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1.0 PURPOSE AND SCOPE

The purpose of this Corporate Environment, Health and Safety Procedure (EHSP) is to establish minimum requirements for the use of fall prevention measures, fall protection equipment, and systems to protect employees exposed to fall hazards.

This EHSP applies to all employees and subcontractors exposed to fall hazards, while working at Responsibilities

General responsibilities for EHS procedures implementation are stated in EHSP 1.5. Additional responsibilities specific to this EHSP include the following.

1.1. Site Manager

The Site Managers shall:

- Maintain a program for storing, inspecting, and procuring fall arrest equipment.
- Will meet the requirements of applicable ANSI, ASTM, or OSHA requirements.
- Approve the use of warning line systems.

1.2. Supervisors

Supervisors shall:

- Ensure that workers have received proper training and documentation on fall hazard recognition, fall prevention measures, and the use of fall protection equipment.
- Ensure visual and documented inspections of fall protection equipment.
- Assure that provisions for prompt rescue of fallen employees is planned.

- Assure that fall protection equipment is used in compliance with this work instruction including manufacturer and regulatory requirements.
- Assure that re-training be conducted/documented when needed.

1.3. Employees

Employees shall:

- Identify fall hazards associated with their work and ensure that such hazards are properly addressed.
- Know the uses and limitations of fall protection equipment.
- Inspect fall protection equipment prior to each use and remove any defective equipment from service.
- Comply with Delta Services LLC. 100% Fall Protection Policy. Any work above 4’ shall use a fall arrest system if hazard cannot be mitigated by other means.
- Remove from service any fall protection equipment subjected to a fall.
- Immediately report both injury and non-injury falls to supervision.

1.4. Corporate EHS

Competent Persons shall:

- Train the employees in:
  - The nature of fall hazards in the work area,
  - The correct procedures for using and erecting fall protection systems,
  - The proper use of guardrail systems, personal fall arrest systems, etc,
  - The correct procedures for handling and storing equipment.
- Maintain the written documentation of the training provided.
- Regularly review and update this program.
- Perform regular site audits to assure employees are properly utilizing fall protection/prevention.
- Supervise the installation and use of third-party manufactured fall arrest systems.
- Shall conduct accident investigations in the event of a fall, near miss, or other serious incident.

1.5. Qualified Person

Qualified Persons shall:

- Use their experience and educational background to design company-specific fall arrest systems.
- Supervise the installation and use of anchorages used for company-specific fall arrest systems, including horizontal lifelines.
- Maintain requirements as a Qualified Person in accordance with definition found below.

2.0 DEFINITIONS

Anchorage	A secure point of attachment for lifelines (horizontal and vertical), lanyards, and retractable devices, which is independent of the means of supporting or suspending the work platform. Anchorage shall be capable of supporting 5,000 pounds (22 kN) per employee attached or shall be designed, installed, and used as follows: (1) as part of a complete fall arrest system that maintains a safety factor of at least two and (2) under the supervision of a Qualified Person. Anchorage must meet applicable local regulatory and manufacturer requirements.
Clearance Distance	The total fall distance required below the anchorage to ensure sufficient clearance to prevent collision with walking and working surface and other obstructions below. The total fall distance is vertically measured from the anchorage and includes a combination of free fall distance, deceleration distance, worker's height, and a safety factor of 2 feet (0.6 m).
Competent Person	One who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has the authorization to take prompt corrective measures to eliminate them.
Connecting Device	A retractable device (self-retracting lifeline), lanyard, anchorage connector, or other means to connect the full-body harness to the anchorage or lifeline to provide protected movement during an elevated work task.
Controlled Access Zones	An area in which certain work may be performed without the use of guardrail systems, personal fall arrest systems, or safety net system. Access to the zone is controlled and the work within the controlled access zone is to be performed by using a warning line system.
Deceleration Device (Shock Absorber)	Any device that serves to dissipate a substantial amount of fall arrest energy or otherwise limits the energy imposed on the body during fall arrest (1,800 pounds maximum (8kN)). This device elongates after activation and shall be considered in calculating clearance distances.
Deceleration Distance	The distance an employee falls after the lanyard or retractable device is activated and is measured from the point of activation to a complete stop. The maximum allowed deceleration distance for a lanyard is 42 inches (1.1 m), and for a retractable device (self retracting lifelines) the maximum allowed deceleration distance is 2 feet (0.6 m).
Designated Area	A fall prevention system composed of a warning line and stanchions erected six feet (2 m) or more from a fall hazard (unprotected roof edge). See Figure 1.
"D" Ring	An attachment point on the full-body harness for attaching a lanyard or other connecting device.
Fall Arrest System	Includes the proper anchorage, body support (harness), and connecting device interconnected and rigged to arrest free fall.
Fall Hazard Control	A means of providing *complete* and *continuous* protection for employees exposed to fall hazards. The means of protection include either fall prevention or fall protection measures. Planning, training, and enforcement are key elements for controlling fall hazards.
Fall Prevention	Any means used to eliminate or prevent exposure to fall hazards including guardrail systems, aerial lifts, hole covers, completed scaffolds, and fall restraint.
Fall Protection	Involves using fall arrest systems/equipment to control a fall once it has occurred. Fall protection systems do not to prevent the fall.

Fall Restraint System	A fall prevention system that prevents the user from falling any distance. The system is comprised of a full-body harness, along with an anchorage, connectors, and other necessary equipment. The system prevents and/or restrains the user from reaching the open edge of the structure or platform. Anchorage shall be capable of resisting 400 lbs. (1.82 kN) of force minimum (same as two times force required for a barricade/handrail) or two times the employee's weight, which ever is greater.
Fall Restraint Line	A line from a fixed anchorage to which an employee is secured in such a way as to prevent the employee from reaching an identified fall hazard.
Free Fall	Distance the D-ring travels from the onset of a fall to the time when the deceleration device is activated (excludes deceleration distance and any system elongation). Free fall shall be limited to six feet (2 meters).
Guardrail System	A vertical barrier erected along exposed edges of a floor opening, roof opening, wall opening, ramp, runway, scaffold, excavation, and other walking or working surface to prevent employee exposure to lower level falls. Constructed of a top rail, mid-rail and toeboard (when required). Material used includes: wood, wire rope, steel, or pipe (see Figure 1).
Harness	A personal fall protection device, which is secured around the body, with a lanyard and/or other fall protection device attached. It is designed to distribute fall arresting forces primarily over the buttocks and thighs and must meet applicable ANSI and other regulatory requirements.
Horizontal Lifeline (HLL) System	A horizontal lifeline system is a flexible cable or rope line strung horizontally and anchored at both ends. The HLL system serves as attachment for single or multiple users based on the application and design. HLL systems must be designed and installed under the supervision of a Qualified Person, as part of a complete personal fall arrest system.
Hole	A hole is a gap or void 2 inches (5 cm) or more in its least dimension in a floor, roof, or other walking/working surface. Holes must be properly barricaded or covered to prevent employees from tripping or stepping into them or falling through and to prevent tools, equipment or material from falling through them to a lower level.
Delta Services LLC. 100% Fall Protection Policy	When employees work from an unprotected elevation of four feet or more, fall protection equipment shall be used. Working means while traveling, stationary, or at anytime exposed to a fall from a surface not protected by approved handrails, guardrails, or some other approved fall arrest or restraint device. The 4-foot fall distance is measured from the employee's feet to the walking and working surface. See EHSP 18.3 for fall protection requirements while using ladders.
Lanyard	A connecting device used to attach a full-body harness to a lifeline or an anchorage point. Lanyards come in varying lengths and must contain a built-in shock absorber.
Leading Edge	The unprotected side and edge of a floor, ramp, or formwork for a floor or other walking/working surface such as a deck, which changes locations as an additional floor, roof, decking, or formwork sections are placed, formed, or constructed.
Lifeline	A flexible line for connection to an anchorage at one end to hang vertically (vertical lifeline) or for connection at both ends to stretch horizontally (horizontal lifeline) and to which other components of a fall arrest system is attached.
Low Sloped Roof	A roof having a slope ratio of less than or equal to 4 to 12 (vertical to horizontal).

Monitoring Systems	A passive safety system in which a Competent Person is assigned responsibility to recognize and warn unprotected employees of fall hazards. The Competent Person monitors work activities and exposures to fall hazards. This system permits work adjacent to openings, holes, and perimeter edges of floors, roofs, etc., without using fall protection equipment. *Delta Services LLC. prohibits the use of monitoring systems.*
Personal Fall Arrest System	A system used to arrest an employee in a fall from a working/walking level. It includes anchorage, connectors, a full-body harness, and may include a lanyard, deceleration device, lifeline, or suitable combination of these.
Positioning Device	A device rigged to a full-body harness and anchored to the work to allow an employee to be supported on an elevated, vertical surface such as a wall, column, formwork, and reinforcing steel (rebar), and to work with both hands free while leaning. *Delta Services LLC. prohibits the use of positioning devices as the sole means of fall protection when working above 4 feet.*
Qualified Person	A person with a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience has successfully demonstrated the ability to solve or resolve problems related to fall protection.
Rope Grab	A device, which travels on a vertical lifeline, that automatically engages and locks on the lifeline in the event of a fall.
Safety Net	A passive fall arrest system designed to catch personnel, who fall from the perimeter of a building, bridge, roof, or any other unprotected work location. Nets typically extend out from and under unprotected work locations. They are comprised of mesh nets, including connectors, and other impact-absorbing components. *Delta Services LLC. prohibits the use of safety nets as an independent means of fall protection.*
Self Retracting Lifeline (Retractable device)	A fall protection device that automatically extends up and down, eliminating slack, as the worker moves. These units have a locking and/or braking mechanism, which senses and arrests free fall, within 2 feet (0.9 m) of activation.
Snap Hook	A double-locking mechanism that is a self-closing, self-locking connector used for connecting lanyards and or devices to the full-body harness D-ring and to the anchorage. *Delta Services LLC. prohibits use of single-locking snap hooks.*
Swing Fall	A pendulum-like motion that results from moving horizontally too far away from the fixed overhead anchorage.
Toeboard	The lower protective barrier of the guardrail system that prevents material, and equipment from falling to a lower level. Toeboards must be designed to withstand 50 lbs. of force and be a minimum of 3½ inches (10 cm) high.
Unprotected Sides and Edges	Any side or edge, except at entrances to points of access for walking and/or working surfaces, such as a floor, roof, ramp, runway, where there is no wall or guardrail system at least 39 inches (1 m) high.
Wall Opening	An opening of at least 30 inches (76 cm) high and 18 inches (48 cm) wide, in any wall or partition, such as a doorway or chute opening, through which employees may fall.

Warning Line System	A barrier erected on the walking/working surface, such as a roof, to warn employees that they are approaching an unprotected fall hazard near the side or edge. Warning lines must be placed a minimum of six feet (2 m) from the edge of a roof, floor, or walking/working surface and consist of a top rail and mid rail. For mechanical equipment operations on roofs, see below for warning line distances from roof edges.

3.0 PROCEDURE

When employees work from an unprotected elevation of 4 feet or more, fall protection equipment shall be used. Working means while traveling, stationary, or at anytime exposed to a fall from a surface not protected by approved handrails, guardrails, or some other approved fall arrest or restraint device. The 4-foot fall distance is measured from the employee's feet to the walking and working surface.

See EHSP 18.3 for fall protection requirements while using ladders and the requirements found later in this EHSP.

3.1. Fall Hazard Control

Personnel shall be prevented from falling or protected by a fall arrest system whenever working 4 feet or more above a lower level. This requirement applies to unprotected sides/edges, leading edges, hoist areas, holes, and floor openings, formwork, and reinforcing steel, excavations, roofing work, pre-cast concrete erection, and other walking/working surfaces not otherwise addressed.

3.1.1. Methods of Fall Prevention and Protection

Fall hazard control shall be provided in the form of fall prevention systems, which includes guardrail systems, scaffolds, aerial lifts, barricades, and hole covers. Fall protection measures include the use of personal fall arrest systems and safety nets, or similar means of fall protection. Emphasis should also be placed on providing protection from falling objects and from slips and trips on the same level.

3.1.2. Planning

Prior to each phase of work, site supervision is responsible for planning fall prevention and fall protection measures to protect employees from fall exposures. Also shall address the prompt rescue of employee in the event of a fall.

This planning effort includes:

- Identifying potential fall hazards,
- Using design safety to eliminate or engineer out fall exposure,
- Determining the appropriate method of protection,
- Supplying anchorage,
- Providing education, training, and enforcement, and
- Arranging for rescue and rescue equipment.

3.2. Hierarchy of Fall Hazard Control

Fall hazard control measures should be initiated in the following order.

3.2.1. Fall Elimination

Eliminate work at elevation by:

- Performing work on the ground,
- Attaching guardrail protection to forms and work platforms while on the ground,
- Attaching fall arrest systems to formwork, bridge steel, and other structural components before erection,

- Using ground release devices to disconnect rigging from the ground, or
- Maximizing the pre-assembly of formwork, structural steel, pipe, and other components.

3.2.2. Design Safety and Engineering Controls

"Design-out or Engineer-out" fall hazards by:

- Maximizing use of prefabricated modular units.
- Adding stairways and platforms that can be used for access both during construction and maintenance operations.
- Designing elevated structures with connecting points to secure retractable devices and other anchorage connectors. For example, embeds can be added into concrete walls for anchorage points, and structural steel can be hole-punched to accommodate wire rope guardrail systems.
- Designing holes and/or attachment points for temporary guardrail systems, stanchions and self-retracting lifelines that can be attached on the ground and provide protection for the first person to access elevation.

3.2.3. Fall Prevention

Prevent falls at elevation by using:

- Guardrail systems,
- Scaffolds,
- Aerial lifts,
- Skylight guarding,
- Fall restraint, and
- Hole/Floor covers.

3.2.4. Fall Protection

Protect employees when they fall by the use of fall arrest systems.

Fall protection systems/equipment used to arrest falling employees are the least desirable method of protection because

- They only minimize the consequences of a fall rather than prevent its occurrence, and
- They rely on human behavior to prevent injury.

The use of fall protection equipment, such as harnesses, lanyards, anchorage connectors, retractable devices, etc. must be planned in the work activity and used properly to reduce the risk of injury from falling.

3.3. Fall Prevention Methods

Since fall *prevention* eliminates *exposure* to a fall, it is preferred over fall *protection* devices and is the first choice for eliminating fall hazards. Fall prevention methods are described below.

3.3.1. Proper Access

Providing safe access to and from work locations is the first step in preventing falls. This includes planning safe access/egress routes of travel and proper installation and use of:

- Ladders,
- Scaffolds,
- Stair Towers,

- Stairways,
- Ramps,
- Designating specific locations to access and egress work locations, and/or
- Backfilling around footers, slabs-on-grade, and other structures.

3.3.2. Guardrail Protection

Designate work locations requiring guardrail protection (See Figure 1). Include

- Elevated work platforms, such as on formwork,
- Scaffolds,
- Openings/holes in bridge decks, floors, roofs, or other unprotected surfaces,
- Unprotected sides of ramps/stairways/platforms,
- Leading edges,
- Edges of bridge surfaces, buildings, floors, roofs, and slabs,
- Ladderway floor openings,
- Exposed skylight openings,
- Pits and trap door openings that are left uncovered,
- Manhole floor openings, and
- Elevator shaft openings left unprotected.

3.4. Fall Prevention System Requirements

3.4.1. Guardrail Systems

Guardrail systems shall be so surfaced to prevent injury from punctures or lacerations and to prevent snagging of clothes.

The ends of top rails and mid-rails shall not overhang the terminal posts, except where such projection does not constitute a projection hazard.

Guardrail systems used around holes shall be erected on *all* unprotected sides and edges of holes.

Guardrail systems used on ramps and runways shall be erected along each unprotected side or edge

Guardrail systems shall be used around holes, which are points of access, such as ladderways. Every ladderway floor opening or platform shall be guarded by a standard guardrail system including toeboards on all exposed sides, except at the entrance to the opening. The passage through the railing shall either be provided with a swing gate or barrier or offset such that a person cannot walk directly into the opening.

Guardrail installation should occur as work progresses — don't wait and then catch up,

Plan inspections for damage and proper construction and immediately replace damaged guardrails.

3.4.1.1. Top Rails

Top rail height must be 42 inches (1 m) plus or minus 3 inches (8 cm) above the walking and/or working surface.

Guardrail systems shall be capable of withstanding, without failure a force of 200 pounds (890 N) applied within 2 inches (5.1cm) of the top edge in any direction.

When the 200 pounds (890 N) is applied in a downward direction the top edge of the guardrail, it shall not deflect to a height less than 39 inches (1 m) above the walking or working level.

3.4.1.2. Mid Rails

Midrails, screens, mesh, intermediate vertical members or equivalent intermediate structural members shall be installed between the top edge of the guardrail system and the walking/working and when there is no wall or parapet wall at least 21 inches (0.55m) high.

Midrails when used shall be installed at a location midway between the top edge of the guardrail system and the walking or working level.

Screens and mesh when used shall extend from the top rail to the walking/working level and along the complete opening between top rail supports.

Midrails, screens, mesh intermediate vertical members or equivalent structural members shall be shall be able to withstand a force of at least 150 pounds (666 N) applied in any direction.

Intermediate vertical members when used between posts shall not be more than 19 inches (48 cm) apart.

3.4.1.3. Protection From Falling Objects

Falling object protection is provided by toe boards, screens on guardrail systems, hole covers, tool tethering, barricades, and canopy structures.

Toeboards shall be:

- Erected along the edge of the overhead walking/working surface for a distance sufficient to protect employees below
- Capable of withstanding, without failure, a force of 50 pounds (222N) applied in any direction.
- A minimum of 3½ inches (9 cm) in vertical height.
- No more than ¼ inch (6 mm) above the walking and/or working surface.
- Solid or have openings not more than 1 inch (2.5 cm) in greatest dimension

Where tools, material, equipment are piled higher than the top edge of a toeboard, paneling or screening shall be erected from the walking/working surface to the top of the guardrail systems top or mid-rail for a distance sufficient to protect employees below.

Barricade the area to which objects could fall, prohibit employees from entering the barricaded area, and keep objects that may fall far enough away from the edge or in a secure container.

Erect a canopy structure of sufficient strength and size to protect workers under a walking or working level.

3.4.2. Covers for Openings and Holes

All covers, including those covers located in roadways, shall be capable of supporting at least twice the weight of employees, equipment, and material that may be imposed on the cover at any one time.

Covers shall be secured to prevent accidental displacement by cleating the underside, tying the cover to grating, or other means to prevent accidental displacement.

Covers shall be color coded, or marked with the word “hole” or ”cover”.

Identify openings and holes. Holes are defined as a gap or void 2 inches (5 cm) or more in at least one dimension in a floor, roof, or walking, and working surface

Install protection as soon as an opening is created.

Immediately replace covers, which have been removed or damaged.

Perform regular inspection and proper maintenance.

Use fall arrest equipment when working near unprotected openings.

3.4.3. Elevating Equipment

Employees are required to be tied-off 100% of the time when operating

- Aerial lifts and scissor lifts, see EHSP 17.9, and

3.4.4. Housekeeping

Keep walking and working areas free of debris, material, and equipment.

Enforce daily clean up of work areas.

Provide a sufficient number of trash containers for clean up.

3.4.5. Fall Restraint System

A fall restraint system is a fall prevention system that prevents the user from falling any distance. The system is comprised of a full-body harness, along with an anchorage, connectors, and other necessary equipment. The system prevents and/or restrains the user from reaching the open edge of the structure or platform.

Anchorage for fall restraint shall be capable of resisting 400 lbs. (182kg) of force minimum or two times the employee's weight, which ever is greater.

3.4.6. Excavations

Employees at the edge of excavations six feet (2 m) or more in depth must be protected from falling by the use of guardrails, fences, or barricades when the excavations are not easily visible.

Wells, pits, shafts, or similar excavations six feet (2 m) or more in depth shall be protected by guardrail systems, barricades, fences, or covers.

3.4.7. Hoist Areas

Hoist areas four-foot or more in depth must be protected by guardrail or personal fall arrest systems.

If guardrail systems or portions thereof must be removed to facilitate the hoisting operation, exposed workers shall be protected by a personal fall arrest system and the area shall be barricaded.

3.4.8. Dangerous Equipment

Regardless of elevation, employees working from elevated positions above dangerous equipment or conditions (machinery, electrical equipment, degreasing units, galvanizing tanks, vertical rebar, etc.) must be protected from falling onto the hazard by fall prevention methods, fall protection systems, or equipment guards.

3.4.9. Roofing Work and Work on Roof-Top Equipment

Persons involved in roofing work must be protected by either a fall prevention or fall protection system.

A designated area inside a warning line is acceptable fall prevention for roofing work and for performing work on equipment located on roofs as long as employees are not required to be within fifteen feet of the edge or unprotected skylights and the Site Manager approves. If work is required within fifteen feet of the edge of the roof, then guardrails, fall restraint systems, or fall protection must be provided and used. This does not include roof access and egress points.

A warning line system is not permitted as a fall prevention means for work on steep roofs. Fall prevention or fall protection is required at all times when performing work on equipment located on any roof other than a flat or low-sloped roof.

Warning lines used for flat or low-sloped roofing work shall:

- Be approved by the Site Manager.
- Be erected around all open sides of the work area.
- Not be less than fifteen feet from the edge of the fall hazard.
- Be used to connect an access route to the work area by forming a path within two warning lines, e.g., access and egress points, material handling areas, storage areas, and hoisting areas.
- Consist of ropes, wires, or chains, and supporting stanchions erected as follows.
    - Be flagged at not more than six foot (1.8M) intervals with high-visibility materials,
    - Be rigged and supported in such a way that the top rail's highest point is no more than 39 inches (1.0m) and lowest point (including sag) is no less than 34 inches (0.9m) from the walking/working surface and the mid-rail shall be approximately midway between the top rail and the walking and working surface.
- Stanchions shall be capable of resisting, without tipping over, a force of at least 16 pounds (71 N) applied horizontally against the top of the stanchion in the direction of the roof edge.
- The rope, wire, or chain shall have a minimum tensile strength of 500 pounds (2.22 kN).
- The lines shall be attached to each stanchion in such a way that pulling in one section of the line will not result in slack being taken up in adjacent sections before the stanchion tips over.

No employee shall be allowed in the area between the roof edge and the warning line unless they are protected by a guardrail, fall restraint system, or personal fall arrest system.

3.4.10. Fall Protection Plans

Alternate fall protection plans such as controlled access zones (CAZ) or safety monitoring systems (SMS) are not normally used and if they are to be utilized they must be approved by corporate EHS and employees must be properly trained on the procedures.

3.4.11. Same-level Walking and Working Surfaces

Good housekeeping is the key to the prevention of same-level falls.

Usable and waste material must be stored in designated areas out of passageways and shall not be allowed to accumulate in the work area or around worktables, desks, threading machines, etc.

Surfaces must be kept free of slipping hazards (grease, oil, chemicals, metal shavings, ice, water, etc.).

To prevent tripping hazards:

- Floor holes and openings shall be covered and secured.
- Electrical cords, welding leads, hoses, etc. must be elevated a minimum of seven feet overhead, lie flat and clear of doorways and walkways, or be relocated to create a clear path of access/egress.
- Tools and equipment must be located clear of travel paths on all walking and working surfaces and away from leading edges and unprotected openings.

- Maintain even and smooth floor surfaces or create an adequately marked, smooth transition through use of ramps, etc.
- Ramps or transitions that are not smooth or even require warning signs.

3.5. Fall Protection and Fall Arrest Systems

The primary function of a fall arrest system is to minimize the consequences of a fall rather than prevent its occurrence. Fall arrest systems provide complete and continuous fall protection while accessing and working at elevation.

A complete fall arrest system includes the proper anchorage, body support (harness), and connecting device (lanyards/lifelines) interconnected and properly rigged to arrest a free fall.

Fall arrest systems must be installed and used in accordance with the manufacturer's recommendations and under the supervision of a Qualified Person.

3.6. Fall Protection Equipment Requirements

3.6.1. General Requirements

Only fall protection equipment approved for use by the Company is permitted. Contact the EHS manager fo questions on approved equipment.

Any equipment that is used as part of a fall protection system, but could also be used for other activities, such as slings, chokers, carabiners, etc., must be tagged, identified, or otherwise controlled and used only as part of a fall protection system. This equipment must be evaluated and approved by a Qualified Person before incorporating them as part of a fall protection system.

In hot-work operations or those involving chemicals or other factors that could cause damage, fall protection equipment must be designed and/or protected to avoid burning or deterioration.

All components of personal protection, i.e., harnesses, lanyards, anchorage, lifelines, and connectors must meet the manufacturer and local regulatory requirements.

Employees reaching more than 10 inches (25 cm) below the level of the walking/working surface on which they are working shall be protected from falling by a personal fall arrest system such as a guard a guard rail or personnel fall prevention or arrest system.

3.6.2. Anchorage

Anchorage planning is the key to designing fall arrest systems. Anchorage requirements include:

- Strength – capable of supporting 5,000 pounds (22.2 kN) per employee or twice the anticipated force and designed by a Qualified Person.
- Independence – anchorages must be independent of the work platform, guardrail system, or surfaces/structures supporting employees.
- Location – anchorages should be located overhead to minimize free fall distance. Minimum height policy for most lanyard anchorage is shoulder level, and overhead anchorage locations for both retractable devices and rope grab lifelines. When anchorage is below shoulder level, a Qualified Person shall determine what changes if any need to be made to the fall arrest system such as shorter lanyards, additional shock absorbing capability, etc.
- Sufficient fall clearance – calculate the total fall distance to ensure anchorage height is sufficient to prevent collision with the ground. Also, ensure lateral movement from fixed anchorage does not create a swing fall hazard.
- Identification – anchorage points should be pre-planned and clearly identified to employees.

3.6.3. Full-body Harness

Full-body harnesses must also be worn and properly anchored when employees are working from aerial lifts, scissor lifts, suspended work platforms, suspended scaffolds, and similar equipment.

Full-body harnesses must fit and be worn properly with the straps tucked so as not to be caught on equipment or otherwise cause a hazard. Chest straps must be worn between the chest and collarbone and the rear D-ring being worn between the shoulder blades.

Body belts are allowed for positioning only. They are not allowed for fall arrest.

3.6.4. Snaphooks

Only self-closing, self-locking snaphooks are allowed for fall protection use.

Snaphooks must open and close properly and be fully closed around their anchorage point.

Locking mechanisms shall be functionally checked before each use.

3.6.5. Shock Absorbers (Deceleration Devices)

Shock absorbers

- Are a required component of an overall fall protection system and
- Minimize loads experienced by anchorage and personnel.

3.6.6. Lanyards

Always use the shortest possible lanyard length.

Self-retracting lanyards are preferred unless they create more of a hazard.

Lanyards shall be anchored at a location to limit the free fall distance to no more than six feet.

Lanyards must be used with a shock absorber unless the fall distance is shortened enough to limit the fall force to 1,800 pounds.

Lanyards must be maintained free of knots.

No more than one employee may be attached to the same lanyard.

Dual or “Y” lanyards may be required to achieve 100% fall protection in some work situations.

When not in use, the lanyard must be secured in a fashion as to not cause a tripping hazard or become entangled in equipment.

Lanyards may only be choked back on onto itself if the manufacturer allows it.

Flexible steel cable lanyards shall not be used by personnel performing work on or in close proximity to electrical equipment. A non-conductive lanyard must be used.

3.6.7. Positioning Devices

Positioning devices can only be used in combination with a fall arrest system when working 4 feet or more above a walking/working surface.

Positioning devices shall be rigged such that an employee cannot free fall more than 2 feet (.9 meters).

Positioning devices shall be secured to an anchorage, which is capable of at least twice the potential impact load or 3,000 lbs (13.3 kN), whichever is greater.

All snap hooks used shall be locking type and shall be properly sized to attach to the member to which they are connected.

3.6.8. Retractable Devices and Self-Retracting Lifelines

Retractable devices are designed to arrest a fall within 2 feet (0.6 m).

Locking mechanism must be tested before each use.

Lifeline must be pulled out and inspected for cuts, fraying, or other signs of damage.

Use taglines to make the device accessible from the ground.

Taglines must be used to prevent the uncontrolled retraction of these devices.

Retractable devices should only be attached to overhead anchorage.

Retractable devices attached to fixed anchorage must be used with the wearer at less than a 45-degree angle from the device to reduce the hazards of a swing fall.

Only retractable devices bearing current manufacturer's certification shall be used.

3.6.9. Vertical Lifelines

Vertical lifelines may only be used by one employee at a time.

Vertical lifelines should be protected from sharp, abrasive edges.

Vertical lifelines must be equipped with a formed eye termination at one end for suspension from the anchorage point and must extend below the lowest level of travel.

The lower end must be either attached to a second anchor point or weighted to provide stability and tension.

Rope grab devices must be compatible with the type and size of rope or cable used and should remain above the shoulders of the user. Only non-trailing type rope grab devices shall be used for vertical lifelines constructed of steel cable.

Manufacturers will specify maximum lanyard length for use on their vertical lifelines—usually 3 feet (1 m).

Vertical lifelines used on rope grab systems require additional clearance distance considerations that include lifeline stretch.

3.6.10. Horizontal Lifeline Systems

Horizontal lifelines shall be designed, installed, and used under the supervision of a Qualified Person, as part of a complete personal fall arrest system, which

- Maintains a safety factor of at least two, or
- Is composed of a manufactured system and installed under the supervision of a Competent Person and used in compliance with all manufacturers' requirements.

Horizontal lifeline (HLL) systems require additional clearance distance considerations that include the lifeline deflection and elongation associated with cable sag during loading and the use of an in-line energy absorber when used.

Employees must be instructed how to install and use the HLL system.

Intermediate stanchions/posts should have a hands-free pass though feature which eliminates the need to disconnect.

Lifelines should be located overhead to minimize the fall distance and to provide sufficient fall clearance distance.

In-line energy absorbers should be considered to minimize arresting forces on anchor points.

HLL's should be properly anchored and tensioned to designers' and manufacturers' specifications.

Only permit use by the number of employees designated by the design.

Retractable devices are preferred over lanyards to minimize fall distance.

3.6.11. Fall Distance

A fall protection system must not allow for more than a six-foot (2 m) free fall.

The fall protection system must be used and secured in a fashion so that the user cannot contact the next lower level should a fall occur. This requires calculating a clearance distance that includes:

- Free fall distance,
- System elongation, e.g., vertical lifeline or in-line energy absorber,
- Deceleration distance of shock absorbers,
- Employee height,
- Deflection in horizontal life line (HLL) system, and
- A minimum safety factor of 2 feet (0.6 m).

3.7. Rescue

Site management must ensure that personnel can be promptly rescued or self-rescue themselves, should a fall occur. The availability of rescue personnel, aerial lifts, ladders, other rescue equipment or rescue services and response time should be evaluated prior to elevated work taking place.

3.8. Equipment Storage

Fall protection equipment must be stored in a clean dry location away from exposure to abrasive materials, cutting tools, equipment or materials, excessive heat, direct sunlight, and chemicals.

Full-body harnesses should be hung by the D-ring for storage.

3.9. Inspections

Fall protection equipment must be inspected by the user prior to each use.

Site management shall designate a Competent Person to conduct inspections of jobsite fall protection equipment. Inspections must be conducted at least quarterly, although monthly inspections are preferable. Inspection results must be documented. (See Figure 3 for a sample form.)

Some types of fall protection equipment, such as self-retracting lifelines, require periodic re-certification by the manufacturer at scheduled intervals. The Competent Person must be familiar with these requirements and have a documented re-certification performed, as required.

The Competent Person shall utilize the specific fall protection equipment manufacturer's inspection instructions and the following information to perform inspections.

3.9.1. Inspection of Harnesses, Lanyards, and Lifelines

Inspections shall evaluate:

Harnesses	**Lanyards and Lifelines**
Stitching	Frayed/Broken Strands
Rivets	Burns
Buckles	Cuts
Buckle Tabs	Tears
"D" Rings	Snap Hooks
Rust and Abrasion	Connectors
Burns, Cuts, Tears	Corrosion

Equipment found to be defective must be immediately removed from service, tagged as defective and repaired, or destroyed and replaced.

3.9.2. Inspection Markings

Fall protection equipment, which has been satisfactorily inspected, shall be marked and/or color-coded with vinyl tape or some other secure means to designate current inspection.

Care should be used not to cover any equipment feature/component vital to inspection or performance, such as stitching, grommets, adjusting mechanisms, labels, etc., with the tape or marking means.

3.10. Training

Fall arrest system training must include the proper use, care, and limitations of fall protection equipment prior to being allowed to use the equipment. A Competent Person must be designated to provide instruction.

Training must, at a minimum, address the following areas.

- Company fall protection policy
- How to evaluate fall hazards
- Fall prevention measures
- Equipment use, care, and limitations
- Proper fitting and wearing of fall protection equipment
- Requirements and proper use of anchor points
- Inspection

Use training modules made available through the EHS Department and manufacturer specific information.

All fall protection training must be documented. Documentation must be signed and dated by the employee and instructor and maintained in the employee's safety training record.

Retraining is required annually or when previous training is rendered obsolete due to

- Changes in the activity/workplace,
- Changes in the fall protection equipment/system, or
- A demonstrated improper use or misunderstanding of fall protection systems.

4.0 REFERENCES AND RELATED DOCUMENTS

29 CFR 1926.500 – 503, Fall Protection

29 CFR 1910.66, Appendix C, Personal Fall Arrest Systems

ANSI Z359.1, 1992, Fall Protection in General Industry

ANSI 1264.I 2002, Safety Requirements for Workplace Floor and Wall Openings, Stairs and Railing Systems

NIOSH, Worker Deaths By Falls, NIOSH (DHHS) Publication No. 2000-116

EHSP 17.3

EHSP 17.9

EHSP 18.3

5.0 FIGURES

Minimum Requirements for Fall Prevention Systems

Fall Arrest System Checklist

Fall Protection Equipment Inspection Report

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Figure 1

Minimum Requirements For Fall Prevention Systems

GUARDRAILS

Must be surfaced in a way to prevent punctures, lacerations, and snags.

Top Rail

- Capable of supporting 200 lbs. of force applied in an outward or downward direction with less than 3 inches deflection with no permanent deformation
- Should be 42 inches high, but can be no less than 39 inches high and no more than 45 inches high

Mid Rail

- Capable of supporting 150 lbs. of force applied in an outward or downward direction with no permanent deformation
- Maximum opening of 19 inches between rails

Wood

- At least 2” by 4” toprail and at least 1” by 6” midrail
- Vertical uprights located on 8-foot maximum centers
- Minimum 1,500 psi construction grade lumber

Pipe

- 1.5” outside diameter on 8-foot maximum centers for vertical uprights

Steel

- 2” by 2” by ⅜ ” angle iron on 8-foot maximum centers for vertical uprights

Wire Rope

- ¼ ” diameter cable stretched taunt, less than 3 inch deflection, flagged at 6 ft. intervals with high visibility materials

TOEBOARDS

- Capable of supporting 50 lbs of force applied in an outward or downward direction
- 3½ inches high, minimum

RESTRAINT LINES

- Capable of 3,000 lb. tensile load
- Capable of supporting 400 lbs or twice the employees weight, whichever is greater
- Limit travel so no edges are reachable in any direction

DESIGNATED AREAS

- Use only if low sloped area (less than or equal to 4 on 12; vertical to horizontal)
- System must be erected six feet or more from the unprotected edge
- Access path with warning lines to ladders, storage areas, etc.
    - Stanchions — Capable of 16 lbs tipping strength horizontally
    - Line/Rope — Capable of 500 lbs break or tensile strength, between 34” and 39” above the work surface, flagged at six-foot intervals with high visibility materials.

Figure 2
Fall Arrest System Checklist

ANCHORAGE POINTS

Do workers know appropriate anchorage points for each task that requires a fall arrest or restraint system?

Has the anticipated load/force at each anchorage point been determined by a Qualified Person?

Are all anchorage points capable of supporting at least 5,000 pounds (22.2 kN) per person attached, or is the complete fall arrest system designed by a Qualified Person and rated at a safety factor of at least two (twice the anticipated load/force)?

Are all anchorage points for body harnesses and lanyards located at shoulder height and are anchorage points for self-retracting devices located overhead or have appropriate provisions been made by the Qualified Person?

Are anchorage points independent of the working platform (e.g. guardrail systems)?

If the lifeline (vertical/horizontal), lanyard, or self-retracting device is not permanently attached to an anchorage point at the elevated work area, is the first worker up or the last worker down protected while climbing?

Is there sufficient clearance below the anchorage to avoid striking an object or the ground?

HARNESSES

Are full-body harnesses issued to all employees who may be exposed to fall hazards?

Are harnesses inspected regularly for wear, abrasion, broken stitching, and missing hardware?

Have workers been instructed how to wear, use, inspect, and store harnesses?

LANYARDS

Is the lanyard length as short as necessary and in no case greater than six feet?

Does the lanyard have a shock-absorbing feature?

Has the lanyard being used in a choker hitch been designed to choke back onto itself?

Is the anchorage point at back D ring level or higher?

RETRACTABLE DEVICE

Are workers properly trained to use a retractable device?

Is the retractable device under a regular maintenance and inspection program (e.g. cable damage, expiration date, etc.)?

Is the retractable device anchored overhead?

Does the locking mechanism work?

Is the retractable device cable accessible from the ground?

HORIZONTAL LIFELINES

Has the horizontal lifeline system been designed by a Qualified Person (e.g. fall arrest supplier or engineer)?

Have the anchorage points been designed to withstand twice the anticipated load?

Has the designer of the system approved the number of workers who will be using it?

Is an energy absorber required in the horizontal lifeline to reduce the anchorage loads?

Has the appropriate fall arrest system been selected to minimize free fall and fall arrest forces?

Does the horizontal lifeline have the required initial tension and sag?

Has the clearance distance been calculated to ensure the employee doesn't strike a lower level?

Has the location and height of the lifeline been determined (shoulder level/overhead)?

Has the rigging hardware (shackles, turnbuckles, eyebolts, Crosby clips) at the anchorage connections been sized (2:1 safety factor) and installed correctly?

Is the horizontal lifeline free from signs of wear or abrasion?

Have all employees been instructed in the proper installation and use of the horizontal lifeline system?

VERTICAL LIFELINES

Does the lifeline have a minimum breaking strength of 5,000 pounds (22.2 kN)?

Is the lifeline protected from abrasive or cutting edges?

Are weights being used at the bottom of the lifeline to tension it properly?

Is the lifeline long enough to reach the ground and to prevent a rope grab from running off it?

ROPE GRAB DEVICES

Is the rope grab compatible with the lifeline (check with the fall arrest equipment/rope supplier)?

Is the rope grab in operational condition?

Is the rope grab equipped with a locking mechanism that prevents unintentional opening of the device and subsequent disengagement from the lifeline?

Is the rope grabs "up" direction marked properly so that the equipment can be attached to the line correctly?

Is the rope grab lanyard for trailing rope grab 3 feet (0.9 m) maximum and shock absorbing?

OTHER CONSIDERATION

Does the clearance distance measured form the anchorage point include: a) free fall distance, b) length of lanyard/device, c) elongation of shock absorber, d) height of person, e) stretch in lifeline, f) sag and deflection during fall arrest, g) 2-foot (0.6 m) safety factor?

Have pendulum-swing fall hazards been considered?

Have safe methods to rescue fallen workers been planned?

Is all of the fall-arrest equipment free of potential damage from concrete and welding operations, chemical corrosion, or sandblasting?

Are all components of the system compatible (e.g. is the retractable device approved for use on a horizontal lifeline, correct hook on lanyard for choker hitch)?

Have employees been properly trained in the following issues?

- Manufacturer's recommendations, restrictions, instructions, and warnings
- Location of appropriate anchorage points, and attachment techniques
- Problems associated with free fall and clearance distances, and the use, inspection, and maintenance of fall arrest equipment

Does a Competent Person perform training and are training records documented?

Have employees been instructed to remove fall arrest equipment/devices from service once a fall has been arrested?

Is the worker always protected when working at elevations above six feet (1.8 m)?

Is a plan needed for tethering tools?

Figure 3

Fall Protection Equipment Inspection Report

Date:_____ Color Code(s) For Year/Quarter:_____

Jobsite/Location:_____

Inspected By:_____

FULL BODY HARNESSES

Number Inspected:_____ Number Pass:_____ Number Failed:_____

LANYARDS

Number Inspected:_____ Number Pass:_____ Number Failed:_____

FALL PROTECTION COMPONENTS & HARDWARE: Anchorage Connectors, Caribiners, Slings, and Chokers

Type:_____ No. Inspected:_____ No. Pass:_____ No. Failed:_____

Type:_____ No. Inspected:_____ No. Pass:_____ No. Failed:_____

Type:_____ No. Inspected:_____ No. Pass:_____ No. Failed:_____

PORTABLE FALL PROTECTION SYSTEMS: Retractables, Vertical Rope or Cable Grabs, and Horizontal Rope or Cable Lifelines

Type:_____ No. Inspected:_____ No. Pass:_____ No. Failed:_____

Type:_____ No. Inspected:_____ No. Pass:_____ No. Failed:_____

Type:_____ No. Inspected:_____ No. Pass:_____ No. Failed:_____

FIXED FALL PROTECTION SYSTEMS: Fixed Cable, Rail, or Trolley Systems

System Identification:_____ Pass:____ Fail:____

System Identification:_____ Pass:____ Fail:____

System Identification:_____ Pass:____ Fail:____