



**Northern Illinois
University**

Fall Protection Program

Environmental Health and Safety Department

1/6/2020

Review and Updates

Date	Reviewed by	Changes Made
2/25/16	Mary Schlager	'Removal from service' clarified.
4/17/17	Mary Schlager	Annual update
5/9/18	Mary Schlager	Annual update, incorporating Walking-Working Surface rule.
5/10/19	Mary Schlager	Annual update Added Lifelines on Campus
9/25/19	Mary Schlager	Added Instructions for Specific Locations
1/6/2020	Mary Schlager	Multiple updates throughout Program

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Purpose

The purpose of the Fall Protection Program (Program) is to establish safe practices and procedures to protect authorized workers from fall hazards.

Applicable Policies and Regulations

This Program is designed to comply with applicable NIU policies and Occupational Safety and Health Administration (OSHA) regulations as codified by the Illinois OSHA. These include:

Policies

- NIU Health and Safety Policy
- NIU Facilities Management and Campus Services Safety Policy

Codes and Regulations

- 56 IL Admin Code Part 350 Health and Safety Code
- 29 CFR 1910 Subpart D Walking and Working Surfaces
- 29 CFR 1910.140 Personal Fall Protection Systems
- 29 CFR 1926 Subpart M Fall Protection
- ANSI A10.32-2004 Fall Protection Systems for Construction and Demolition Operation
- ANSI Z359 Fall Protection Code

Scope

The scope of the Program includes authorized workers performing work activities at elevations in which there is potential exposure to fall hazards at four (4) feet or higher.

Please note the scope of this Program excludes fall hazards associated with scaffolding, ladders, mobile elevated work platforms and retrieval procedures associated with confined space entry. Please reference other EH&S programs for safe practices and procedures associated with these types of fall hazards.

Responsibilities

Environmental Health and Safety Department (EH&S)

- Develop and maintain this Program as needed to ensure compliance with current regulatory requirements.
- Schedule, coordinate and provide training as needed.
- Provide guidance for the proper selection and use of appropriate fall protection equipment.
- Provide technical support and consultation.

- Monitor compliance and program effectiveness by using the following criteria to evaluate performance:
 - Periodic worksite inspections
 - Department audits to review training records and fall protection and rescue plans
 - Accident/near miss reports
 - Staff feedback
- Schedule and coordinate a third-party competent person to perform annual inspections of fall protection systems.
- Maintain annual inspection reports and the inventory of fall protection systems on NIU property.
- Work with project management staff to review the scope and design specifications of fall protection systems scheduled for installation as part of capital projects.

Facilities Management and Campus Services (FMCS)

- Pursue opportunities to identify fall hazards and ensure that engineered fall protection systems are incorporated into the capital project scope and associated budget to mitigate such hazards.
- Collaborate with qualified personnel to ensure that engineering fall protection systems are designed and installed in accordance where applicable codes.
- Ensure guardrails and/or protective screens capable of supporting at least 200 pounds are installed to protect skylight openings. Skylights constructed at least 42 inches above the roof deck with sides capable of supporting 200 pounds do not require additional protection.
- Monitor the worksite to ensure authorized workers are properly and safely using fall protection.
- Communicate program requirements during pre-construction meetings and job-site visits as needed.

Competent Person

- Work with other stakeholders to evaluate site conditions for evidence of fall hazards and develop fall protection and rescue plans to prevent exposure to such hazards.
- Provide technical assistance and assist with training opportunities where needed.
- Stop site operations and work with site personnel to mitigate identified fall hazards.
- Conduct incident investigations in response to a fall event.

Supervisors and Foremen

- Continuously monitor the work to ensure fall protection is being used properly and safely.
- Contact EH&S for assistance with training and technical support.
- Ensure staff receive proper training.

- Maintain training records, fall protection plans and rescue plans.
- Provide necessary fall protection equipment and ensure authorized workers are competent in understanding how to safely use and operate.
- Implement appropriate disciplinary action whenever an authorized worker fails to follow safety precautions outlined in this Program.
- Work with competent person(s) to develop fall protection and associated rescue plans prior to performing work. Communicate such plans to authorized workers prior to performing the work.

Authorized Workers

Authorized workers include workers from FMCS and/or contractor workers who are required to access restricted areas of campus (i.e. rooftops, steam tunnels, utility vaults, etc.) to perform project or maintenance operations. Performing such work may exposure workers to various types of fall hazards. Authorized workers are required to:

- Follow safe practices and procedures as outlined in this Program.
- Inspect all fall protection equipment prior to use, and immediately report any defects or concerns to the supervisor or project manager.
- Use fall protection systems according to training and manufacturer instructions.
- Never attempt to alter or repair any fall protection equipment.

Definitions

Aerial Lift Device: Equipment such as powered platforms, vehicle-mounted elevated and rotating work platforms, extensible boom platforms, aerial ladders, articulating boom platforms, vertical towers, and powered industrial truck platforms.

Anchor Points: A secure point of attachment for lifelines, lanyards, or deceleration devices. An anchor point must be capable of supporting at least 5000 pounds (3600 pounds if engineered/certified by a qualified person) per person and must be independent of any anchorage being used to support or suspend platforms.

Authorized Person/Worker: A person approved or assigned by the employer to perform a specific type of duty or duties or to be at a specific location or job site (i.e., building maintenance, roof repair, etc.).

Competent Person: Worker capable of identifying existing and potential hazards in the work environment and can implement corrective actions to abate identified hazards. Competent persons are also required to develop fall protection and rescue plans to prevent exposure to fall hazards and/or ensure authorized workers can be safely rescued from a fall.

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

Designated Area: A distinct portion of a walking-working surface delineated by a warning line in which employees may perform work without additional fall protection.

Fixed Ladder: A ladder (including an individual rung ladder), which is permanently attached to a structure, building, or equipment.

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

Full Body Harness: An interconnected set of straps that may be secured about a person in a manner that distributes the fall arrest forces over at least the thighs, pelvis, waist, chest, and shoulders with a means for attaching the harness to other components of a person fall arrest system.

Guardrail System: A barrier at least 42 inches high erected to prevent personnel from falling from working levels more than 30 inches above the floor, ground, or other working areas of a building.

Hole: A gap or void 2 inches or more in its least dimension, in a floor, roof, or other walking/working surface.

Ladder safety system: A system designed to eliminate or reduce the possibility of falling from a ladder. A ladder safety system usually consists of a carrier, safety sleeve, lanyard, connectors, and body harness. Cages and wells are not ladder safety systems.

Lanyard: A flexible line of rope, wire rope or strap, which generally has a connector at each end for connecting the body harness to a deceleration device, lifeline, or anchorage.

Leading Edge Work: the edge of a floor, roof, or formwork for a floor or other walking/working surface (such as a deck) which changes location as additional floor, roof, decking, or formwork sections are placed, formed, or constructed.

Life Lines: A component consisting of a flexible line for connection to an anchorage at one end to hang vertically (vertical lifeline), or for connection to anchorages at both ends to stretch horizontally (horizontal lifeline), and which serves as a means for connecting other components of a personal fall arrest system to the anchorage.

Low Slope Roof: A roof having a slope less than or equal to 4 in 12 (vertical to horizontal). A roof with approximately a 19.5-degree slope or less.

Lower Levels: Those areas or surfaces to which an employee can fall. Such areas or surfaces include, but are not limited to, ground levels, floors, platforms, ramps, runways, excavations, pits, tanks, material, water, equipment, structures, or portions thereof.

Mechanical Equipment: All motor or human propelled wheeled equipment used for roofing work, except wheelbarrows and mop carts.

Opening: A gap or void (30 inches or more in height and 18 inches or more in width) that is in a wall or partition through which person can fall to a lower level.

Personal Fall Arrest System: A system used to arrest an employee in a fall from a working level. It consists of an anchorage, connectors, a body belt or body harness and may include a lanyard, deceleration device, lifeline, or suitable combinations of these. As of January 1, 1998, the use of a body belt for fall arrest is prohibited. Fall arrest systems are engineered to be compatible between the permanent system and the personal protective equipment. Interchanging the components is not permitted.

Personal Fall Restraint: Fall protection system, which prevents an employee from approaching a fall hazard using a lanyard and body harness.

Positioning device system: A body harness system rigged to allow an employee to be supported on an elevated vertical surface, such as a wall, and work with both hands free while leaning.

Qualified Person: A person with a recognized degree or professional certificate AND with extensive knowledge and training in the fall protection and rescue field who is capable of designing, evaluating and specifying fall protection and rescue systems.

Roof: The exterior surface on the top of a building. This does not include floors or formwork which, because a building has not been completed, temporarily becomes the top surface of a building.

Scaffold: Any temporary elevated or suspended platform, and its supporting structures, used for supporting employees or materials or both.

Snap-Hooks: A connector consisting of a hood-shaped member with a normally closed keeper, or similar arrangement, which may be opened to permit the hook to receive and object and, when released automatically closes to retain the object.

Self-retracting lifeline/lanyard: A deceleration device containing a drum-wound line which can be slowly extracted from, or retracted onto, the drum under minimal tension during normal movement and which, after onset of a fall, automatically locks the drum and arrests the fall (usually within two feet or less).

Toe board: A low protective barrier that prevents material and equipment from falling to lower levels and which protects personnel from falling.

Tie-Off: A procedure of connecting directly or indirectly to an anchorage point.

Unprotected sides and edges: Any side or edge (except at entrances to points of access) of a walking/working surface, e.g., floor, roof, ramp, or runway where there is no wall or guardrail system at least 42 inches high.

Warning Line System: A barrier erected on a roof to warn employees that they are approaching an unprotected roof side or edge, and which designates an area in which roofing work may take place without the use of guardrail, or body belt, systems to protect employees in the area.

Working Surfaces: Any surface, whether horizontal or vertical, on which an employee walks or works including, but not limited to, floors, roofs, ramps, bridges, and runways.

General Requirements

- Fall protection is required wherever the potential to fall 4 feet or more exists. Authorized workers who are exposed to a fall hazard as defined by this Program shall follow requirements herein. Inquiries regarding a specific fall protection situation, please consult your immediate supervisor or the EH&S Department.
- Authorized workers should evaluate each project/task to determine the risk exposure to fall hazards and follow practices/procedures described herein. This should include working with the competent person to develop and implement a fall protection and rescue plan prior to performing assigned work. (Refer to the sample plan in the appendix.) Workers involved in a fall arrest or fall will be immediately sent for a medical evaluation to determine the extent of injuries, if any.

- Engineering controls or other alternative work methods should be used whenever possible to eliminate the need for fall protection. This could include, but not be limited to: redesign or automation of job, perform task at lower heights, use tool extensions to enable work at ground level, or use permanent access platforms that provide built-in fall protection.
- Design and installation of fall arrest equipment must be reviewed by the EH&S Department.
- Body belts are not considered a means of fall arrest protection and are prohibited from use.
- All components of a personal fall arrest system; i.e. harnesses, lanyards, anchorage, lifelines, and connectors must have a minimum breaking strength of 5000 pounds.
- All fall protection equipment must be designed and used in accordance with this Program and all applicable manufacturer and regulatory requirements.
- All fall protection equipment shall meet or exceed American National Standards Institute (ANSI) standards.
- An appropriate type of fall protection system shall be selected based upon the project scope of work and/or fall protection plan.

Floor and Wall Openings

All floor and wall openings that present a fall hazard shall be mitigated using one or more of the following:

- Safely covered or blocked from access.
- Covers shall be sound, solid, highly visible, and not easily opened.
- Floor surfaces surrounding the opening shall be clear of clutter or slippery material.
- Wall openings from which there is a drop of more than 4 feet shall be guarded by a rail, picket fence, half door or equivalent.
- Barriers that are designed to prevent falling into the opening shall be visually noticeable, strong enough to hold the weight of multiple workers and shall not, in themselves, have additional openings that create fall hazards.
- Guardrail systems must be capable of withstanding at least 200 pounds of force applied within 2 inches of the top edge, in any direction and at any point along the edge, and without causing the top edge of the guardrail to deflect downward to a height less than 39 inches above the walking/working level.

Protection from Falling Objects

When elevated work is taking place and there is the potential for falling objects to create a hazard to persons on lower levels, precaution must be taken to ensure injuries do not occur.

Where the work site is restricted to authorized workers and the public is not allowed

access, and the workers are exposed to falling object hazards one of the following precautions should be implemented.

- Employees shall wear a hard hat at all times;
- Toe boards, screens or guardrail systems shall be placed on the elevated work surface to prevent objects from falling;
- A canopy structure shall be erected to keep potential fall objects far enough from the edge or the elevated work surface so as not to create a fall hazard;
- The area to which objects can fall is barricaded and access to the area is prohibited any time work is being done on an elevated work surface.

When the elevated work area creates a potential fall hazard where the public may be exposed to falling objects one of the following precautions should be implemented.

- Redirect public traffic through a barrier system to ensure they do not enter areas where falling objects exist;
- Erect a structure capable of withstanding impact from a fallen object under which the public may travel.

Loading Docks

Loading docks and other open sided floors greater than 4 feet above ground level must be protected. The approved method of protection is the installation of a guardrail as described in this section. The guardrail may have removable sections to provide access for loading but rails must remain in place when access is not required. Loading docks with a leading edge of less than 4 feet above ground should be protected by a physical or visual barrier to prevent falls. Dock doors shall remain closed when not in use to minimize the fall hazard and all personnel working around loading docks shall be trained to recognize and avoid fall hazards.

Skylights

Skylights also represent a fall hazard. A standard guardrail or skylight screens capable of supporting at least 200 pounds must be provided around the opening to prevent workers from falling through to the surface below. Skylights constructed at least 42 inches above the roof deck with sides capable of supporting 200 pounds do not require additional protection.

Unprotected Sides and Edges

- Employees on a work surface with an unprotected side or edge which is 4 feet (1.8 meters) or more above a lower level shall be protected from falling using a guardrail system, warning line system (and safety monitor) or personal fall arrest system.
- If one of these systems is not available or is infeasible during leading edge work, a fall protection plan must be developed and implemented to protect workers from fall hazards.
- Hoist areas shall be protected by guardrail or personal fall arrest systems. If guardrail systems or portions of guardrail systems are removed to facilitate the hoisting process creating a potential fall hazard for the employee, that employee must be protected by a personal fall arrest system.

Excavations

- Employees working at the edge of an excavation 4 feet or more in depth shall be protected from falling by guardrail systems, fences or barricades. This includes trenches, wells, pits, shafts or other similar excavations.
- Excavations where the public may be exposed shall be addressed as required by NIU Campus Standards to prevent potential fall hazards.

Rooftop Work

Rooftop work is common and therefore, operations should adhere to the following requirements to ensure conformity to OSHA regulations:

- If the building is equipped with parapet walls, guardrails, or other barriers that extend at least 42” above the roof and provide a protective barrier between the worker and fall hazards, then the fall hazard has been eliminated and no further action or equipment is needed.
- If the building is not equipped with features that protect workers from falls from the roof, the following fall protection features must be in place to ensure worker safety:
 - Develop a fall protection plan prior to each roof entry that includes a description of the work to be completed, the path from the roof access point to the work area, and the protective devices to be used.
 - Limit access to the roof to only trained authorized workers who are capable of recognizing, evaluating and controlling fall hazards.
 - Implement any one of the following fall protection options:
 - Portable guardrails
 - Fall restraint/prevention systems or
 - Personal fall arrest systems

Roof hatches when left open, constitute a fall hazard. Therefore, roof hatches must be kept closed while the work is underway unless the hatch opening is protected by guardrails.

All new construction or renovation operations shall incorporate engineered fall protection systems into the project design and installation. This may include guardrail (including parapets), personal fall arrest or fall restraint systems. Fall protection design shall be approved by a qualified person who is typically a licensed professional engineer or architect.

Types of Fall Protection Systems

Guardrail Systems

Guardrail systems provide a barrier to prevent employees from falling to lower levels, and designate an area in which work may take place without the use of additional fall protection.

- Where guardrail systems are in place as a fall protection measure, the railing shall have a vertical height of 42 inches (+/-3 inches) measured from the upper surface of the top rail to the working surface and consist of a top rail, intermediate rail, and posts.

- The intermediate rail shall be approximately halfway between the top rail and the working surface.
- Guardrail systems must be capable of withstanding, without failure, a force of at least 200 pounds in any direction.
- When 200 pounds of force is applied in a downward direction, the top edge of the guardrail shall not deflect to a height less than 39 inches above the working surface.
- Stair railings shall be not more than 34 inches or less than 30 inches from the upper surface of the top rail to the forward edge of the tread surface.
- A standard toe-board shall be provided where persons can pass under the work surface; there is moving machinery; and/or equipment utilized on the elevated surface with which falling equipment creates a hazard. Toe-boards shall be 4 inches nominal in vertical height and securely fastened in place with not more than ¼ inch clearance above the working surface. Where material is stored near the guardrail system, at heights exceeding the toe-board, paneling from the work surface to the intermediate rail shall be provided.
- Engineered guardrail systems may be utilized provided they meet these requirements and are installed as per the manufacturer’s specifications.
- Portable guardrail systems may be utilized as a fall protection measures provided they meet the OSHA and ANSI guardrail specification requirements.

Table 1: Guardrail System Specifications

Material of construction	Post requirements	Top rail requirements	Intermediate rail requirements	Additional requirements
Wood	2-inch by 4-inch stock spaced 6 feet apart	2-inch by 4-inch stock	2-inch by 4-inch stock	If top rail is two right angle pieces of 1"x4", posts may be spaced 8 feet on center.
Pipe	1 ½ inches nominal diameter spaced not more than 8 feet on center	1 ½ inches nominal	1 ½ inches nominal	
Structural Steel	2"x2"x3/8" angles spaced not more than 8 feet on center	2"x2"x3/8" angles	2"x2"x3/8" angles	
Other	Provide strength to top rail to support 200 pounds applied in any direction	Smooth surface at a height 42-inches above the work surface, capable of withstanding 200 pounds top rail pressure	Protection between top rail and floor equivalent to that afforded by standard intermediate rails	

Fall Restraint/Prevention Systems

Where workers must work at an elevated working surface while exposed to fall hazards and a guardrail system isn't feasible, a fall restraint/prevention system is the first option considered to protect employees (Refer to Figure 1). A fall restraint is arranged to prevent the worker from reaching the edge where a fall is possible. Fall restraint/prevention systems require:

- A competent person to assess the work area to ensure that a fall restraint/prevention system is feasible and to assist the worker in designating a suitable anchor point and system components.
- The connecting lanyard must be adjusted to a length that will not allow the worker to reach the edge where a free fall is possible.
- A full-body harness must be used in a fall restraint/prevention system.
- An anchor system that is rated to at least 3000lbs for standard restraint system.
- Direct supervision of workers using fall restraint/prevention systems is critical to ensure that lanyards and lifelines are adjusted properly.

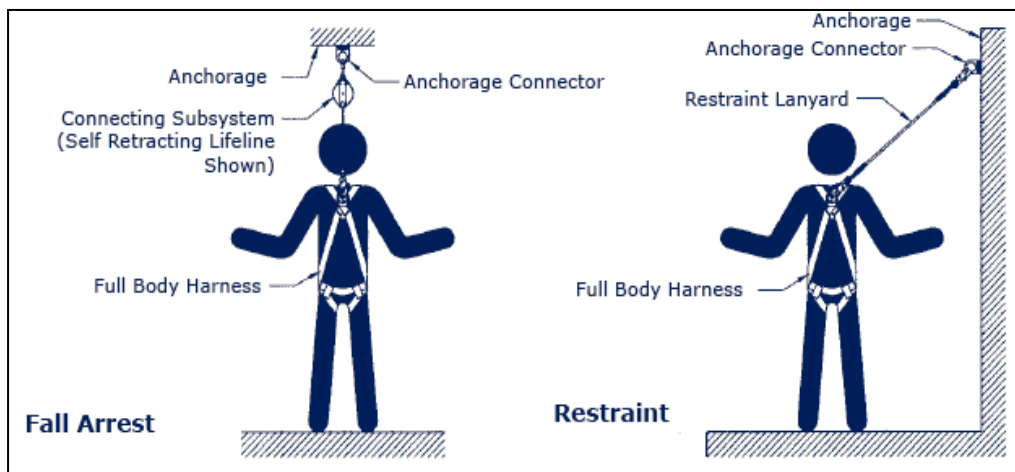


Figure 1 - Personal Fall Arrest System vs. Fall Restraint/Prevention System

Personal Fall Arrest Systems (PFAS)

Where workers must work at an elevated working surface, exposed to fall hazards, where a free fall is possible, and a fall restraint/prevention system is not feasible (Refer to Figure 2):

- A full-body harness, approved connecting lanyard, and suitable anchor point must be used.
- All PFAS components shall be compatible with each other.
- All PFAS equipment shall meet applicable ANSI standards.
- All PFAS equipment shall be used as per the manufacturer specifications.
- Workers utilizing PFASs shall not work alone.
- The fall distance shall be calculated for each work area. (See Figure 4).
- The equipment shall be rigged to prevent a falling worker to free fall more than 6' or strike a lower level. Fall restraint, that won't allow a free fall, is always preferable.
- Snap hooks shall not allow pressure to be applied to the gate in the opening direction.
- Snap hooks shall be sized to be compatible with the member to which they are connected to prevent unintentional disengagement of the snap hook. Only a locking type snap hook

designed and used to prevent disengagement of the snap hook by the contact of the snap hook keeper by the connected member shall be used.

- Horizontal lifelines shall be designed, installed, and used, under the supervision of a qualified person, as part of a complete PFAS, which maintains a safety factor of at least two.
- Lanyards and vertical lifelines shall have a minimum breaking strength of 5,000 pounds. Where vertical lifelines are used, each employee shall be attached to a separate lifeline.
- Lifelines shall be protected against being cut or abraded.
- Self-retracting lifelines and lanyards which automatically limit free fall distance to 2 feet or less shall be capable of sustaining a minimum tensile load of 3,000 pounds applied to the device with the lifeline or lanyard in the fully extended position.
- Anchorages used for attachments shall be independent of any anchorage being used to support or suspend platforms and capable of supporting at least 5,000 pounds per employee attached, or shall be designed, installed, and used as part of a complete PFAS which maintains a safety factor of at least two and under the supervision of a qualified person.
- Systems used by a worker having a combined person and tool weight in excess of 310 pounds shall be modified to provide proper protection for such heavier loads.
- The attachment point of the connecting lanyard to the full-body harness shall be located in the center of the wearer's back near shoulder level, or above the wearer's head, except when climbing.
- Equipment shall be utilized for worker protection and should not be used for any other purpose (i.e. hoisting slings, tow ropes, etc.)
- Systems and components subjected to impact loading shall be immediately removed from service and shall not be used again for worker protection until inspected and determined by a third party competent person to be undamaged and suitable for reuse.
- Systems and components shall be inspected prior to each use for wear, damage and other deterioration, and defective components shall be removed from service.
- When a PFAS is used at hoist areas, it shall be rigged to allow the movement of the employee only as far as the edge of the walking/working surface.
- Life lines used as a component of a PFAS shall be designed and installed under the supervision of a qualified person.
- Life lines or other components of a PFAS should not be attached to guardrail systems, ladders, scaffolding components, building fixtures, conduit or plumbing, other lanyards, roof stacks/vents/pipes or other unauthorized anchor points.
- Components shall be stored in a clean, dry environment free from temperature and humidity extremes, corrosive materials or other contaminants.

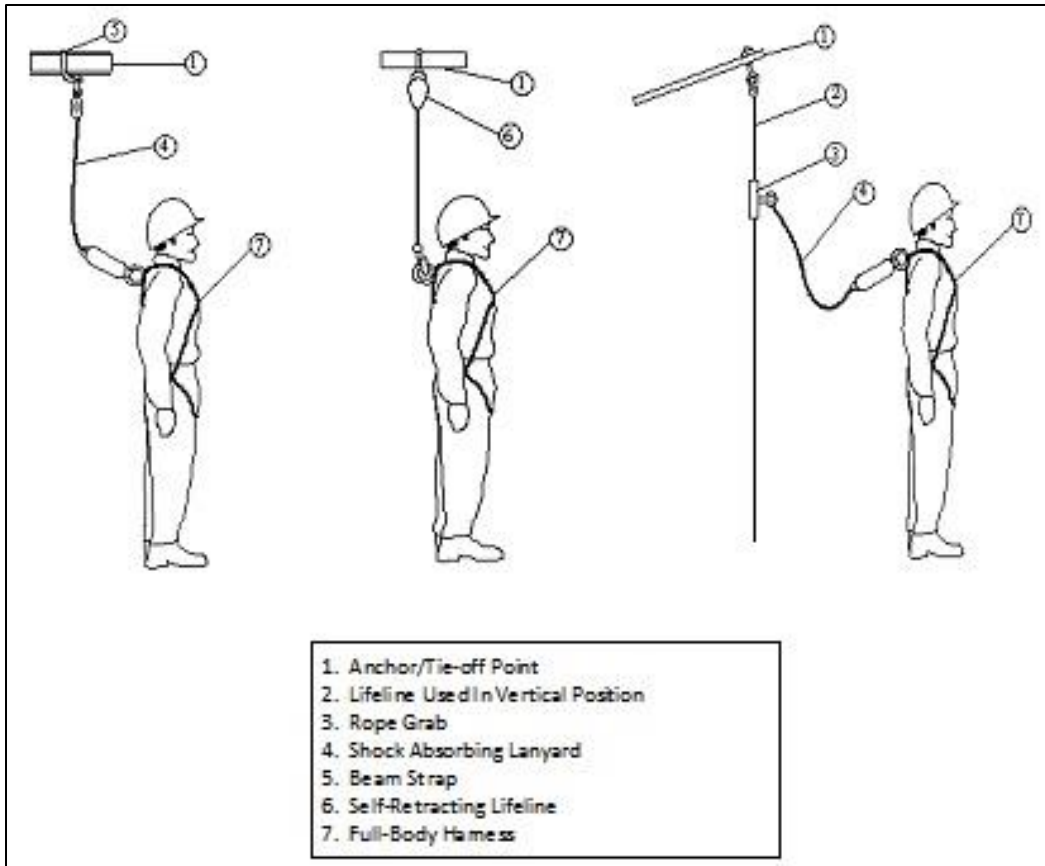


Figure 2 - Various Connection Methods for Personal Fall Arrest Systems (PFAS)

Preventing a Fall

Fall hazards can be prevented or reduced by effectively eliminating the hazard through the following methods:

- Complete as much work on the floor or ground as possible to eliminate or reduce the time working above ground.
- Build and lift sub-assemblies into place rather than placing piece-by-piece above the ground.
- Establish an effective guard railing system.
- Consider a fall prevention/restraint system rather than a PFAS. A fall prevention/restraint system involves the use of a full-body harness with connecting lanyard or lifeline arranged in such a way that does not allow the worker to reach an unprotected edge. With no free fall possible, a fall prevention/restraint system does not require a rated anchor point.

Stopping/Arresting a Fall

Personal fall arrest systems are designed to protect workers that experience a fall.

- These systems shall bring a worker to a complete stop and limit maximum deceleration distance to 3.5 feet. All fixed-length lanyards shall be equipped with a deceleration device designed to reduce the arresting forces on the body to less than 900ft/lbs.
- The anchor point should be overhead and as close as possible to reduce fall arresting forces in the event a fall.

- Avoid anchor points where a fall may result in a pendulum motion that could cause serious injury aka swing-fall (See Figure 3)
- Limit maximum arresting forces to 1,800 pounds.
- Ensure workers can neither free fall more than 6 feet or contact any lower level in the event of a fall.
- Be capable of withstanding twice the potential impact energy of a worker falling 6 feet, or the fall distance permitted by the system, whichever is less.



Figure 3 - Swing Fall Diagram

Calculating Total Fall Distance

The maximum free fall distance shall not exceed 6 feet. Consideration must be given to the following factors that can affect total fall distance:

- Length of connecting means (i.e., lanyard length, use of carabiners, snap hooks, etc.)
- Position and height of anchorage relative to work platform/area (always keep above the head whenever possible).
- Position of attachment and D-ring slide on the full body harness.
- Deployment of shock absorber (max. 42”).
- Movement in the lifeline.
- Initial position of worker before free fall occurs (i.e., sitting, standing, etc.).

The calculation should include the total length of shock absorbing lanyard, height of the person and the distance from the D-ring to the work surface or platform.

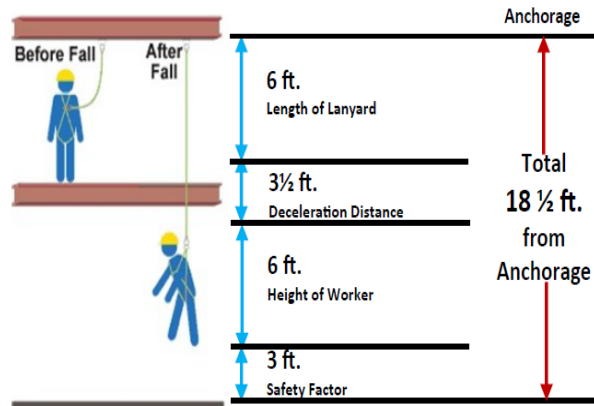
Always allow a minimum of 6 feet of clearance above the ground at the end of the fall from the fall arrest point.

Calculating Fall Clearance using a Shock Absorbing Lanyard

Example:

- First, add the length of the shock absorbing lanyard (6 ft.) to the maximum elongation of the shock absorber during deceleration (3 ½ ft.) to the average height of a worker (6 ft.)
- Then, add a safety factor of 3 ft. to allow for the possibility of an improperly fit harness, a taller than average worker and/ or a miscalculation of distance.
- The total, 18 ½ ft. is the suggested safe fall clearance distance for this example.

NOTE: Should the shock absorbing lanyard be used in conjunction with a cross-arm anchorage connector or other, the additional length of the anchorage connector must be taken into consideration.



Calculating Fall Clearance using a Self-Retracting Lifeline

Example:

- First, add the maximum free fall distance (2 ft.) with a retractable lifeline to the maximum deceleration distance (3 ½ ft.) to the average height of a worker (6 ft.)
- Then, add a safety factor of 3 ft. to allow for the possibility of an improperly fit harness, a taller than average worker and/ or a miscalculation of distance.
- The total, 14 ½ ft. is the suggested safe fall clearance distance for this example.

NOTE: When using a retractable lifeline, the distance is calculated from the point where the retractable attaches to the back D-ring of the worker's harness.

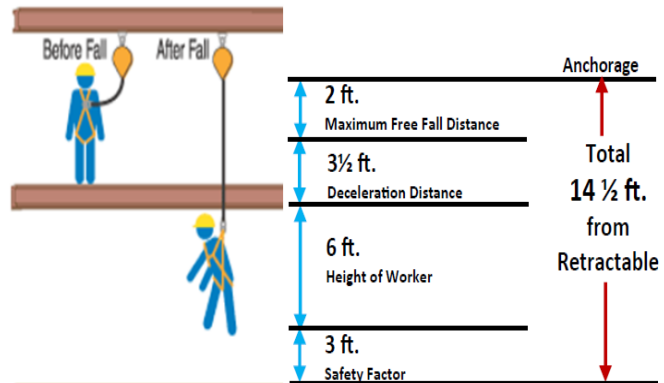


Figure 4 - Calculating Fall Distance

Engineered Lifelines

Engineered horizontal and vertical lifeline systems must be designed and approved by a professional engineer or qualified person.

These systems must be engineered with appropriate anchorages, strength of line designed to hold a designated number of workers connected to the system, line strength to aid in the arrest of a fall, and durability to hold a fallen worker(s) suspended until a rescue can occur.

Warning Line Systems

- All work on a flat roof greater than 50 feet wide, which is performed 6 feet or further back from the edge of the roof can be completed by installing a warning line system and using a competent person safety monitor. (If the roof is flat and less than 50 feet wide, a competent person safety monitor may be used.) Warning line systems consist of the following:
 - Erected 6 feet from an unprotected side or edge of the roof.
 - Erected around the entire perimeter of the roof where work is being performed.
 - Constructed using ropes, wires or chains supported by stanchions.
 - Flagged every 6 feet with high visibility flags.
 - Supported to ensure the lowest point is not less than 34 inches above the work surface; and not more than 39 inches at its highest point.
 - Capable of withstanding a force of at least 16 pounds applied horizontally against the stanchion; and the rope, chain or wire shall have a minimum tensile strength of 500 pounds.
 - Attached at each stanchion in such a way that pulling on one section of the line will not result in slack being taken up in adjacent sections.
- If mechanical equipment is being utilized on the roof top, the warning line shall be not less than 6 feet from the roof edge parallel to the direction of equipment operation, and not less than 10 feet from the roof edge perpendicular to the direction of the equipment operation.
- Points of access, material handling areas, storage areas and hoisting areas shall be clearly delineated and connected to the work area by an access path formed by two warning lines.
- When the path or point of access is not in use; a rope, wire, chain or other barricade equivalent in strength and height to the warning line shall be placed across the path.
- Workers are not permitted to enter the area between the roof edge and warning line unless work is being conducted on that portion of the roof and adequate fall protection measures are in place.
- If a worker must access an area within 6 feet of the roof's edge, for reasons other than exiting the roof via a ladder or fixed industrial ladder, the safety monitor must monitor the worker and communicate any potential hazards or unsafe conditions. If another worker is not available to serve as a safety monitor to monitor rooftop operations, then the worker must don a full body harness and attach a fall restraint lanyard to an anchor point to prevent reaching the edge of the roof.

Safety Monitoring System

A safety monitoring system relies on a competent person to monitor the work site and ensure workers are aware of fall hazards while working. This system may only be utilized on a low-slope roof and should be considered a last resort for protecting workers from fall hazards.

A competent person must be designated prior to work taking place on a roof top. The competent person who has received adequate training and possesses sufficient knowledge, will serve as a safety monitor during work and shall:

- Be competent to recognize fall hazards.
- Warn unaware workers of a fall hazard or are acting in an unsafe manner.
- Be on the same working surface and within visual distance of the workers performing work.
- Be close enough to communicate verbally with the workers.
- Ensure no unauthorized workers access the work area.
- Have no other responsibilities which may distract them while performing safety monitoring duties.
- Have the responsibility to order work stoppage and personnel removal from elevated work areas in the event of dangerous, hazardous, or life-threatening circumstances.

Mechanical equipment shall not be utilized where a safety monitoring system is being used as the fall protection method. Additional fall protection measures are required in these situations such as guardrail systems, fall restraint systems, fall arrest systems or warning line systems.

Training

Training shall be provided to all workers performing work on an elevated work surface or who may be exposed to a fall hazard. Training should enable workers to recognize fall hazards and provide the requirements to be followed to minimize these hazards. Training must be completed and documented prior to worker working in areas where fall hazards exist. Workers exposed to fall hazards as part of their job duties shall be trained in the following areas by a competent person to become an authorized worker;

- The nature of fall hazards in the work area.
- Procedures for erecting, maintaining, disassembling and inspecting fall protection systems being utilized.
- Use and operation of guardrail systems, fall restraint systems, PFAS, warning line systems, safety monitoring systems, and other protection to be used.
- The role of each worker in the safety monitoring program, if being incorporated into the fall protection program for the work to be performed.
- Limitations on the use of mechanical equipment during roof work on low-sloped roof tops.
- Procedures for handling and storage of equipment and materials and the erection of overhead protection.
- The employee's role in the fall protection program.
- The applicable standards and regulations affecting the work to be performed.

- Limitations of fall protection equipment.
- Personal protective equipment specific to fall protection including use, inspection, care and storage requirements.

Retraining

Retraining shall be provided when management has reason to believe that any authorized worker who has already received training does not have the understanding and skill required to perform work and effectively utilize fall protection equipment. Circumstances where retraining is required may include situations where:

- Changes in the workplace render previous training obsolete.
- Changes in the types of fall protection systems or equipment that render previous training obsolete.
- Inadequacies in a worker's performance or knowledge of fall protection systems that may indicate that the worker has not retained the requisite understanding or skill.
- Deficiencies in the fall protection plan or incident investigations determine that additional retraining is necessary.

Incident Investigations

The competent person shall conduct an incident investigation in the event of a fall, near miss or related incident. The incident investigation may include, but not be limited to:

- Evaluation of the fall protection plan and associated rescue plan to identify opportunities for improvements to practices, procedures or training to prevent reoccurrence. Any corrective actions generated as a result of the incident investigation shall be implemented immediately. Retraining for all workers will be conducted as needed.
- Review and evaluation of the incident report.
- Interviews with workers and witnesses where appropriate.

Maintenance and Inspection of Fall Protection Systems

Personal Fall Arrest/Restraint Systems:

Personal fall arrest systems must be inspected by the user before each use. Specific inspection guidelines include:

Full Body Harnesses

- Closely examine the nylon webbing to ensure there are no burn marks, which could weaken the material.
- Verify there are no torn, frayed or broken fibers, pulled stitches, or frayed edges anywhere on the harness.
- Examine the D-ring for excessive wear, pits, deterioration, or cracks.
- Verify that buckles are not deformed, cracked, and operate correctly.
- Check to see that each grommet (if present) is secured and not deformed from abuse or a fall.
- The harness should never have additional punched holes.
- All rivets should be tight and not deformed.

- Check tongue/straps for excessive wear from repeated buckling.

Lanyards/Shock Absorbing Lanyards

- Check lanyard material for cuts, burns, abrasions, kinks, knots, broken stitches and excessive wear.
- Inspect the snap hooks for distortions in the hook, locks, and eye.
- Check the carabiner for excessive wear, distortion, and lock operation.
- Ensure that all locking mechanisms seat and lock properly.
- Once locked, locking mechanism should prevent hook from opening.
- Visually inspect shock absorber for any signs of damage, paying close attention to where the shock absorber attaches to the lanyard.
- Verify that points where the lanyard attaches to the snap hooks are free of defects.

Snap Hooks

- Inspect snap hook for any hook and eye distortions.
- Verify there are no cracks or pitted surfaces.
- The keeper latch should not be bent, distorted, or obstructed.
- Verify that the keeper latch seats into the nose without binding.
- Verify that the keeper spring securely closes the keeper latch.
- Test the locking mechanism to verify that the keeper latch locks properly.

Self-Retracting Lanyards/Lifelines

- Visually inspect the body to ensure there is no physical damage to the body.
- Make sure all nuts and rivets are tight.
- Make sure the entire length of the nylon strap/wire rope is free from any cuts, burns, abrasions, kinks, knots, broken stitches/strands, excessive wear and retracts freely.
- Test the unit by pulling sharply on the lanyard/lifeline to verify that the locking mechanism is operating correctly.
- If the manufacturer requires, make certain the retractable lanyard is returned to the manufacturer for scheduled annual inspections.

Tie-Off Adapters/Anchorages

- Inspect for integrity and attachment to solid surface.

Personal fall arrest systems are also inspected annually by a third-party competent person. Any deficiencies identified by the user or third-party competent person during the inspection process must be addressed prior to the fall protection system being used by the worker.

Permanently-Installed Fall Protection Systems

Permanently-installed systems must be initially certified by a qualified person upon completion of installation. Re-inspection and certification must be completed annually per manufacturer specifications. Systems shall also be re-inspected and repaired as needed if subjected to tension during a near miss or fall incident. A third-party competent or qualified person certified by the manufacturer of the specific fall protection system typically performs these services.

Guardrail systems shall be subject to annual structural inspections performed by a competent person with follow-up inspections performed based upon on conditions/controls present. Guardrail systems or parapets serving as guardrails should be visually inspected prior to work on

an elevated surface. Any deterioration or deficiencies noted, which may cause the fall protection system to fail should be addressed prior to work commencing.

Storage

- Never store PFAS in the bottom of a toolbox, on the ground, or outdoors exposed to the elements (i.e., sun, rain, snow, etc.).
- Hang equipment in a cool, dry location in a manner that retains its shape.
- Clean with a mild, nonabrasive soap and hang to dry.
- Never force dry or use strong detergents in cleaning.
- Never store equipment near excessive heat, chemicals, moisture, or sunlight.
- Never store in an area with exposures to fumes or corrosive elements.
- Avoid dirt or other types of build-up on equipment.

Chessick Center Chimney Fall Protection System Procedure

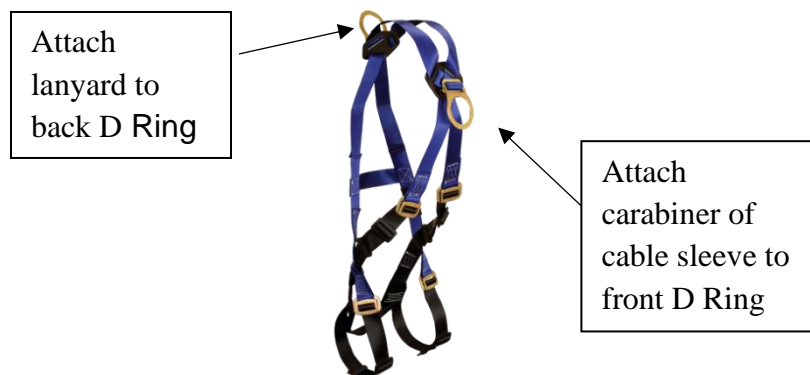
Please reference this procedure when operating in the mezzanine in the east and west chimneys at the Chessick Performance Center.

The front D ring is for fall protection while on the ladder. The back D ring with lanyard is for fall protection while transitioning to the mezzanine and back unlatched from the ladder lifeline.

1. Attach carabiner on lifeline cable sleeve to D ring on front of harness.
2. Attach a lanyard to the D ring on the back and the free end to another accessible point on the harness.
3. Ascend ladder.
4. Tie off free end of lanyard on ladder rail.
5. Disconnect from lifeline cable sleeve.
6. Open gate. Transition to mezzanine. Close gate.
7. Disconnect from lanyard or ladder rung.

When done on the mezzanine:

8. Reconnect lanyard to back D ring or ladder rung.
9. Open gate. Transition to ladder. Close gate.
10. Connect front D ring to carabiner on ladder cable sleeve.
11. Disconnect lanyard from ladder rung. Attach free end to another accessible point on the harness.
12. Descend ladder, dismount at floor.



Fall Protection and Rescue Plan Form

Department	Site Location
Job Task	
Job Location/Description	

Plan prepared by	Date
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- **Workers must review and sign this plan prior to starting work. Workers must understand this plan and be trained in fall protection and the systems and equipment that will be used.**
- **This plan must be posted at the worksite for the duration of work activities.**

1. Identify potential fall hazards (check all that apply)	
<input type="checkbox"/> Mobile elevating work platforms	<input type="checkbox"/> Stairways
<input type="checkbox"/> Excavations/trenches	<input type="checkbox"/> Roof steep slope (greater than 4:12)
<input type="checkbox"/> Floor openings	<input type="checkbox"/> Roof low slope (4:12 or less)
<input type="checkbox"/> Wall openings	<input type="checkbox"/> Swing fall
<input type="checkbox"/> Skylight openings	<input type="checkbox"/> Hazardous process/equipment
<input type="checkbox"/> Roof openings	<input type="checkbox"/> Debris/objects falling to lower level
<input type="checkbox"/> Elevator shaft	<input type="checkbox"/> Sharp edges
<input type="checkbox"/> Ladders (fixed or portable)	<input type="checkbox"/> Reinforcing steel installation
<input type="checkbox"/> Scaffold	<input type="checkbox"/> Other:
2. Describe the fall hazard(s) details	
3. Identify fall protection systems to be used	
<input type="checkbox"/> Guardrail system	<input type="checkbox"/> Aerial lift
<input type="checkbox"/> Covers (holes and openings)	<input type="checkbox"/> Horizontal lifeline
<input type="checkbox"/> Appropriate anchors for systems used	<input type="checkbox"/> Vertical lifeline and rope grab
<input type="checkbox"/> Personal fall arrest system	<input type="checkbox"/> Warning line
<input type="checkbox"/> Personal fall restraint system	<input type="checkbox"/> Safety monitor
<input type="checkbox"/> Positioning device system	<input type="checkbox"/> Safety watch
<input type="checkbox"/> Scaffold with guardrail	<input type="checkbox"/> Other:
<input type="checkbox"/> Scissor lift	<input type="checkbox"/> Other:
4. Describe procedures for assembly, maintenance, inspection, disassembly of fall protection system to be used	

5. Describe procedures for handling, storage, securing tools and materials	
6. Identify methods of overhead protection for workers who may be in, or pass through the area below worksite	
<input type="checkbox"/> Barricading	<input type="checkbox"/> Toeboards/screens on scaffolds
<input type="checkbox"/> Hard hats required	<input type="checkbox"/> Toeboards/covers on floor openings
<input type="checkbox"/> Catch net	<input type="checkbox"/> Screens on guardrails
<input type="checkbox"/> Warning signs	<input type="checkbox"/> Secure large tools
<input type="checkbox"/> Tool belts	<input type="checkbox"/> Other:
<input type="checkbox"/> Tool lanyards	<input type="checkbox"/> Other:
7. Identify method for prompt, safe rescue of injured workers CALL 911 IF FALL OCCURS	
<input type="checkbox"/> Police/Fire Response	<input type="checkbox"/> Self-Rescue Options?
<input type="checkbox"/> On-Site Equipment Available: Ladders, Lifts, Winches, Pulleys, Work Platforms, etc?	<input type="checkbox"/> On-Site Attendants
<input type="checkbox"/> Obstructions that may impede rescue?	<input type="checkbox"/> Methods of Communication with Injured Worker: Cell Phone Numbers Supervisor: On-Site Attendant: Injured Employee:
8. Identify method used to determine adequacy of anchorage points	
<input type="checkbox"/> Evaluation by professional engineer	<input type="checkbox"/> Existing engineering/design documents
<input type="checkbox"/> Manufacturer's data	<input type="checkbox"/> Other:
9. Describe and identify locations of anchorage points	
10. Select system components	
<input type="checkbox"/> Full body harness	<input type="checkbox"/> Choker
<input type="checkbox"/> Vertical lifeline	<input type="checkbox"/> Carabiner
<input type="checkbox"/> Horizontal lifeline	<input type="checkbox"/> Rope grab
<input type="checkbox"/> Lanyard	<input type="checkbox"/> Personal shock absorber
<input type="checkbox"/> Boatswains chair	<input type="checkbox"/> Beamer
<input type="checkbox"/> Connecting devices (identify)	<input type="checkbox"/> Anchorage points (identify)

<input type="checkbox"/> Other:	<input type="checkbox"/> Other:
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11. Distance from anchor to ground, lower level or obstruction

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12. Calculated minimum fall clearance

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13. Inspection Checklist

<input type="checkbox"/>	Identification tags
<input type="checkbox"/>	Horizontal lifeline tension is correct
<input type="checkbox"/>	Integrity of stitching in shock absorber
<input type="checkbox"/>	Integrity of stitching in harness/lanyard
<input type="checkbox"/>	Manufacturers assembly/disassembly instructions
<input type="checkbox"/>	Locking capability of retractable lanyards assured
<input type="checkbox"/>	Locking capability of carabiners assured
<input type="checkbox"/>	Locking capability of snap hooks assured
<input type="checkbox"/>	Knots and other connection methods do not weaken lifeline
<input type="checkbox"/>	Lifelines installed and protected from cuts or abrasions
<input type="checkbox"/>	Rope (wear, fraying, damage, mildew)
<input type="checkbox"/>	Lanyards (wear, fraying, damage, mildew)
<input type="checkbox"/>	D-rings have adequate strength, are not cracked or deformed
<input type="checkbox"/>	Guardrails are sound and of adequate strength
<input type="checkbox"/>	Devices that are used to connect to horizontal lifelines lock in both directions
<input type="checkbox"/>	Anchorage points provide adequate strength and are capable of meeting requirements
<input type="checkbox"/>	Hole covers are secured, marked and capable of withstanding anticipated weight loads
<input type="checkbox"/>	Warning line meets strength and other requirements
<input type="checkbox"/>	Safety Monitor is Competent Person, can see workers, is close enough to communicate, has no other duties
<input type="checkbox"/>	Safety Watch is Competent Person, can see worker, is close enough to communicate, has no other duties
<input type="checkbox"/>	Other
<input type="checkbox"/>	Other

14. Employee(s) trained to work under this plan

Name (print)	Signature	Date

Name/title of Competent Person who provided training under this plan

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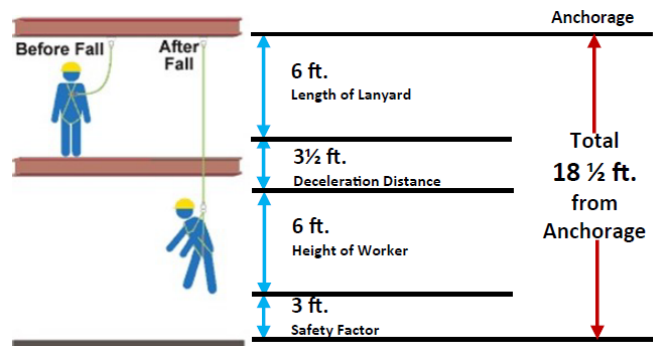
15. Work plan approval(s)

Name of lead worker or supervisor	Signature	Date
Name of Competent Person (If engineered system: Name of Qualified Person)		
If administrative controls: Name of department manager		

Calculating Fall Clearance using a Shock Absorbing Lanyard

Example:

- First, add the length of the shock absorbing lanyard (6 ft.) to the maximum elongation of the shock absorber during deceleration (3 ½ ft.) to the average height of a worker (6 ft.)
- Then, add a safety factor of 3 ft. to allow for the possibility of an improperly fit harness, a taller than average worker and/ or a miscalculation of distance.
- The total, 18 ½ ft. is the suggested safe fall clearance distance for this example.

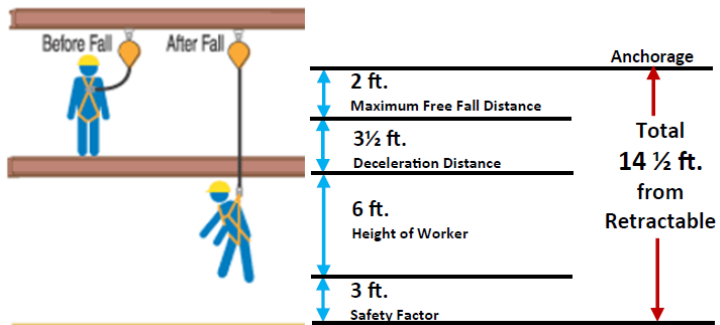


NOTE: Should the shock absorbing lanyard be used in conjunction with a cross-arm anchorage connector or other, the additional length of the anchorage connector must be taken into consideration.

Calculating Fall Clearance using a Self-Retracting Lifeline

Example:

- First, add the maximum free fall distance (2 ft.) with a retractable lifeline to the maximum deceleration distance (3 ½ ft.) to the average height of a worker (6 ft.)
- Then, add a safety factor of 3 ft. to allow for the possibility of an improperly fit harness, a taller than average worker and/ or a miscalculation of distance.
- The total, 14 ½ ft. is the suggested safe fall clearance distance for this example.



NOTE: When using a retractable lifeline, the distance is calculated from the point where the retractable attaches to the back D-ring of the worker's harness.

Fall clearance is the minimum vertical distance needed between the anchor point and a lower level (this can be the ground or lower obstruction) with a safety factor to prevent the worker from hitting the lower level in a fall.

What is the distance from the anchor point to the ground or lower level where a worker would fall?

If a worker falls, when wearing a fall protection system, what is the minimum fall clearance from the anchor point to the worker's feet including a 3 ft. safety factor? (Calculate as shown below)

The calculated minimum fall clearance of a specific fall protection system may **never** be equal or greater than the distance between the anchor point and the lower level.

Description	Distance (ft.)
Lanyard length or free fall distance for self-retracting lifeline	
Maximum allowable deceleration distance	3 ½ ft.
Worker's height	
Other component if applies	
Safety factor	3
Minimum fall clearance (sum of above)	