installation, use, inspection, maintenance, and dismantling of any fall protection system. The report shall, as a minimum, identify the presence of:

- hot objects, sparks, flames and heat-producing operations
- chemicals hazardous to the authorized person or to the fall protection system
- electrical hazards
- environmental contaminants of any form
- sharp objects and abrasive surfaces
- moving equipment and materials

The Risk Assessment Analysis provides an analysis of the type of fall hazard, the basic configuration of the hazard (graphic/drawings), the exposure rating (high, medium, low), the frequency of the job, the height of the potential fall, the suggested corrective solution(s), and the type of rescue equipment (if required) to be used. When many different types of hazards are encountered, the assessment should generate a comprehensive list of the fall hazards from highest priority to lowest priority. This will assist in arranging for solutions to those hazards that present the greatest risk of exposure and potential for injury, therefore, utilizing resources to their greatest advantage. (See Risk Assessment Analysis Grid.)

The employer should provide appropriate resources, assistance, and personnel as needed to accomplish these responsibilities.

Obstructions in the potential fall path which could be impacted during all fall motions should be documented in the fall hazard survey report.

- unstable, uneven and slippery walking/working surfaces; unguarded openings;
- climatic and weather factors;
- other materials or circumstances which could adversely affect the fall protection system; and
- foreseeable changes in any of these conditions taken individually or collectively.

The fall hazard survey report shall establish risk factors to assist in the ranking of fall hazards.

Fall hazard survey reports shall be revised or re-written whenever there is a change to the task, process, structure, equipment, or legislation that would render past surveys obsolete.

Minimum Requirements for Fall Protection Procedures

Fall protection procedures are to be written and modified only by their employer’s qualified person or competent person.

Fall protection procedures shall address the specific fall hazards of the jobsite.

Fall protection procedures shall provide for 100% continuous fall protection.

Fall protection procedures for fall arrest systems:

- Identification of acceptable fall arrest anchorages
- Clearance requirements
- Complete setup procedure for access
- Use and egress from the system
- Limitations on use of the system, including the maximum free fall, maximum arrest force, and the maximum number and permitted locations of authorized persons who may attach to or use the system
- Training requirements and qualifications of authorized persons permitted to use the system

Fall protection procedures for work positioning and travel restraint:

- Identification of acceptable anchorages
- Complete setup procedure for access
- Use and egress of the system
- Limitations on use of the system including the maximum number and permitted locations of authorized persons who may attach to or use the system

Fall protection procedures for installing and dismantling fall protection equipment:

- A description of all components used in the fall protection system, specifying the applicable manufacturers, standard, and/or drawings
- Required anchorage strengths or other criteria for choosing acceptable anchorages.
- Any limitations on where or how the system shall be installed
- Detailed instructions for assembling the components into the complete fall protection system
- If applicable, detailed instructions for disassembling the fall protection system

Fall protection procedures for inspection:

- Required or recommended inspection intervals.
- Detailed instructions for inspecting each component of the system.
- Description of acceptance and rejection criteria, including retirement criteria, of each component of the system.

Fall protection procedures shall include a requirement that any incidents, including accidents or near misses, be investigated to determine if procedures can be improved.

Fall Protection Hierarchy

The following hierarchy or preferred order of control shall be used to choose methods to eliminate or control fall hazards. The fall protection hierarchy shall be considered when designing fall protection solutions for both existing and new facilities. The methods listed below are in decreasing order of preference.

Elimination or Substitution

Removing the hazard or hazardous work practices.

Passive Fall Protection

Isolating or separating the hazard or hazardous work practice from employees or others.

Fall Restraint

Securing the authorized person to an anchorage using a lanyard short enough to prevent the person's center of gravity from reaching the fall hazard.

Fall Arrest.

A system designed to stop an authorized person after a fall has begun.

Administrative Controls.

Work practices or procedures that signal or warn an authorized person to avoid approaching a fall hazard.

From EM385 1-1

a. **Elimination**: Remove the hazard from work areas or change task, process, controls or other means to eliminate the need to work at heights with its subsequent exposure to all hazards (i.e., build roof trusses on ground level and then lift into place or design change by lowering a meter or valve at high locations to a worker's level). This control measure is the most effective;

b. **Prevention (passive or same-level barrier**): isolate and separate fall hazards from work areas by erecting same level barriers such as guardrails, walls, covers or parapets;

c. **Work platforms (movable or stationary)**: use scaffolds, scissor lifts, work stands or aerial lift equipment to facilitate access to work location and to protect workers from falling when performing work at high locations. > See Section 22.S;

d. **Personal Protective Systems and Equipment**: Use of fall protection systems, including (in order of preference): restraint, positioning, or personal fall arrest. All systems require the use of full body harness, connecting means and safe anchorage system.

e. **Administrative Controls**: Introduce new work practices that reduce the risk of falling from heights, or to warn a person to avoid approaching a fall hazard (i.e., warning systems, warning line, audible alarms, signs or training of workers to recognize specific fall hazards).

General Requirements for Fall Protection Systems

All components used in a fall protection or rescue system for which requirements have been established in this standard shall be certified and shall be incorporated into the system in a way that is consistent with its manufacturer's instructions.

The design of fall protection systems shall be based on the results of tests or predictive calculations made by a qualified person.

The design and installation of the following fall protection systems or components shall be performed under the direct supervision of a qualified person.

Certified Anchorages

Horizontal Lifelines

The adequacy of the fall protection system shall be demonstrated through evaluation by a qualified person or by test force, which may act upon or arise within the system due to reasonably anticipated conditions or circumstances for which the system will be used, shall be considered.

All fall arrest systems shall limit the maximum arrest force to 1,800 pounds (8.0kN) or less and shall be designed such that authorized persons subject to a fall shall not strike an obstruction or lower level.

A fall restraint system shall be limited to a working surface that is at or less than a slope of 4:12 from horizontal.

Design Requirements for Fall Protection Systems in New Facilities

When planning and designing new buildings and facilities, special consideration shall be given to eliminating and controlling fall hazards.

When planning and designing new buildings or facilities, architects, planners, engineers, and designers, including the owner and managers of such facilities, shall provide a safe design and shall protect all authorized persons who will be exposed to fall hazards during performance of their work including maintenance and normal workplace operation. Selection of a control measure shall be in accordance with the fall protection hierarchy of this standard.

The fall protection issues that arise during the maintenance and occupancy phase shall be considered during the design phase.

Anchorage Systems for Fall Protection

Anchorage Connectors

The compatibility between anchorage connectors and anchorages shall be considered when designing or selecting an anchorage and anchorage connector.

The exposure of anchorage connectors to sharp edges, excessive bending of wire rope, abrasive surfaces, and physical hazards such as thermal, electrical, and chemical sources shall be considered when designing or selecting an anchorage. Anchorage connectors shall be protected from damage from these exposures.

Anchorages for Fall Arrest Systems

The design, selection, and installation of certified fall arrest anchorages shall be performed under the supervision of a qualified person.

Anchorages selected for fall arrest systems shall have strength capable of sustaining static loads applied in the directions permitted by the system of at least:

A) 5,000 pounds (22.2kN) for non-certified anchorages, or

B) Two times the maximum arresting force for certified anchorages.

When more than one fall arrest system is attached to an anchorage, the strengths set forth in (A) and (B) above shall be multiplied by the number of systems attached to the anchorage.

Design, selection, and installation of certified fall arrest anchorages shall include determining a safe location where and how to connect to those anchorages by taking into consideration the forces generated by arresting a fall, total existing and anticipated loading, load path, structural member strengths, connection and support strengths, stability, clearance requirements, swing fall, rescue deflection of the system, and impact on the structural members to which the fall arrest system is attached.

When designing, selecting, and certifying a fall arrest anchorage, the qualified person shall include the limitations on use of the system in fall protection procedures described in this standard.

Fall arrest anchorages shall be used exclusively for fall arrest systems and shall be marked to prevent other uses.

Anchorages for Work Positioning Systems

Anchorages selected for work positioning systems shall have a strength capable of sustaining static loads applied in the directions permitted by the system of at least:

A) 3,000 pounds (13.3kN) for non-certified anchorages, or

B) Two times the foreseeable force for certified anchorages.

When more than one work positioning system is attached to an anchorage, the strengths set forth in (A) and (B) above shall be multiplied by the number of systems attached to the anchorage.

If the anchorage is also used as an anchorage for fall arrest, it shall comply with the requirements for fall arrest anchorages as indicated in this standard.

Anchorages for Restraint and Travel Restraint Systems

Anchorages selected for restraint and travel restraint systems shall have a strength capable of sustaining static loads applied in the directions permitted by the system of at least:

A) 1,000 pounds (4.5kN) for non-certified anchorages, or

B) Two times the foreseeable force for certified anchorages.

When more than one restraint and travel restraint system is attached to an anchorage, the strengths set forth in (A) and (B) above shall be multiplied by the number of systems attached to the anchorage.

If the anchorage is also used as an anchorage for fall arrest, it shall comply with the requirements for fall arrest anchorages as indicated in this standard.

Anchorages for Horizontal Lifeline Systems

Anchorages for horizontal lifeline systems shall be certified and designed, prior to use, by a qualified person with experience and training in designing and using horizontal lifeline systems.

Anchorages for horizontal lifelines shall be capable of sustaining at least two times the maximum tension developed in the lifeline during fall arrest in the direction applied by the lifeline forces.

The number of persons attached to a horizontal lifeline shall be used in determining the maximum tension in the horizontal lifeline.

Anchorages for Rescue Systems

Anchorages selected for rescue systems shall have a strength capable of sustaining static loads applied in the directions permitted by the system of at least:

A) 3,000 pounds (13.3kN) for non-certified anchorages, or

B) Five times the applied load for certified anchorages.

When more than one rescue system is attached to an anchorage, the strengths set forth in (A) and (B) above shall be multiplied by the number of systems attached to the anchorage.

If the anchorage is also used as an anchorage for fall arrest, it shall comply with the requirements for fall arrest anchorages as indicated in this standard.

Anchorage connectors for rescue systems shall not be attached to anchorages in a way that reduces the strength of the anchorage below its design capacity or the applicable building code requirements without the approval of a qualified person.

Anchorage connections shall be stabilized to prevent unwanted movement or disengagement of the rescue system from the anchorage.

Inspection of Anchorage Systems

Anchorage systems shall be inspected by the authorized person prior to each use and by a qualified person or competent person at least annually in accordance with the manufacturer's qualified person's instructions.

Those inspecting the anchorage systems shall check for any cracks in the structure around the anchorage or if the connection is unstable or loose.

A fall protection anchorage system shall be taken out of service when any inspection reveals that it may no longer serve the required function, that it may be unsafe due to damage or wear, or if the required inspection interval has been exceeded. An anchorage system taken out of service for exceeding the inspection interval may be returned to service after a satisfactory inspection has been performed and approved by a competent person.

Anchorages that have been recertified shall be field-verified by a qualified person.

Selection of Safe Anchorages

Anchorage connectors shall not be attached to anchorages where such attachment

would reduce the anchorage strength below the applicable level set forth in Section 5.4 of this standard or reduce the anchorage strength below the allowable level set by applicable building codes.

All components and sub-components of the selected fall protection system shall be compatible with the anchorage connector.

Fall arrest anchorages shall be located as high as practicable above an authorized person to minimize the free fall and the total fall distance, and to prevent contact with an obstruction or the lower level.

The maximum angle from the point of attachment of the anchorage connector to the authorized person shall be in accordance with manufacturer's recommendations for swing falls. The anchorage connector shall be located in such a way to minimize the pendulum-like motion during a fall.

Welders shall be certified to a recognized welding standard when the anchorage connector is welded to the anchorage.

Accessibility, location, and ease of connecting (tying off) shall be taken into consideration when planning and selecting anchorages.

When selecting an eyebolt for an anchorage connector, it shall be rated along its intended use axis in accordance with the manufacturer's requirements. The diameter of the eyebolt shall be compatible to the snaphook or carabiner.

Inspection, Maintenance, and Storage of Fall Protection and Fall Rescue Equipment

General Requirements

Inspection, maintenance, storage, and care of equipment shall at a minimum be in accordance with manufacturer's and competent person's instructions.

Manufacturer's instructions and recommendations on the use, inspection, maintenance,

storage, and care of equipment shall be accessible for review by authorized persons who use, inspect, maintain, or store such equipment.

Inspections

Fall protection equipment shall be inspected by the authorized person at least once at the beginning of each eight-hour shift in which it is used to verify that it has not sustained any wear or damage that would require its removal from service.

Fall protection and fall rescue equipment shall be inspected on a regular basis not to exceed one year (or more frequently if required by manufacturer's instructions) by a competent person or a competent rescuer, as appropriate, to verify that the equipment is safe for use. The inspection shall be documented.

Fall protection and fall rescue equipment shall be inspected and shall include, but not be limited to:

- Absence or illegibility of markings or tags;
- Absence of any elements affecting the equipment form, fit, or function;
- Evidence of defects in or damage to hardware elements including cracks, sharp edges, deformation, corrosion, chemical attack, excessive heating, alteration, or excessive wear;
- Evidence of defects in, or damage to, straps or ropes including fraying, unsplicing, enlaying, kinking, knotting, roping, broken or pulled stitches, excessive elongation, chemical attack, excessive soiling, abrasion, alteration, needed or excessive
- Lubrication, excessive aging, or excessive wear;
- Alteration, absence of parts, or evidence of defects in, damage to, or improper function of, mechanical devices and connectors;
- Any other condition that calls to question the suitability of the equipment for its intended purpose.

Written or electronic records of inspections completed under this standard shall be kept on file for the service life of the equipment.

Removing Equipment from Service

Fall protection and fall rescue equipment shall be taken out of service when any inspection reveals that it may no longer serve the required function due to damage or wear, because the required inspection interval has been exceeded, because it does not meet the criteria of this standard, or because it has been used to arrest a fall.

Equipment taken out of service may be returned to service after a satisfactory inspection has been performed by a competent person.

All fall protection and fall rescue equipment that has been inspected and determined no

longer adequate for service shall be tagged so that the equipment will not be returned to service without the authorization of the competent person. The competent person shall destroy this equipment, return it to the manufacturer, or, if it is used in training, keep it in a controlled area to prevent reuse.

Maintenance of Fall Protection and Fall Rescue Equipment

The competent person or competent rescuer, as appropriate, shall verify that the equipment is maintained according to the manufacturer's instructions. Other maintenance issues not addressed by the manufacturer's instructions shall be addressed with the manufacturer prior to any attempt to perform maintenance.

Responsibility for maintenance of equipment shall be included in fall protection procedures.

Storage of Fall Protection and Fall Rescue Equipment

Procedures for storage of fall protection and fall rescue equipment shall be developed, incorporated into fall protection procedures, and implemented in a manner consistent with manufacturer's instructions.

Equipment shall be stored in a manner that protects it from exposure to any conditions that could result in damage.

Procedures for storage of equipment shall include provisions for limiting access to only those personnel trained in the proper use of the equipment.

Rope Access

Prior to commencing workplace activities, the employer's competent person shall make a job safety analysis of the rope access workplace that includes the following:

- Detail of rope access procedures to be used;
- List of work team members and duties;
- Specification of equipment to be used;

- List of hazards associated with the job;
- Appropriate personal protective equipment (PPE) to be used;
- Specification of anchorage system;
- Public safety requirements.

All rope access equipment shall be purchased in new condition and records maintained on use and storage.

All equipment shall be maintained and inspected by the authorized person prior to use in accordance with the manufacturer's instructions and best safety industry practices.

An appropriate full body harness shall be used to connect the authorized person to both the working line and the safety line. The primary connection to the authorized person of both the working line and the safety line shall always be via the harness even if a work seat is being used.

All ropes (i.e. working line and safety line) used for rope access operations shall be constructed of synthetic fiber and specifically designed and intended for life safety use.

All ropes used for life safety applications shall meet Cordage Institute requirements for Life Safety Ropes (CI-1801).

All safety lines shall be utilized in a way that meets the requirements of this standard.

If the safety line is connected to the back dorsal D-Ring of a full body harness, the maximum free fall distance shall be six feet (1.8m), and the maximum arresting force shall not exceed 1,800 pounds (8.0kN).

Descender devices and systems shall allow a controlled descent with consideration of the mass of the authorized person, the length of descent, considerations for safety (for example fail-to-safe features, adjustable friction, heat dissipation), and the need for stopping along the working line for the purpose of hands free work.

A competent person specifically trained in rope access shall determine appropriate anchorage and rigging, establish fall hazard exposures, and identify the means of protecting the authorized person from fall hazards while entering and exiting the workplace.

Rope access equipment may be used to protect the authorized person from a free fall when entering and exiting their workplace.

Any supplemental equipment weighing over two pounds, including tools, used during rope access shall be protected from falling.

When engaging in rope access workplace activities, a competent person must evaluate the application and determine an adequate number of authorized persons required to safely perform and supervise the work at heights.

The employer shall provide prompt rescue to all fallen authorized persons.

Written rescue procedures shall be prepared and maintained by the competent person for all instances where authorized persons work at heights.

Such procedures shall contain provisions for the prompt rescue and self-rescue of any authorized person who falls.

Summoning Rescue Services

Professional Rescue Agency

If a professional rescue agency is going to be used, the employer's competent person or program administrator shall contact the rescue agency to review the location of elevated workplace before starting workplace activities, and shall review with that agency the types of fall protection being used and the environment where the agency may be called to perform a rescue.

The rescue agency shall advise the employer in writing of its availability and capability, any limitations on the types of rescue it can perform, and detailed instructions regarding how they are to be called and if they need to be advised when certain activities are planned or certain conditions exist so that they may ensure the fastest possible response.

The employer and their competent person or program administrator shall review the qualifications of the rescue agency and shall determine whether or not, or in what circumstances, the agency can be relied upon to perform a prompt and safe rescue.

The professional rescue agency shall develop and furnish to the employer's competent

person or program administrator their own written strategies and written procedures for dealing with all anticipated circumstances where a rescue may need to be performed.

After the employer and their competent person or program administrator is satisfied that

the above requirements have been met, the employer's competent person or program administrator shall, prior to commencing workplace activities, post written procedures for summoning the rescue agency, as well as any special instructions, including circumstances where the agency has asked to be advised.

In-House Rescue Service

Where outside professional rescue agencies cannot be relied upon to promptly rescue a fallen authorized person, the employer's program administrator shall establish training for their own employees, or a selected group of employees as authorized rescuers or competent rescuers, to safely and promptly rescue a fallen authorized person. The rescue procedures shall include:

- A description of all equipment to be used by the rescue team specifying the applicable manufacturers.
- Complete instructions for performing the rescue safely and promptly.

Incident Investigations

All fall-related incidents shall be reported to the program administrator and competent person. All incidents shall be investigated promptly. An incident investigation shall consider all factors that contributed to the event including, but not limited to, a review of policies, procedures, training, the fall hazard survey, equipment and related systems, and general communication. Any activity affecting the equipment or site involved in the incident shall cease, and the site and equipment secured until the investigator permits activity to resume.

After the incident, all equipment associated with a fall shall be immediately removed from service until the investigation is complete. A competent person shall inspect for damage and determine whether the equipment is suitable for service.

Incident investigations shall be retained on file for the length of time mandated by the applicable legislative authority, but not less than five years.

Evaluating Program Effectiveness

The managed fall protection program shall be evaluated by the program administrator.

Evaluation Criteria

The program evaluation shall contain:

a. A review of the written policy statement and its application in the workplace.
b. A determination that duties and responsibilities have been appropriately assigned.
c. A determination that the training for the required personnel is adequate to perform their duties and responsibilities.
d. A review of training programs to verify that fall protection training conforms to the current version of ANSI/ASSE Z490.1, Criteria for Accepted Practices in Safety, Health, and Environmental Training, and any applicable regulations.
e. A review of existing fall hazard survey reports to ensure that all fall hazard exposures have been identified.
f. A review of all fall protection equipment and systems currently in use.
g. A review of anchorage systems.
h. A review of the process for purchasing fall protection equipment/systems to ensure such equipment/systems meet the requirements of this standard.
i. A review of the inspection, maintenance, storage, and care for fall protection equipment.
j. A review of the fall protection procedures and rescue procedures.
k. A review of insurance claims to identify procedures, workplace activities, or equipment that might be improved.
l. Evaluations of authorized persons.
m. Rescue drills.
n. A review of fall protection and prevention considerations for new buildings, facilities, and equipment.
o. A review of incident investigations.

The program shall be evaluated by the program administrator at periodic intervals not to exceed two years. Additionally, the program shall be evaluated when authorized persons or competent persons identify deficiencies or when there are incidents involving injuries, property damage, or near misses.

The program evaluation shall identify the strengths and deficiencies for each element of the Managed Fall Protection Program along with recommendations for improvement. This evaluation shall be documented.

A documented plan of action shall be developed, identifying what changes will be made, who is responsible for making each change, and when the change will be completed.

Program evaluations shall be retained on file for the length of time mandated by the applicable legislative authority, but not less than five years.

Anchorages

Anchorages Strength A.10.32

Anchorages selected for **fall arrest** systems shall have sufficient strength capable of sustaining static loads applied in the directions permitted by the system of at least:

A. 5,000 pounds (22.2kN) for non-certified anchorages, or

B. Two times the maximum arrest force for certified anchorages.

Anchorages selected for **work positioning** systems shall have sufficient strength capable of sustaining static loads applied in the directions permitted by the system of at least:

A. 3,000 pounds (13.3kN) for non-certified anchorages, or

B. Two times the foreseeable force for certified anchorages.

Anchorages selected for **restraint and travel restraint** systems shall have sufficient strength capable of sustaining static loads applied in the directions permitted by the system of at least:

A. 1,000 pounds (4.5kN) for non-certified anchorages, or

B. Two times the foreseeable force for certified anchorages.

Compatibility

The compatibility between anchorage connectors and anchorages shall be considered when designing or selecting an anchorage and anchorage connector. 359.2

When fall arrest components made by different manufacturers are used in a system, a competent person shall determine that they meet the requirements of this standard and are compatible with one another.

Anchorages for Horizontal Lifeline Systems

Anchorages for horizontal lifeline systems shall be certified and designed, prior to use, by a qualified person with experience and training in the design and use of horizontal lifeline systems.

NOTE: Non-certified anchorages shall not be used for horizontal lifelines.

EM-385

Locally manufactured HLLs are not acceptable unless they are custom designed for limited or site specific applications by a Registered Professional Engineer (RPE) who is also qualified in designing HLL systems.

Commercially manufactured HLLs shall be designed, installed, certified and used under the supervision of QP only, as part of a complete fall arrest system. The CP may (if

deemed appropriate by QP), supervise the assembly, disassembly, use and inspection of the HLL systems, under the direction of the QP.

The design shall include drawings, required clearance, instructions on proper installation, and use procedures, proof testing reports and inspection requirements.

All HLL anchorages shall be designed by a RPE who is also qualified in designing HLL systems.*

*This section applies to products and materials that are not manufactured in accordance with an ANSI/ASSE Z359 standard.

Anchorage systems shall be inspected by the authorized person prior to each use and by a qualified or competent person at least annually in accordance with the manufacturer's or qualified person's instructions.

An anchorage connector shall be attached to no more than one PFAS unless certified for such purpose.

The maximum angle from the point of attachment of the anchorage connector to the worker shall be in accordance with manufacturer's recommendations for swing falls. The anchorage connector shall be located in such a way to minimize the pendulum-like motion during a fall. Typically 30^0 each way

Eyebolts

When selecting an eyebolt for an anchorage connector it shall be rated along its intended use axis in accordance with the manufacturer's instructions. The diameter of the eyebolt shall be compatible with the snap hook or carabiner of the fall protection system.

Crosby size	**90^0**		**45^0**		**0^0**	
Capacity	**WLL**	**Breaking**	**WLL**	**Breaking**	**WLL**	**Breaking**
1/2	**2600**	**13000**	**780**	**3900**	**650**	**3250**
5/8	**5200**	**26000**	**1560**	**7800**	**1300**	**6500**
3/4	**7200**	**36000**	**2160**	**10800**	**1800**	**9000**

The chart is only for sholdered eyebolts. Shoulderless eyebolts are straight pull only with no more than 5^0 each way. 5^0 has a ratio of 1 to 10.

Nail or screw on roof anchors

Most components require the bracket to be installed over a truss but on top of the sheathing. Some allow for installation in between the trusses

Typical Installation

If the fastener choice is nails, place the anchor on the sheathing with one outside row of holes centered on the truss. Drive in five #16d x 3.5” nails on each plate, through the sheathing, into the truss. Drive in five more on the other outer row of each plate. This row will not engage the truss.

If the choice is wood screws, place the anchor on top of the sheathing at the chosen location. Drive in six #14 flat head wood screws in each leg. Each screw must penetrate the truss a minimum of 11/2”

Some manufacturer’s anchor may be installed with screws onto the field or ridge into sheathing between trusses if the sheathing is a minimum 3/4” CDX plywood.

Typical Installation anchor bolt

- Drill the hole ¾” & 4 3/8” deep
- Blow hole clean with compressed air
- Use a hammer to drive the Swivel Concrete Anchor into the hole with bracket seated firmly against the concrete.
- The concrete substrate must be at the minimum of 6¼” thick & the drilled hole must be at least 15” from any free edge
- Minimum spacing is 10” for multiple anchor installation
- Can be used with lanyard, SRL or HLL

ECO ANCHOR

- Material: Fire resistant neoprene
- Surface Contact Dimensions: 4’4” x 4’4”
- Weighs: Empty = 18 lb., Full = 948 lb.
- Pressure Loading: 50 lb. per square foot
- Puncture resistant

Horizontal Life Lines

The adequacy of the fall protection system shall be demonstrated through evaluation by a qualified person or by test force.

All fall arrest systems shall limit the maximum arrest force to 1,800 pounds (8.0kN) or less and shall be designed such that authorized persons subject to a fall shall not strike an obstruction or lower level.

A fall restraint system shall be limited to a working surface that is at or less than a slope of 4:12 from horizontal.

Systems are to be evaluated to ensure that workers cannot hit the lower surface.

Table 1 - Required Clearance for One WorkersConnected to the System with a DBI/SALA Energy Absorbing Lanyard (See Figure 4)								
Span Length (in feet)	Length of Energy Absorbing Lanyard (in feet)							
	3	4	5	6	7	8	9	10
0 - 10	16'-1"	17'-1"	18'-1"	19'-1"	20'-1"	21'-1"	22'-1"	23'-1"
10 - 15	16'-3"	17'-3"	18'-3"	19'-3"	20'-3"	21'-3"	22'-3"	23'-3"
15 - 20	16'-5"	17'-5"	18'-5"	19'-5"	20'-5"	21'-5"	22'-5"	23'-5"
20 - 25	16'-7"	17'-7"	18'-7"	19'-7"	20'-7"	21'-7"	22'-7"	23'-7"
25 - 30	16'-9"	17'-9"	18'-9"	19'-9"	20'-9"	21'-9"	22'-9"	23'-9"
30 - 35	17'-6"	18'-6"	19'-6"	20'-6"	21'-6"	22'-6"	23'-6"	24'-6"
35 - 40	18'-3"	19'-3"	20'-3"	21'-3"	22'-3"	23'-3"	24'-3"	25'-3"

Inspection of Anchorage Systems

Authorized person is to inspect anchorage systems prior to each use and by a qualified person or competent person at least annually in accordance with the manufacturer's qualified person's instructions.

Those inspecting the anchorage systems shall check for any cracks in the structure around the anchorage or if the connection is unstable or loose.

A fall protection anchorage system shall be taken out of service when any inspection reveals that it may no longer serve the required function, that it may be unsafe due to damage or wear, or if the required inspection interval has been exceeded. An anchorage system taken out of service for exceeding the inspection interval may be returned to service after a satisfactory inspection has been performed and approved by a competent person.

Anchorages that have been recertified shall be field-verified by a qualified person.

Fall Protection

Competent person means an individual knowledgeable of fall protection equipment, including the manufacturers recommendations and instructions for the proper use, inspection, and maintenance; and who is capable of identifying existing and potential fall hazards; and who has the authority to take prompt corrective action to eliminate those hazards; and who is knowledgeable of the rules regarding the installation, use, inspection, and maintenance of fall protection equipment and systems.

Ensure that all surfaces on which employees will be working or walking on are structurally sound and will support them safely prior to allowing employees to work or walk on them.

Inspection criteria. All Components, of personal fall arrest systems, personal fall restraint systems and positioning device systems shall be inspected prior to each use according to manufacturer's specifications for mildew, wear, damage, and other deterioration.

Defective components shall be removed from service if their function or strength has been adversely affected.

Safety nets shall be inspected at least once a week according to manufacturer's specifications for wear, damage, and other deterioration. Safety nets shall also be inspected after any occurrence which could affect the integrity of the safety net system such as high winds or person falling into net.

Defective components shall be removed from service. Defective nets shall not be used.

Personal fall arrest systems, personal fall restraint system, positioning device systems, and their components shall be used only for employee protection and not to hoist materials.

Exemptions. Employees are exempt from sections WAC 296-155-24509 and WAC 296-155-24511 only under the following conditions:

During initial installation of the fall protection anchor (prior to engaging in any work activity), or the disassembly of the fall protection anchor after the work has been completed.

An employee directly involved with inspecting or estimating roof-level conditions only on low-pitched roofs prior to the actual start of construction work or after all construction work has been completed.

Examples of activities the department recognizes as inspecting or estimating include:

- Measuring a roof to determine the amount of materials needed for a project
- Inspecting the roof for damage without removing equipment or components

- Assessing the roof to determine what method of fall protection will be provided to employees

Examples the department does not recognize as inspecting or estimating under this exemption include:

- Delivering, staging or storing materials on a roof
- Persons estimating or inspecting on roofs that would be considered a “Hazardous Slope,” by definition.

Fall Protection at 0 feet- Guard Rail

Open sided floors, walkways, platforms, or runways above or adjacent to dangerous equipment, such as rock crushing equipment and material handling equipment,

Falling into or onto impalement hazards, such as: reinforcing steel (rebar), or exposed steel or wood stakes used to set forms.

Fall Protection Required at 4 Feet or More.

Ensure that the appropriate fall protection system is provided, installed, and implemented when employees are exposed to fall hazards of 4 feet or more to the ground or lower level when on a walking/working surface.

Walking/working surface means any area including but not limited to floors, a roof surface, bridge, the ground, and any other surfaces through which workers can pass or conduct work.

Walking working surfaces are protected by a standard guardrail system, or the equivalent on all open sides, except where there is entrance to a ramp, stairway, or fixed ladder. The railing shall be provided with a standard toe board wherever, beneath the open sides, persons can pass, there is moving machinery, or there is equipment with which falling materials could create a hazard.

Where employees are working on platforms above the protection of the guardrail system, increase the height of the guardrail system or select another fall protection system

When guardrails must be temporarily removed to perform a specific task, the area shall be constantly attended by an employee until the guardrail is replaced. The only duty the employee shall perform is to prevent exposure to the fall hazard by warning persons entering the area of the fall hazard.

Types of Fall Protection

Elimination*: Remove the hazard from work areas or change task, process, controls or other means to eliminate the need to work at heights with its subsequent exposure to fall hazards

Examples would be:

- Assembling a structure then raising to a position
- Filling in a hole rather than using PFAS

Prevention (passive or same-level barrier): isolate and separate fall hazards from work areas by erecting same level barriers such as guardrails, walls, covers or parapets

Fall Restraint: Securing the authorized person to an anchorage using a lanyard short enough to prevent the person's center of gravity from reaching the fall hazard.

Administrative Controls: Introduce new work practices that reduce the risk of falling from heights, or to warn a person to avoid approaching a fall hazard (i.e. warning systems, warning lines, audible alarms, signs or training of workers to recognize specific fall hazards).

Guardrails

- Top rails between 39 and 45 inches tall and resist 200lbs of force
- Midrails resist 150lbs of force
- Toeboards at least 3 1/2 inches high

Maximum spacing 8 ft.

Top Rail force is an outward/ downward force within 2 inches of the top anywhere along the rail. Cannot deflect below 39 inches.

Top rail to be made of:

- 2 by 4 stock
- 1 ½ steel schedule 40 OD
- Minimum ¼ inch steel cable flagged every 6 feet with less than 3 inch deflection

Midrail to withstand an outward downward force and is to be half way between the top and walking surface. Midrail to be made of:

- 1 by 6 minimum stock
- 1 ½ steel schedule 40 OD
- ¼ inch steel cable
- Screen mesh or solid panels meeting the 150lb strength test

Toeboards are to be securely fastened in place and have not more than 1/4 inch clearance above floor level. Toeboard to be made of:

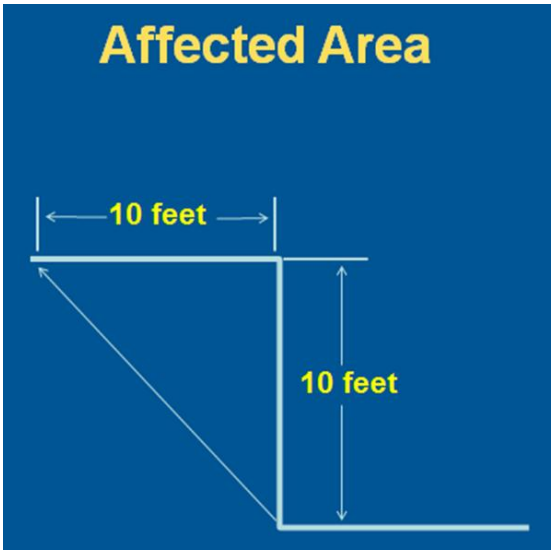
- 1 by 4 minimum stock
- Screen mesh or solid panels meeting the 150lb strength test
- Toe boards 50 lbs.

No gaps greater than 1 inch between boards

When is Fall Protection Needed?

Washington. When the distance away from the edge of an excavation equal to the depth of the excavation up to a maximum distance of 15ft. Employees standing or working in the affected area, who are not directly involved with the excavation process; or employees who are on a protective system or other structure in the excavation are required to have fall protection.

EM385-1-1 Anytime the fall hazard is 6 feet or greater.



Floor holes- 2 inch up to 12 inches 200 pounds resistance force

Floor opening- 12 inches or more where a person may fall through 4 times intended force.

Secured with cleats or hinges, marked “Hole” or “Cover”, hole must be attended if the cover is removed.

Common hole hazards:

- Holes recently made
- Weak skylights (minimum 6 inch by 6 inch grid for permanent installations)
- Holes just uncovered
- HVAC stack just removed

Washington

Hazardous slope-is a slope where normal footing cannot be maintained (roofs greater than 4/12 pitch)

Walking or working surfaces- means any area including, but not limited to, floors, a roof surface, bridge, the ground, and any other surfaces whose dimensions are forty-five inches or more in all directions, through which workers can pass or conduct work.

A walking /working surface does not include vehicles or rolling stock on which employees must be located in order to perform their job duties.

Roofing work or leading edge work is 10 feet in Washington.

A leading edge is the advancing edge of a floor, roof or formwork as additional sections are placed, formed or constructed. The edge of a finished roof is not a leading edge.

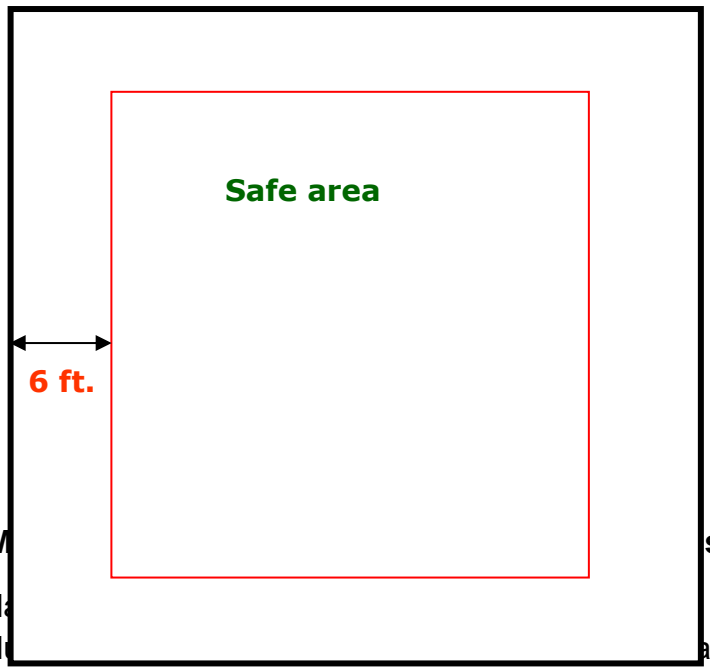
A roof with a slope of 4:12 or less is a low-pitched roof and waring lines maw be used.

Fall protection is required on low-pitched roofs where the fall distance is 4 feet or more.

Fall restraint system

A system in which all necessary components function together to restrain/prevent an employee from falling to a lower level. Types of fall restraint systems include standard guardrail systems, personal fall restraint systems, warning line systems, or a warning line system and safety monitor.

The warning line is installed six feet from the roof edge at a height of 36-45 inches(OSHA 34-39). Line is flagged every six feet. Work outside the safe area requires a safety monitor. Equipment cannot be used or stored outside safe area.



Safety M **some General Contractors**

- M
- M afety monitor and warning lines

- Must be distinguishable from other crew members
- Must be able to clearly see and use normal voice to communicate
- May not supervise more than eight people
- Warn employees of unsafe condition or fall hazard
- People working in the control zone shall be distinguishable from other crew members by wearing highly visible material
- Employees shall promptly comply with warnings given by safety monitor regarding hazards

You must be tied off so that you can never go past the roof edge, no matter where you work on the roof. Anchorage points used for fall restraint shall be capable of supporting 4 times the intended load.

Fall Arrest

Unless otherwise designed, the fall arrest system must arrest the fall in 6 feet or less.

Fall arrest must arrest the fall before the user reaches the lower surface.

Safety Nets

Vertical Distance	Horizontal Distance
Up to 5 feet	8 feet
5 feet up to 10 feet	10 feet
more than 10 feet	13 feet
Test with 400lb at 42 inches above max fall height	

Material Diameter	Manila	Polypro	Dacron	Nylon
5/8 in.	**3470**	**4858**	**6940**	**8675**
17 mm	**3987**	**5882**	**7974**	**9967**
18 mm	**4477**	**6268**	**8954**	**11,192**
¾ in. 19 mm	**4997**	**6996**	**9994**	**12,492**

Knot	percent of line strength lost	percent of line strength left
Bowline	**37%**	**63%**
Round turn (double half-hitch)	**30-35%**	**65-70%**
Clove hitch	**40%**	**60%**

Personal Fall Protection Systems

Do not make connections where the hook locking mechanism can come into contact with a structural member or other equipment and potentially release the hook.

Do not connect a snap hook into a loop or thimble of a wire rope or attach in any way to a slack wire rope.

The snap hook must be free to align with the applied load as intended

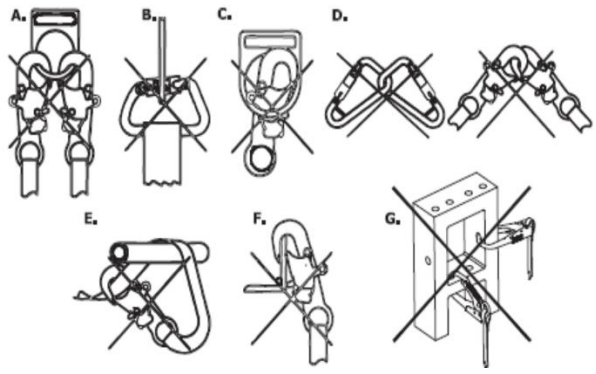
Tensile loads that a snap hook and carabiner must withstand remain the same as the existing Standard – 5,000 lbs.

Gate face strength requirements have changed from 220 lbs. (1kN) (old Standard) to 3,600 lbs. (16kN) (new Standard).

Do not make connections where the hook locking mechanism can come into contact with a structural member or other equipment and potentially release the hook.

Do not connect a snap hook into a loop or thimble of a wire rope or attach in any way to a slack wire rope.

The snap hook must be free to align with the applied load as intended



Unless the snap hook is designed for the following connections, snap hooks shall not be engaged:

- Directly to the webbing, rope or wire rope
- To each other
- To a D-ring to which another snap hook or other connector is attached
- To a horizontal lifeline or
- To any object which is incompatibly shaped or dimensioned in relation to the snap hook such that unintentional disengagement could occur

WAC 296-155-24613

Do's and Don't's

Do inspect for wear and damage before use.

Do remove from service after a fall for inspection.

Don't use to lift materials.

Don't attach to guardrails or hoists.

Harness, lanyard, SPR, these items must not be damaged, broken, distorted, and must be free of sharp edges, burrs, cracks, worn parts, or corrosion.

PVC coated hardware must be free of cuts, rips, tears, holes, etc. in the coating to ensure non-conductivity.

Ensure that release tabs on buckles work freely and that a click is heard when the buckle engages.

Inspect vertical torso adjusters for proper operation. Ratchet knobs should turn with ease in a clockwise direction and should only turn counterclockwise when the knob is pulled out.

Webbing

Material must be free of frayed, cut, or broken fibers. Check for tears, abrasions, mold, burns, or discoloration.

Inspect stitching; check for pulled or cut stitches. Broken stitches may be an indication that the harness has been impact loaded and must be removed from service.

When performing the annual formal inspection, unsnap and open the back pad to facilitate inspection of the webbing.

All labels should be present and fully legible

Fall Protection Work Plan

You are required to prepare a fall protection plan for every job where the fall hazard is over 10 feet. Be prepared to go over this plan with your crew boss or lead worker at the beginning of the job.

- Identify fall hazards in the work area
- Describe the method of fall arrest or restraint to be used
- Correct procedures for assembly, maintenance, inspection and disassembly of fall protection system
- Proper procedures for handling, storing and securing of tools and materials
- What type of overhead protection for workers working below
- What method of removal or rescue for injured workers
- Must be available for inspection by L&I

Ladders

Common causes of falls

- Improperly getting on or off the ladder
- Loss of balance
- Setting up the ladder improperly
- Overreaching while on the ladder
- Mis-stepping or slipping while climbing or descending
- Lack of training on safe ladder use
- Using the wrong type ladder for the job
- Exceeding the ladder weight capacity
- Climbing ladder with tools or material in hands
- Climbing or descending not facing the ladder
- Oil, grease or mud on ladder rungs
- Ladder not secure at the base or top
- Ladder not set up at the proper angle
- Ladder not extended 3 feet above upper surface
- Using the top step of a step ladder
- Placing ladder on unstable surfaces
- Over-reaching beyond the side rails of the ladder

Ensure the following:

- Side rails aren't bent, broken, or split
- Rungs, cleats, or steps aren't bent, broken, or missing
- All bolts and rivets are in place and securely tighten
- Joint between the side rails and the individual rungs/steps is tight
- Safety feet are not excessively worn
- Hardware and fittings are securely attached and working properly
- Ropes aren't frayed or badly worn

- Moveable parts operate freely without binding or excessive play.
- Metal components aren't corroded.
- No other faulty or defective components exist.
- Any auxiliary equipment is securely attached, not excessively worn and functions properly.

Position ladders so that they are:

- Not in the paths of workers walking through,
- Not in front of unblocked exits,
- Not in front of doors that can open out into the ladder,
- Not on boxes, barrels or other unstable surfaces,
- On solid footing and level at the bottom,
- Stable at the top with each rail supported equally,
- Against a structure capable of supporting the intended load,
- Away from debris and other hazards.

Additional items:

- Don't test a ladder by jumping on it.
- Don't paint a wood ladder.
- Don't use any ladder that has been exposed to fire or other strong chemicals.
- Protect ladders from environmental elements such as: excessive heat or cold.
- Don't drop or throw ladders.
- Store ladders out of the way of other employees.
- Secure ladders firmly when transporting on vehicles.

Inspection of Harness and Lanyard

Grasp the webbing with your hands and bend the webbing, checking both sides. This creates surface tension making damaged fibers or cuts easier to see. Webbing damage may not show up through a sight (visual) inspection only – manual (touch) the harness is equally important.

Webbing

• Cuts, nicks or tears	
• Broken fibers/cracks	
• Overall deterioration	
• Modifications by user	
• Fraying/Abrasions	
• Discoloration of material	Dependent on cause of discoloration
• Hard or shiny spots	Indicates heat damage
• Webbing thickness uneven	Indicates possible fall
• Mildew	Clean harness
• Missing Straps	
• Undue Stretching	Indicates possible fall
• Burnt, charred or melted fibers	Indicates heat damage
• Material marked w/permanent marker	Check w/manufacturer
• Excessive hardness or brittleness	Indicates heat or UV damage

Stitching

• Pulled stitches	
• Stitching that is missing	
• Hard or shiny spots	Indicates heat damage
• Cut stitches	
• Discoloration of stitching	Dependent on cause of discoloration

Hardware

- Distortion (twists, bends)
- Rough or sharp edges
- Rust or corrosion
- Cracks or breaks
- Broken/distorted grommets
- Modification by users (ie additional holes)

- Tongue buckle should overlap the buckle frame and move freely back and forth in their socket
- Roller of tongue buckle should turn freely on frame
- Bars must be straight

All springs must be in working condition

Cleaning and Storage

Wipe off all surface dirt with a sponge dampened in plain water. Squeeze the sponge dry. Dip the sponge in a mild solution of water and mild detergent. Work up a thick lather, with a vigorous back and forth motion. Then wipe dry with a clean cloth.

Hang freely to dry, but away from excessive heat, steam or long periods of sunlight.

Storage areas should be clean, dry and free of exposure to fumes, heat, direct ultra violet light, sunlight and corrosive elements.

Shock Absorbing Strap Lanyard

• Pay attention to the wrinkled port	
• Cuts, nicks or tears	
• Broken fibers/cracks	
• Overall deterioration	
• Modifications by user	
• Fraying/Abrasions	
• Discoloration of material	Dependent on cause of discoloration
• Hard or shiny spots	Indicates heat damage
• Change in core size	Indicates possible fall
• Mildew	Clean harness
• Missing or popped flag	Indicates possible fall
• Undue Stretching	Indicates possible fall
• Burnt, charred or melted fibers	Indicates heat damage
• Material marked with permanent marker	Check with manufacturer
• Excessive hardness or brittleness	Indicates heat or uv damage
• Knots in lanyard	

Stitching

- Pulled Stitching
- Missing stiches

- Hard or shiny spots
- Cut stiches

Snap Hook

- No hook or eye distortion (twists, bends
- Latch/keeper should seat into the nose w/o binding
- Latch/keeper should not be distorted or obstructed
- Overall deterioration/Excess
- Modification
- Rust/pitting/corrosion
- No cracks
- No missing parts
- No excessive wear
- No rough or sharp edges

Snap Hook Locking Mechanism

All moving parts should move back to original position when released

Rope lanyards
Grasp the rope with both hands and rotate the lanyard. Remember to check inner strands for damage.

Synthetic fiber ropes will show a reduction in strength when used at elevated temperatures. For exposure to excessive temperatures specific for the rope fiber refer to the rope manufacturers specifications and instructions.

Rope Diameter
Weakened areas from extreme loads will appear as a noticeable change in original diameter. The rope diameter should be uniform throughout. If areas appear to be reduced more than 5%, remove from service – (ie: 5/8” rope, 5% reduction would be approx. 1/32” – calipers can be used to measure.)

- Fiber, cuts or nicks
- Broken fibers
- Fuzzy or worn fibers
- Overall deterioration
- Modifications by user
- Fraying/Abrasions
- Hard or shiny spots — Indicates heat damage
- Fused fibers or strands — Indicates heat damage

- Change in original diameter — Indicates possible fall
- Burnt, charred or melted fibers — Indicates heat damage
- Discoloration of rope & brittle fibers (such as splinters/slivers)
- Kinks, hockling* or knots

*unraveling of the lanyard due to constant turning in same direction or shock loading

Thimbles and Eyes

- Thimbles (steel or plastic) must be seated firmly in the eye.
- Thimbles must not show any sign of damage. Check around the eye itself for damage, wear or deterioration.
- Missing thimble(s)
- Loose thimble(s)
- Damaged thimbles-white stress marks, thimble collapsing over itself
- Eye damage due to cuts, nicks, abrasions, fraying, fused areas (look for same indicators as you would for the rope body itself.
- Eyes with metal thimbles – look for rust in or around the eye.

Wire Rope

Grasp the steel lanyard with your hands and rotate the lanyard, checking both sides. Watch for unusual wearing patterns on the wire. Broken strands or wires will separate from the body of the lanyard. To avoid hand injury always wear protective gloves when inspecting a wire rope lanyard.

Note: Unlike rigging inspection standards, wire rope used for the purpose of fall protection does not allow any broken wires or strands.

- Cuts, frayed areas
- Worn or broken strands/wires
- Overall deterioration/excessive outside wear
- Modifications by the user
- Rust/pitting/corrosion
- Crushed/jammed or flattened strand
- Bulges in rope
- Heat damage, torch burns or electric arc strikes
- Kinks, bird-caging
- Core protrusion
- Do not use frozen ropes

SRL and Lifelines

Self-Retracting Device Classifications

Self-Retracting devices shall be classified according to dynamic performance as follows:

Class A: Maximum arrest distance of 24 inches(610mm).

Class B Maximum arrest distance of 54(1,372mm).

Self-retracting lanyards shall automatically limit free-fall distance to 2 feet (0.61m) or less and shall be capable of sustaining a minimum tensile load of 3,000 pounds (13.3kN) applied to the device with the lanyard in the fully extended position.

Variances from the requirements of this standard are permissible in isolated instances of practical difficulties when applying it at the authorized person level, but only when it is clearly evident that an equivalent degree of protection is thereby secured.

REQUIREMENTS

Integral Connectors

Snaphooks or carabiners which are integral to self-retracting devices shall

meet the requirements of ANSI/ASSE Z359.12. Integral rings or similar openings intended to accept a snaphook or carabiner shall be designed to minimize the possibility of rollout of a mating snaphook or carabiner.

Locking Function

Self-retracting devices shall be automatic in their locking (fall stopping) function. It shall not be possible to override the self-locking feature of the device when in use. The design of working parts, their location and the protection afforded to them shall be such as to prevent the possibility of performance being impaired by casual interference.

Energy Absorption

Self-retracting devices which perform an energy absorption function shall be designed such that the energy absorption function is available throughout the usable working range of the device. The working range or length is defined as the amount of travel allowed by the device starting from full retraction to full extension under normal working tension.

Visual Indicator

Self-retracting devices shall include a visual indicator that will activate in accordance with the requirements of Section Dynamic Performance

Self-Retracting Devices shall be marked to identify:

- part number and model designation;
- year of manufacture;
- manufacturer's name or logo;
- capacity range;
- unique ID number;
- standard number (Z359.14);
- how to inspect visual indicator;
- warning to follow the manufacturer's instructions included with the equipment at time of shipment from the manufacturer;
- warning of the need for inspection in accordance with the manufacturer's instructions;
- the fiber or other materials used in the lanyard construction;
- the lanyard working length;
- average arresting force for the SRD class;
- arrest distance;
- proper installation means;
- warning of the need for testing of the device for locking and retraction before each use;
- SRD class;
- warning of the need to avoid lanyard contact with sharp edges and abrasive surfaces (not required for leading edge type SRD's);
- free fall limit;
- suitability for use with horizontal lifelines;
- suitability for horizontal use.

Self-retracting lanyards with integral leading edge capability shall be marked to

identify:

- minimum installation setback distance;
- clearance required when falling over edge.

Life Lines

Rope and webbing used in the construction of energy absorbers shall be made of virgin synthetic material.

Synthetic rope used in vertical lifelines shall have a minimum breaking strength of 5,600 pounds (25kN).

Vertical lifelines should be protected from abrasion that may occur from suspension over or along a structural member. 359.1

The VLL shall be extended to or below the lowest level to which the user is expected to travel and a stop specified by the manufacturer of fall arrester shall be installed to prevent the fall arrester from accidentally coming off the lifeline.

A vertical lifeline shall be securely attached to and suspended freely from its anchorage connection and not contact any structures or other objects.

Vertical lifelines shall be protected from abrasion or other damage (i.e., heat, welding slag, electrical, chemicals, etc.) that may occur from suspension over or along a structural member.

The authorized person shall check the lifeline to assure that it is of the correct size and construction for use with the intended fall arrester.

Care shall also be taken to assure that the fall arrester is installed in the proper direction on the lifeline in accordance with the manufacturer's instructions.

Fall arresters that are not bidirectional (could arrest a fall or lock in both directions of travel) and which could be installed upside down on the lifeline shall be clearly marked showing proper orientation of use.

A knot may be an acceptable means of securing the free end of the lifeline at ground level.

Remove from service when an inspection reveals:

- Defects in equipment
- Damage to equipment
- Inadequate maintenance of equipment;
- Activated stress indicators
- Activated warning systems or devices

Inspection

- Check for loose screws and bent or damaged parts
- Check the housing for distortion, cracks or other damage.
- Fully extend lifeline and verify that it retracts smoothly
- Ensure the device locks when the lifeline is pulled sharply. Lock-up should be positive with no slipping
- All labels must be legible and present
- Check for corrosion on the entire unit
- Check for cuts burns, chemical damage or severely abraded areas
- Check the connecting hooks or carabiners for damage, distortion or corrosion
- Evidence of defects in or damage to straps, wire rope, or ropes
- Record the inspection annually

Type Of Use	Application Examples	Conditions Of Use	Inspection Frequency Competent Person	Factory Authorized Inspection
Infrequent to Light	Rescue and confined space, factory maintenance	Good storage conditions, indoor or infrequent outdoor use, room temperature, clean environments	Annually	At least every 2-5 years, but not longer than intervals required by the manufacturer
Moderate to Heavy	Transportation, residential construction, utilities, warehouse	Fair storage conditions, indoor and extended outdoor use, all tempera- tures, clean or dusty environments	Semi-annually to annually	At least every 1-2 years, but not longer than intervals required by the manufacturer
Severe to Continuous	Commercial construction, oil and gas, mining	Harsh storage conditions, pro- longed or continuous outdoor use, all temperatures, dirty environment	Quarterly to semi-annually	At least annually, but not longer than intervals required by the manufacturer

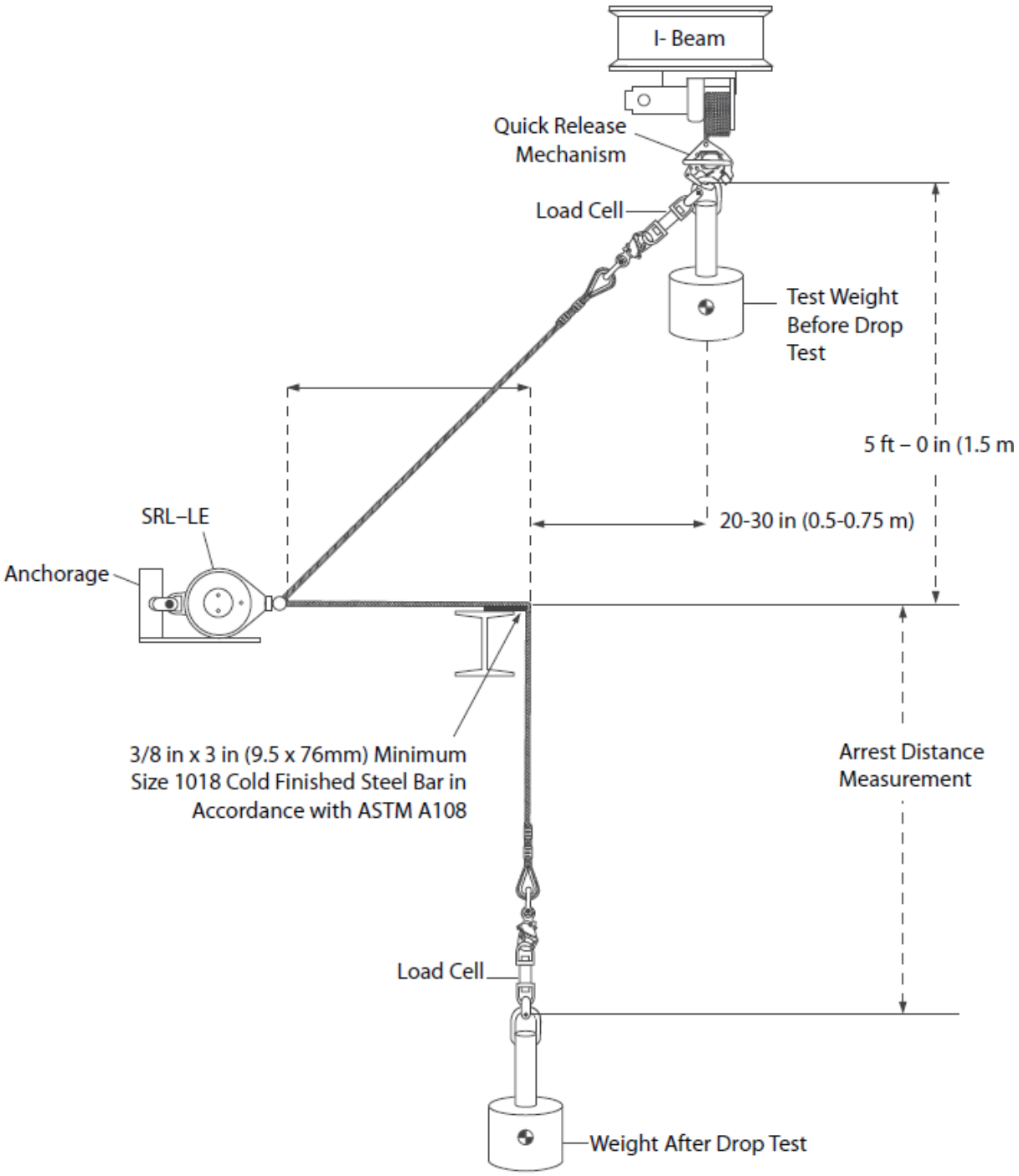


Figure 5b: Dynamic Performance Testing: SRL-Leading Edge

Risk Assessment

A fall hazard survey report shall be prepared for each fall hazard to which an authorized person may be exposed. The report shall identify one or more methods to eliminate or control each identified fall hazard.

- The fall hazard survey shall be conducted by a competent person or a qualified person.
- The fall hazard survey report shall identify all current and predictable workplace hazards including falling objects.

The report shall, as a minimum, identify the presence of:

- Hot objects, sparks, flames and heat-producing operations
- Chemicals hazardous to the authorized person or to the fall protection system
- Electrical hazards
- Environmental contaminants of any form
- Sharp objects and abrasive surfaces
- Moving equipment and materials

Unsuitable Tie off points

- Standard Guardrails
- Standard Railings
- Ladders/Rungs
- Scaffolding*
- Light fixtures
- Conduit or Plumbing
- Ductwork or Pipe Vents
- Wiring Harnesses
- Single rebar
- Lanyards
- Vents
- Fans
- Roof Stacks
- or any item or structure not capable of meeting OSHA structural load requirements.

Some of the above my be considered acceptable by a competent person, but as a general rule these items are suspect.
*If manufacturer allows

Risk/Activity/Work Task:	Overall Risk Assessment Code (RAC) after controls in place (Use highest code)					
Project Location:	**Risk Assessment Code (RAC) Matrix**					
Contact Person:	**Severity**	**Probability**				
Date Prepared:		Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title):	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
Notes: (Field Notes, Review Comments, etc.)	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

RAC Chart

E = Extremely High Risk

H = High Risk

M = Moderate Risk

L = Low Risk

Identified Risk	Hazards	Controls	RAC

Controls To Be Used	Training Requirements	Inspection Requirements

Risk Assessment Analysis

Obstructions should be documented in the fall hazard survey report. These might include:

- Unstable, uneven and slippery walking/working surfaces; unguarded openings;
- Climatic and weather factors;
- Other materials or circumstances which could adversely affect the fall protection system; and
- Foreseeable changes in any of these conditions taken individually or collectively.

Fall Protection Plan*

Minimum Requirements

- Fall protection procedures are to be written and modified only by their employer's qualified person or competent person.
- Fall protection procedures shall address the specific fall hazards of the jobsite.
- Fall protection procedures shall provide for 100% continuous fall protection.

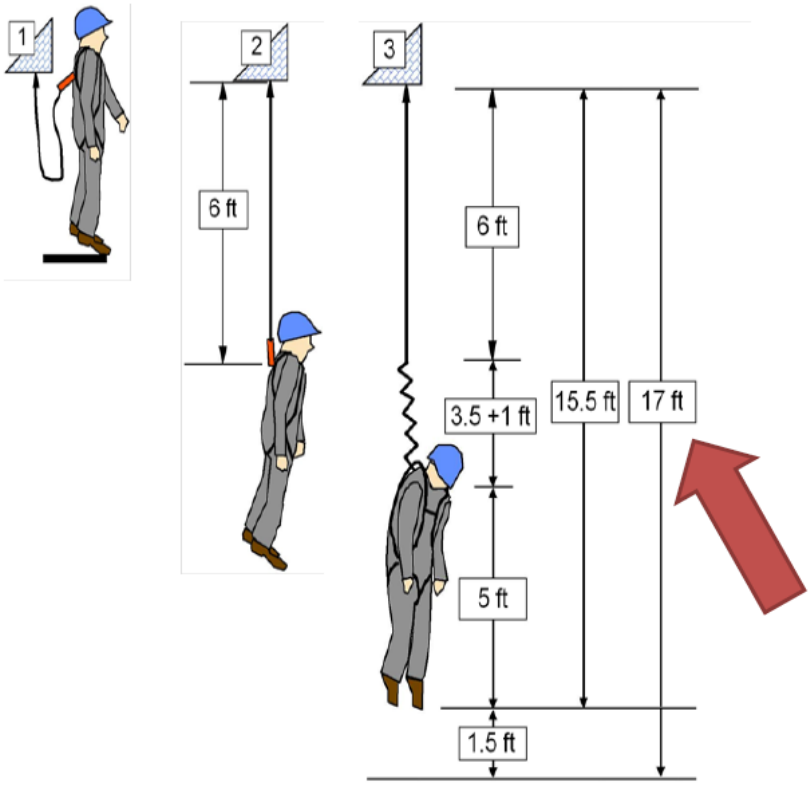
*Required in Washington over 10 feet not including guard rails systems

Fall Protection Plan Items

- Identify fall hazards in the work area
- Describe the method of fall arrest or restraint to be used
- Correct procedures for assembly, maintenance, inspection and disassembly of fall protection system
- Proper procedures for handling, storing and securing of tools and materials
- What type of overhead protection for workers working below
- What method of removal or rescue for injured workers
- Must be available for inspection by L&I

Fall Procedures- Arrest

- Identification of acceptable fall arrest anchorages
- Clearance requirements
- Complete setup procedure for access
- Use and egress from the system
- Limitations on use of the system, including the maximum free fall, maximum arrest force, and the maximum number and permitted locations of authorized persons who may attach to or use the system
- Training requirements and qualifications of authorized persons permitted to use the system



Fall Procedures- Restraint

- Identification of acceptable anchorages
- Complete setup procedure for access
- Use and egress of the system
- Limitations on use of the system including the maximum number and permitted locations of authorized persons who may attach to or use the system

Fall Procedures-Installing and Dismantling

- A description of all components used in the fall protection system, specifying the applicable manufacturers, standard, and/or drawings
- Required anchorage strengths or other criteria for choosing acceptable anchorages.
- Any limitations on where or how the system shall be installed
- Detailed instructions for assembling the components into the complete fall protection system
- If applicable, detailed instructions for disassembling the fall protection system

Fall Procedures-Inspection

- Inspection intervals.
- Instructions for inspecting each component of the system.
- Description of acceptance and rejection criteria, including retirement criteria, of each component of the system.

Types of Fall Protection

Elimination*: Remove the hazard from work areas or change task, process, controls or other means to eliminate the need to work at heights with its subsequent exposure to fall hazards

Examples would be:

- Assembling a structure then raising to a position
- Filling in a hole rather than using PFAS

*Most effective control measure

Prevention (passive or same-level barrier): isolate and separate fall hazards from work areas by erecting same level barriers such as guardrails, walls, covers or parapets;

Fall Restraint: Securing the authorized person to an anchorage using a lanyard short enough to prevent the person's center of gravity from reaching the fall hazard.

Fall Arrest: A system designed to stop an authorized person after a fall has begun.

Administrative Controls: Introduce new work practices that reduce the risk of falling from heights, or to warn a person to avoid approaching a fall hazard (i.e. warning systems, warning lines, audible alarms, signs or training of workers to recognize specific fall hazards).

General Requirements for Fall Protection Systems

All components used in a fall protection or rescue system for which requirements have been established in this standard shall be certified and shall be incorporated into the system in a way that is consistent with its manufacturer's instructions.

The design of fall protection systems shall be based on the results of tests or predictive calculations made by a qualified person.

The design and installation of a HLL fall protection systems or components shall be performed under the direct* supervision of a qualified person.

*Some jurisdictions omit direct

Horizontal Lifelines

HLL usage shall be demonstrated through evaluation by a qualified person or by test force

All fall arrest systems shall limit the maximum arrest force to 1,800 pounds (8.0kN) or less and shall be designed such that authorized persons subject to a fall shall not strike an obstruction or lower level.

A fall restraint system shall be limited to a working surface that is at or less than a slope of 4:12 from horizontal.

Anchorage Systems

Anchorage Connectors

The compatibility between anchorage connectors and anchorages shall be considered when designing or selecting an anchorage and anchorage connector.

Protect connectors from sharp edges, excessive bending of wire rope, abrasive surfaces, and physical hazards such as thermal, electrical, and chemical.

Anchorages

The design, selection, and installation of certified fall arrest anchorages shall be performed under the supervision of a **qualified person**.

> "Qualified" means one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated their ability to solve or resolve problems relating to the subject matter, the work, or the project. OSHA
>
> Qualified Person: a person with a recognized degree or professional certificate and with extensive knowledge, training and experience in the fall protection and rescue field who is capable of designing, analyzing, evaluating and specifying fall protection and rescue systems; ANSI
>
> Advanced understanding of the regulatory requirements, physical sciences and engineering principles that affect equipment and systems for FP and rescue; be able to calculate forces generated by an arrested fall, the total loading and the deflection of the fall arrest anchorage, the impact on the structural members to which the fall arrest system is attached and shall be able to determine safe locations of anchorages; shall supervise the design, selection, installation and inspection of certified anchorages and horizontal lifelines. EM 385-1-1

- The design, selection, and installation of certified fall arrest anchorages, under the supervision of a qualified person.
- Anchorages selected for fall arrest systems shall have strength capable of sustaining static loads of at least:
- 5,000 pounds (22.2kN) for non-certified anchorages, or
- Two times the maximum arresting force for certified anchorages.

Design, selection, and installation of certified fall arrest anchorages shall include:

- Safe location where and how to connect to those anchorages
- Forces generated by arresting a fall
- Total existing and anticipated loading
- Load path
- Structural member strengths

- Connection and support strengths
- Stability
- Clearance requirements
- Swing fall
- Rescue deflection of the system, and
- Impact on the structural members to which the fall arrest system is attached

Anchorages for Work Positioning Systems (SRL)

Anchorages selected for work positioning systems shall have a strength capable of sustaining static loads applied in the directions permitted by the system of at least:

- 3,000 pounds (13.3kN) for non-certified anchorages, or
- Two times the foreseeable force for certified anchorages.

Anchorages for Restraint

Anchorages selected for restraint and travel restraint systems shall have a strength capable of sustaining static loads applied in the directions permitted by the system of at least:

- 1,000 pounds (4.5kN) for non-certified anchorages, or
- Two times the foreseeable force for certified anchorages.

Anchorages for Horizontal Lifeline

Anchorages for horizontal lifeline systems shall be certified and designed, prior to use, by a qualified person with experience and training in designing and using horizontal lifeline systems.

Anchorages for horizontal lifelines shall be capable of sustaining at least two times the maximum tension developed in the lifeline during fall arrest in

Commercially manufactured HLLs shall be designed, installed, certified and used under the supervision of QP only, as part of a complete fall arrest system. The CP may (if deemed appropriate by QP), supervise the assembly, disassembly, use and inspection of the HLL systems, under the direction of the QP. EM-385-1-1

All HLL anchorages shall be designed by a RPE who is also qualified in designing HLL systems. See ANSI/ASSE Z359.6

Z359.6 was written as guidelines for an engineer who is designing a complete system

This standard is intended for the design of complete active fall protection systems. Therefore, it is recommended that this standard not be referenced on specific fall protection products. Pg 9 of Z359.6

DEFINITIONS

Activation Distance. The distance traveled by a fall arrester or the amount of line laid out by a self-retracting lanyard (SRL) from the point of onset of a fall to the point where the fall arrester or self-retracting lifeline begins to apply a braking or stopping force.

Active Fall Protection Systems. A fall protection system that requires authorized persons to wear or use fall protection equipment and that requires fall protection training.

Adjuster. A component that provides a means to vary the length of a strap, webbing or rope.

Administrative Controls. Employer mandated safe work practices or procedures that are designed to prevent exposure to a fall by signaling or warning an authorized person to avoid approaching a fall hazard.

Anchorage. A secure connecting point or a terminating component of a fall protection system or rescue system capable of safely supporting the impact forces applied by a fall protection system or anchorage subsystem.

Anchorage Connector. A component or subsystem that functions as an interface between the anchorage and a fall protection, work positioning, rope access or rescue system for the purpose of coupling the system to the anchorage.

Anchorage System. A subsystem of a complete active fall protection system to which workers connect their personal equipment.

Arrest Distance. The total vertical distance required to arrest a fall. The arrest distance includes the deceleration distance and activation distance.

Assisted Rescue. A rescue requiring the assistance of others.

Attachment Element. A connector integral to the body support that provides a point on the body harness to which other components or connecting subsystems may be attached.

Authorized Person. For purposes of the Z359 standards, a person assigned by the employer to perform duties at a location where the person will be exposed to a fall hazard.

Authorized Rescuer. A person assigned by the employer to perform rescue from fall protection.

Automatic Descent Control Device. A load lowering device or mechanism that automatically controls pay-out speed of line or descent speed under load once it has been engaged.

Available Clearance. The distance from a reference point, such as the working platform, to the nearest obstruction that an authorized person might contact during a fall which, if struck, could cause injury.

Ballasted Anchor. An anchorage that rests on, but is not mechanically connected to, an underlying structure.

Belt, Body. A body support comprised of a strap with means for securing it about the waist.

Body Support. An assembly of webbing arranged to support the human body for fall protection purposes, including during and after fall arrest.

Buckle. A connector for attaching a strap or webbing segment to either another strap or webbing segment or back to itself.

Capacity. The maximum weight that a component, system or subsystem is designed to hold.

Carabiner. A connector generally comprised of a trapezoidal or oval shaped body with a closed gate or similar arrangement that may be opened to attach another object and, when released, automatically closes to retain the object.

Certification. The act of attesting in writing that the criteria established by these standards or some other designated standard have been met.

Certified. An act or process resulting in documentation that determines and attests to criteria that meet the requirement of an American National Standard. Such act or process may be carried out by testing or applying proven analytical methods, or both, under the supervision of a qualified person or entity.

Certified Anchorage. An anchorage for fall arrest, positioning, restraint or rescue systems that a qualified person certifies to be capable of supporting the potential fall forces that could be encountered during a fall or that meet the criteria for a certified anchorage prescribed in these standards.

Chest Harness. See “Harness, Chest”.

Chest-waist Harness. See “Harness, Chest-Waist”.

Clearance. The distance from a specified reference point, such as the working platform or anchorage of a fall arrest system, to the lower level that a worker might encounter during a fall

Clearance Requirement. The distance below an authorized person that must remain clear of obstructions in order to ensure that the authorized person does not make contact with any objects that would cause injury in the event of a fall.

Compatibility. The quality or power of being compatible.

Compatible. Capable of orderly, efficient integration and operation with other elements or components in a system, without the need of special modification or conversion, such that the connection will not fail when used in the manner intended.

Competent Person. An individual designated by the employer to be responsible for the immediate supervision, implementation and monitoring of the employer's managed fall protection program who, through training and knowledge, is capable of identifying, evaluating and addressing existing and potential fall hazards, and who has the employer's authority to take prompt corrective action with regard to such hazards.

Competent Person Trainer. An individual who by training, knowledge and experience is capable of conducting competent person training.

Competent Rescuer. An individual designated by the employer who by training, knowledge and experience is capable of the implementation, supervision and monitoring of the employer's fall protection rescue program.

Competent Rescue Trainer. An individual who by training, knowledge and experience specific to fall protection rescue is capable of conducting rescue training.

Component. An element or integral assembly of interconnected elements intended to perform one function in the system.

Connecting Subsystem. An assembly, including the necessary connectors, comprised of all components, subsystems, or both, between the anchorage or anchorage connector and the harness attachment point.

Connector. A component or element that is used to couple parts of the system together.

Constituent. An integral component of a larger assembly.

Continuous Fall Protection. One or more fall protection systems that provide fall protection without interruption.

Cusp Sag. The sag that an HLL attains before it begins to provide significant deceleration force to stop a fall.

Deceleration Distance. The vertical distance between the user's fall arrest attachment at the on-set of fall arrest forces during a fall, and after the fall arrest attachment comes to a complete stop.

D-Ring. An integral "D" shaped connector typically used in harnesses, lanyards, energy absorbers, lifelines and anchorage connectors as an integral connector as an attachment point.

Descent Controller. A device designed to be used by one worker for personal descent or to lower another worker from an elevation.

Dynamic Analysis. A method for predicting the performance of an active fall protection system by calculating the velocity of a moving or falling body at selected time or distance intervals. The method takes into consideration both the arresting force from the system and the gravitational pull on the falling body to determine how much the body speeds up or slows down over the selected interval.

Element. An integral part of a constituent, component, hybrid component, subsystem or system.

Employer. Any corporation, partnership, proprietorship, government agency or other organization that has employees.

Energy (Shock) Absorber. A component whose primary function is to dissipate energy and limit deceleration forces which the system imposes on the body during fall arrest.

Energy Absorber, Horizontal Lifeline. An energy absorber that is attached to one of the end anchorages or anchorage connectors of a horizontal lifeline subsystem.

Energy Absorer, Personal. An energy absorber that is attached to a harness.

Energy Absorber, Vertical Lifeline. An energy absorber that is attached to the top anchorage or anchorage connector of a vertical lifeline subsystem.

Energy Analysis. A method for predicting the performance of an active fall protection system by calculating the energy produced by a moving or falling body and determining how this energy is absorbed or dissipated by the components of the fall protection system.

Equipment. A general term referring to components, subsystems or systems, in any combination, singular or plural.

Evacuation. Self-rescue affected by the rescue subject alone.

Eye, Formed. A loop or eye, with or without a thimble, formed in the end of a rope, wire rope or strap and secured by means of a splice, swaged fitting or stitched joint.

Eye, Return. A loop or eye in the end of a rope or wire rope formed by lapping the rope or wire rope back on itself and securing it by using swaged fittings.

Eye, Spliced. A loop or eye in the end of a rope or a wire rope formed by tucking the strand ends into the rope or wire rope.

Eye, Stitched. A loop or eye in the end of a strap formed by lapping the strap back on itself and securing it by means of a stitched joint.

Fall Arrest. The action or event of stopping a free fall or the instant where the downward free fall has been stopped.

Fall Arrest Attachment. A connector integral to the body support specifically designated as a point for connecting the fall arrest system.

Fall Arrest System. The collection of equipment components that are configured to arrest a free fall.

Fall Arrester. A device that travels on a lifeline and will automatically engage or lock onto the lifeline in the event of a fall.

Fall Arrester Connecting Sub-system. The portion of a vertical lifeline fall protection system that is attached between the anchorage or anchorage connector and the fall arrest attachment on the harness.

Fall Edge. The unprotected edge of a walking/working surface or an unprotected opening from which a person could fall to a lower surface or into a hazard.

Fall Hazard. Any location where a person is exposed to a potential free fall.

Fall Hazard Survey Report. A written document that contains information about existing or potential fall hazards and a method or methods for eliminating or controlling those hazards.

Fall Hazard Zone. An area of fall exposure on a roof or slope.

Fallout. The action of a person or test torso being unintentionally separated from the body support component during or after fall arrest.

Fall Protection. Any equipment, device or system that prevents an accidental fall from elevation or that mitigates the effect of such a fall.

Fall Protection System. Any secondary system that prevents workers from falling or, if a fall occurs, arrests the fall.

Fall Protection Procedure. A written series of logical steps that describes in detail the specific practices, equipment and methods to be used to protect authorized persons from falling when exposed to fall hazards.

Fall Restraint. See “Restraint or “Travel Restraint”.

Fall Restraint System. See “Travel Restraint System”.

Force Factor. The ratio of peak arresting force of a rigid mass to a human body of the same weight, both falling under identical conditions.

Free Fall. The act of falling before a fall protection system begins to apply forces to arrest the fall.

Free Fall Distance. The vertical distance traveled during a fall, measured from the onset of a fall from a walking working surface to the point at which the fall protection system begins to arrest the fall.

Frontal D-Ring Attachment. An attachment element affixed to the full body harness within the vertical seven-inch sternum (breastbone) area that is designed to withstand dynamic fall arrest, restraint and post-fall suspension forces.

Full Body Harness. See “Harness, Full body”.

Gate. The element of a connector that opens to receive an object and closes when released to retain the object.

Guardrail System. A passive system of horizontal rails and vertical posts that prevent a person from reaching a fall edge.

Hardware. A rigid component or element that is used to couple parts of the system together.

Harness, Chest. A component comprised of chest and shoulder straps with means for fastening it about the torso and for attaching it to other components or subsystems.

Harness, Chest-Waist. A body support consisting of separate chest and waist components that can be combined to form a full body harness. Chest-waist harnesses are excluded from these standards for purposes of fall arrest.

Harness, Evacuation. A body support designed and constructed so the rescue subject is securely held and suspended during the rescue process.

Harness, Full Body. A body support designed to contain the torso and distribute the fall arrest forces over at least the upper thighs, pelvis, chest and shoulders.

Harness, Positioning. A body support that encircles and closes around the waist and legs with attachment elements appropriate for positioning.

Hazard Elimination. Changing the task, process, controls or other means so as to remove the need for an authorized person to be exposed to a fall hazard.

Horizontal Lifeline. A component of a horizontal lifeline subsystem, consisting of a flexible line with connectors or other coupling means at both ends for securing it horizontally between two anchorages or anchorage connectors.

Horizontal Lifeline Sub-system. An assembly, including the necessary connectors, comprised of a horizontal lifeline component and, optionally, of: a) An energy absorber component or, b) A lifeline tensioner component, or both. This subsystem is normally attached at each end to an anchorage or anchorage connector and may also contain one or more intermediate anchorages. The end anchorages have the same elevation.

Horizontal Track System. A form of rigid rail system that typically encloses a trolley inside a formed channel or track.

Hybrid Component. An integral assembly of elements or components, or both, intended to perform more than one function in the system.

Initial Sag. The initial mid-span deflection of an HLL due to static equilibrium between gravitational forces and pretension.

Inspection. An examination of equipment or systems to assess conformance to particular standard.

Instructions, Manufacturer. Printed informational documents supplied with equipment.

Integral. Not removable from the component, subsystem or system without destroying or mutilating any element or without use of a special tool.

Lanyard. A component consisting of a flexible rope, wire rope or strap, which typically has a connector at each end for connecting to the body support and to a fall arrester, energy absorber, anchorage connector or anchorage.

Lanyard Connecting Sub-system. An assembly, including the necessary connectors, comprised of a lanyard only, or a lanyard and energy absorber.

Lifeline. A component of a fall protection system consisting of a flexible line designed to hang either vertically (vertical lifeline), or for connection to anchorages or anchorage connectors at both ends to span horizontally (horizontal lifeline).

Lifeline Sub-system. An assembly, including the necessary connectors, comprised of at least a lifeline, and which may also have means for pre-tensioning the lifeline or for energy absorption, or both.

Lifeline Tensioner. A device, such as a turnbuckle, to tauten a horizontal lifeline or a weight to tension a vertical lifeline.

Maintenance. A process for keeping the product, component or system usable and safe from degradation.

Manual Descent Control Device. A load lowering device or mechanism that, once engaged, requires manual attention to control pay-out speed of line or descent speed under load.

Manual Fall Arrester. A fall arrester that will remain locked where it has been positioned on a VLL until deliberately repositioned by a worker.

Manual Rope grab. See “Manual Fall Arrester”.

Manufacturer. Any producer of fall protection equipment with written product labels and instructions meeting the requirements of these standards.

Marking. Any sign, label, stencil, plate or the like containing information or guidance.

Maximum Anchorage System Deflection (MASD). The dynamic displacement of the anchorage system to the position at fall arrest after all slack has been removed.

Maximum Arrest Force. The peak force measured by the test instrumentation during arrest of the test weight in the dynamic tests set forth in these standards.

Maximum Arrest Load (MAL). The peak force applied to an anchorage by an active fall protection system when arresting a fall.

Maximum Sag. The peak sag of an HLL at the instant of fall arrest.

Model. A specific type or design of a product.

Non-Certifed Fall Arrest Anchorage. A fall arrest anchorage that a competent person can judge to be capable of supporting the predetermined anchorage forces as prescribed in these standards.

O-Ring. A circular shaped ring.

Oval Ring. An oval shaped ring.

Passive Fall Protection System. Fall protection that does not require the wearing or use of personal fall protection equipment.

Personal Energy Absorber. See “Energy Absorber”.

Personal Fall Arrest System (PFAS). An assembly of components and subsystems used to arrest a person in a free fall.

Plan. An orderly arrangement of parts of an overall design or objective. A systematic arrangement of elements or important parts.

Positioning. The act of supporting the body with a positioning system for the purpose of working with hands free.

Positioning Lanyard. A lanyard used to transfer forces from a body support to an anchorage or anchorage connector in a positioning system.

Positioning Line. A vertical, horizontal or angled rope or wire rope used to transfer forces from a body support to an anchorage or anchorage connector in a positioning system.

Positioning System. A full body harness system or a body belt incorporated into a full body harness or work positioning harness configured to allow an authorized person to be supported on an elevated vertical or inclined surface, such as a wall, and work with both hands free from body support.

Pretension. The initial force (tension) in an HLL cable immediately before a fall occurs. Pretension of the HLL balances the weight of the cable, holding it to its initial sag.

Primary System. In fall protection terminology, the main mechanism that allows a worker to maintain their desired position.

Procedure. A series of logical steps by which all repetitive action is initiated, performed, controlled and finalized. A procedure establishes the specific step-by-step action that is required; who is required to act; and when the action is to take place.

Product. A component, subsystem or system inclusive of all packaging, markings and instructions at the point of sale by the manufacturer.

Professional Engineer. A person who holds an engineering registration in the state or other jurisdiction in which they are applying these standards.

Program. An organized, directed effort that uses specified resources to achieve desired objectives. A broad framework of goals to be achieved, serving as a basis to define and plan more specific requirements for meeting those goals.

Program Administrator. A person authorized by their employer to be responsible for managing the employer's fall protection program.

Proof Load Testing. A type of verification testing performed on equipment or elements thereof by applying to the specimen a static load of a specified amount below the design breaking strength of the specimen.

Proof Test. A test to prove the structural integrity of a component or system.

Qualified Person. A person with a recognized degree or professional certificate and with extensive knowledge, training and experience in the fall protection and rescue field who is capable of designing, analyzing, evaluating and specifying fall protection and rescue systems to the extent required by these standards.

Qualified Person Trainer. A qualified person who meets the requirements of these standards and who is also qualified to provide fall protection training.

Rated Working Load. The manufacturer's specified maximum and minimum loads for which the component is designed to be used.

Required Clearance Below the Anchorage. The minimum distance between the anchorage of a fall arrest system and the highest lower level a worker might encounter during a fall.

Required Clearance Below the Platform. The minimum distance between the working platform and the highest lower level a worker might encounter during a fall.

Rescue. The process of removing a person from danger, harm or confinement to a safe location.

Rescue Plan. A written process that describes in a general manner how rescue is to be approached under the specified parameters, such as location or circumstances.

Rescue Procedure. A written series of logical steps that describes the specific manner in which rescue is to be accomplished.

Rescue Subject. The person being rescued or in need of rescue.

Rescue System. An assembly of components and subsystems used for rescue.

Rescue System, One Person. A rescue system intended to bear only the weight of a single person at one time.

Rescue System, Two Person. A rescue system intended to bear the weight of up to two persons simultaneously.

Rescuer. Person or persons other than the rescue subject acting to perform an assisted rescue by operation of a rescue system.

Restraint. The technique of securing an authorized person to an anchorage using a lanyard short enough to prevent the person's center of gravity from reaching the fall hazard.

Rigging. The process of building a system to move or stabilize a load or the system itself.

Rigid Anchorage Sub-system. An anchorage system, such as a rigid rail system or a single point of attachment that does not appreciably deflect, deform or stretch when a fall arrest impact occurs. For the purposes of these standards, a rigid anchorage subsystem is one where the deflection or stretch is not more than 4 inches (100mm) when the peak impact force from the worst-case fall protection loading is applied to the subsystem.

Rigid Rail System. A fall protection system that uses one or more trolleys on a horizontal track (often an I-beam or slotted tube).

Ring. A generally hoop-shaped connector (hardware) element or component.

Rollout. A process by which a snaphook or carabiner unintentionally disengages from another connector or object to which it is coupled.

Rope Access. A technique using safety ropes, normally incorporating two separately secured systems, one as a means of access and the other as a secondary system, used with a harness in combination with other devices, for access to and from as well as suspension at the place of work.

Rope (or Strap) Adjuster. A mechanical means of readily moving a vertical line attachment or changing the position of an intermediate anchorage device between an anchorage (connector) and a body support while loaded with the authorized person's weight or partial weight while leaning.

Rope grab. See "Fall Arrestor".

Rope, Synthetic. A construction of bundled man-made yarns, fibers or filaments forming a strong flexible line.

Rope, Wire. A plurality of drawn wires forming strands laid helically over an axis or core.

Routine. Of a commonplace or repetitious character or of, relating to or being in accordance with established procedure.

Safety Margin. A clearance factor of safety defined as the distance between the lowest extremity of the worker's body at fall arrest and the highest obstruction the worker might otherwise make contact with during a fall.

Safety Net System. A horizontal or semi-horizontal, cantilever-style barrier that uses netting system to stop falling workers before they make contact with a lower level or obstruction.

Secondary Fall Protection System. One or more means of fall protection, as defined by these standards, configured as a supplement or as backup to protect a worker from a potential fall if the primary system fails.

Self-Retracting Device (SRD). A device that contains a drum wound line that automatically locks at the onset of a fall to arrest the user, but that pays out from and automatically retracts onto the drum during normal movement of the person to whom the line is attached. After onset of a fall, the device automatically locks the drum and arrests the fall. Self-retracting devices include self-retracting lanyards (SRL's), self-retracting lanyards with integral rescue capability (SRL-R's), and self-retracting lanyards with leading edge capability (SRL-LE's) and, hybrid combinations of these.

2.159 Self-Retracting Lanyard (SRL). A self-retracting device suitable for applications where during use the device is mounted or anchored such that possible free fall is limited to 2 feet (.6m) or less.

Self-Retracting Lanyard Connecting Sub-system (SRLCSS). An assembly, including the necessary connectors, comprised of a self-retracting lanyard or a self-retracting lanyard/energy absorber combination.

Self-Retracting Lanyard With Integral Rescue Capability (SRL-R). An SRL that includes an integral means for assisted rescue via raising or lowering the rescue subject.

Self-Retracting Lanyard With Leading Edge Capability (SRL-LE). A self-retracting device suitable for applications where during use the device is not necessarily mounted or anchored overhead. The device may be at foot level and where the possible free fall is up to 5 feet (1.5m) that includes integral means to withstand impact loading of the line constituent with a sharp or abrasive edge during fall arrest and for controlling fall arrest forces on the user.

Sequential Fall. A multiple-worker fall where the impacts from each worker occur at different times in a cascading manner.

Shall. The word shall is to be understood as denoting a mandatory requirement.

Shock Absorber. See definition of "Energy Absorber".

Should. The word should denotes a recommendation.

Simultaneous Fall. A multiple-worker fall where the impacts from each worker occur at the same instant.

Snap Hook. A connector comprised of a hook-shaped body with a normally closed gate or similar arrangement that may be opened to permit the hook to receive an object and, when released, automatically closes to retain the object.

Span. The portion of the system between any pair of adjacent supports on fall protection systems such as rigid rails and HLLs.

Splice. A means of terminating a rope or wire rope by an appropriate tucking of the strand ends into the rope.

Stable Surface. A walking working surface that has the strength and structural integrity to support an authorized person(s).

Static Analysis. A method to predict the performance of an active fall protection system based on applying static loadings specified by these standards.

Stitch Pattern. The particular configuration of threads used to form terminations or joints of webbing.

Strap. A length of webbing that may be incorporated in a harness, lanyard or other component or subsystem.

Strap, Chest. A harness strap passing generally horizontally across the chest or around the body at chest level with adjustable means for fastening.

Strap, Shoulder. A harness strap that passes from the waist, up the chest, over the shoulder and down the back to the waist. It is connected to the waist strap or thigh straps or sub-pelvic strap or combinations thereof.

Strap, Shoulder Retainer. A means of connecting the harness shoulder straps for the purpose of retaining them on the shoulders.

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

Strap, Thigh. A full body harness strap with adjustable means for fastening it about the thigh.

Strap, Waist. A harness strap passing around the body at the waist with adjustable fastening means.

Stretch Out. The change in distance between the worker's D-Ring and toes during a fall arrest.

Sub-system. A multi-function assembly comprised of either: a) independent components, including the necessary connectors, interconnected by the user; or b) integrally interconnected components (also referred to as hybrid components or integral subsystems).

Sub-system Assembly. An assembly of components used as part of a system.

Supporting Sub-system. An integral assembly of a body support component with another component or connecting subsystem.

Suspended Equipment. Machines, platforms or other equipment suspended by support lines.

Suspension. The act of supporting 100% of a user's body weight, including equipment, for the purpose of accessing a work location with one or two points of contact.

Suspension Seat. An arrangement of straps in a harness used to provide a body support and permit leaning or sitting while working.

Swaged Fitting. A mechanically pressed sleeve at the termination of a rope or wire rope used to form a loop or terminate a line.

Swing-Drop Distance. The vertical drop in height experienced by the worker using a fall arrest system from the onset of the swinging motion to the point where the user can initially make contact with a structure.

Swing Fall. A pendulum-like motion that occurs during and/or after a vertical fall. A swing fall results when an authorized person begins a fall from a position that is located horizontally away from a fixed anchorage.

Swing Fall Distance. The vertical drop in height experienced by the worker using a fall arrest system from the onset of the swinging motion to the lowest point reached during the swing.

Synthetic Rope Tackle Block. A load lifting and/or lowering device that does not include a winding or traction drum, but uses pulleys to achieve a mechanical lifting advantage.

System. See definition of "Personal Fall Arrest System (PFAS)".

Testing. The controlled application of test conditions to a product (system, subsystem, component or element) and the recording of observed effects. When the terms "testing" or "tests" are used in these standards, those terms shall denote qualification testing or

qualification test(s), not developmental or verification testing or test(s), unless otherwise specified.

Testing, Developmental. The controlled application of test conditions to a pre-production prototype of a product in the developmental stage, and the recording of observed effects, for the purpose of determining and evaluating the developmental product's performance and design characteristics.

Testing and Interpolation Analysis. A method for determining the performance of an active fall protection system through direct testing of the system and mathematical interpolation of test results for similar systems.

Testing, Qualification. The controlled application of test conditions to a product specimen randomly selected from the initial production lot, and the recording of observed effects, for the purpose of determining the product's compliance with the requirements of these standards. When the terms "testing" or "tests" are used in the Z359 standards, those terms shall denote qualification testing or qualification test(s), not developmental or verification testing or test(s) unless otherwise specified.

Testing, verification. The controlled application of test conditions to a product specimen sampled from ongoing production lots (after qualification testing), and the recording of observed effects, for the purpose of conforming the product's continuing compliance with the requirements of these standards. Proof load testing is a type of verification testing.

Thimble. A grooved metal or plastic piece about which a rope is bent and spliced or swaged to the main body of the rope to form an eye.

Thread. A group of synthetic filaments twisted together to form a strong strand.

Total Fall Distance (TFD). The total vertical distance a person falls, measured from the onset of a fall to the point where the person comes to rest after the fall is stopped.

Travel Restraint Lanyard. A lanyard used to transfer forces from a body support to an anchorage or anchorage connector in a travel restraint system.

Travel Restraint Line. A rope, or wire rope, used to transfer forces from a body support to an anchorage or anchorage connector in a travel restraint system.

Travel Restraint System. A combination of anchorage, anchorage connector, lanyard (or other means of connection) and body support that limits travel in such a manner that the user is not exposed to a fall hazard.

Trolley. A mobile anchorage device that travels along a track (horizontal track system), structural beam (rigid rail system), or cable (HLL system).

User. A person who performs activities at heights while protected by a personal fall protection system.

Variance. A change in, or effect to, a characteristic, function, design or element of a product that is different from the original.

Vertical Lifeline. A component, element or constituent of a lifeline subsystem consisting of a vertically suspended □exible line and along which a fall arrester travels.

Vertical Lifeline Sub-system. An assembly, including the necessary connectors, comprised of a vertical lifeline component and, optionally, an energy absorber and a lifeline tensioner component.

Webbing. A narrow woven fabric with selvedge edges and continuous □lament yarns made from light and heat resistant fibers.

Winch/Hoist. A load lifting and/or lowering device that incorporates a traction drum and a means for controlling pay-out and take-up of the line from the drum. Device relies on reduction gearing and/or lever principles to achieve a mechanical lifting advantage.

Wire. A single, continuous length of metal with a circular cross-section that is cold-drawn from rod.

Wire Rope. See “Rope, Wire”.

Work Positioning. See “Positioning”.

Work Positioning System. See: “Positioning System”.

Work Restraint System. See “Travel Restraint System”.

Working Line. A flexible line used for positioning or travel restraint.