



Personal Fall Arrest Systems

Falls are one of the leading causes of fatalities in the construction industry, and are preventable if the right equipment is used correctly. Death and injuries from falls can be reduced and prevented by using a personal fall arrest system. It is important for employers and employees to fully understand how to properly use a personal fall arrest system. To do this, follow the *ABC's* of fall protection outlined below.

Anchorage: An anchorage is used to anchor the personal fall arrest system to a secure point of attachment on the structure. This must be used only for the attachment of personal fall arrest systems, and it must be capable of supporting at least 5,000 pounds per employee attached. Examples of anchorages include structural steel members, precast concrete, and wood trusses. Inappropriate anchors would be fluid pipes, handrails, and electrical conduits.

Body Harness: In order to be effective, a personal fall arrest system should use a body harness, which distributes fall forces over the upper thighs, pelvis, chest, and shoulders. The harness should fit snug, but comfortably on the employee. A body belt alone should not be used because it can cause internal injuries in the event of a fall. The body harness attachment should be in the center of the employee's back, near shoulder level, or above the head. This allows the user to work in the harness and will provide the safest arrest in the event of a fall.

Connectors: Connectors, such as shock absorbing lanyards, and self-retracting lifelines, connect the worker's harness to the anchorage. Lanyards are made of webbing, and they must incorporate a shock absorber. All snaphooks and carabiners used with connectors must be self-locking to reduce the possibility of a rollout or accidental disengagement. It is important to use the connectors in accordance with the manufacturer's recommendations, as there are many incorrect ways to use connectors which can be very dangerous.

Lifelines

There are two types of lifelines, vertical and horizontal. A vertical lifeline typically holds only one employee. The lanyard moves with the employee, and will hang vertically in the event of a fall. A horizontal lifeline connects to anchorages at both ends to stretch horizontally. A personal fall arrest system can be attached to the horizontal line instead of directly to the anchorage, as long as special precautions are met. When using a horizontal lifeline, certain things need to be taken into account (see numbers 1-4 on the following page).

- 1) Limit the distance a worker can fall. A greater sag in the horizontal line will mean a further fall.
- 2) Minimize the forces on the connectors at the anchorages. The optimum angle for the sagging of a horizontal lifeline is about 30 degrees. Any greater and the risk of falling too far and striking the ground is raised. A lesser degree of sag will dramatically increase the stress on the anchorage points. The anchorages should be able to withstand 5,000 pounds of force each, at a 30 degree sag angle. At a 15 degree sag angle, they must withstand 10,000 pounds of force, and at a 5 degree sag angle, they must be able to withstand 30,000 pounds of force.
- 3) Extreme care must be used if a horizontal line is used to tie-off multiple employees. The force of a fall from one employee can cause other employees to fall as well. Horizontal lifelines should have the strength to support a fall impact load of at least 5,000 pounds per employee using the lifeline.
- 4) Because of the complexity of these horizontal lifelines, they must be designed, installed, and used under the supervision of a qualified person, and must only be used as part of a complete fall arrest system that maintains a safety factor of at least two.

Additional Factors to Consider

Length: A retractable lanyard will not recoil during a fall; they just lock at their current length. If the ground is 10 feet away, and an employee wanders 15 feet away from their anchorage, they will hit the ground. It is also important to note that with the harness connection between the shoulder blades, the employee's feet are roughly another 5 feet below, which should also be taken into consideration.

Swing: When wearing a personal fall arrest system, employees must remain within 30 degrees of the anchorage. Outside of the 30 degree safe zone, employees who fall risk swinging into the structure they are working on or a nearby structure, which can also cause serious injuries.

Wear and tear: Fall protection equipment should be visually inspected before each use for frayed edges, broken fibers, pulled stitches, cuts, chemical damage, and distorted or broken connectors. If any damage is found on fall protection equipment it should be removed from service immediately.

Rescue: Have a rescue plan in place, and review the rescue plan with all employees. Employees should be trained to promptly rescue others in need, and how to rescue themselves when necessary.

For more information regarding fall protection and personal fall arrest systems, please contact Acadia's Virtual Loss Control Team at 207-874-5701 or virtuallc@acadia-ins.com.

Sources:

1. "Horizontal Lifeline," *Iron Worker Safety*. <http://ironworkersafety.com/id12.html> (accessed May 6, 2020).
2. "OSHA Technical Manual Section V Chapter 4" *United States Department of Labor*. 2013, https://www.osha.gov/dts/osta/otm/otm_v/otm_v_4.html#vertical (accessed May 6, 2020).
3. "Ch. 9: What is a Personal Fall Arrest System?" *3M Fall Protection*. 2013, <https://www.youtube.com/watch?v=hpXkaJGXJ5k> (accessed May 6, 2020).
4. "Personal Fall Arrest Systems" *United States Department of Labor*. 2000, <https://www.osha.gov/SLTC/etools/construction/falls/fallarrest.html> (accessed May 6, 2020).

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