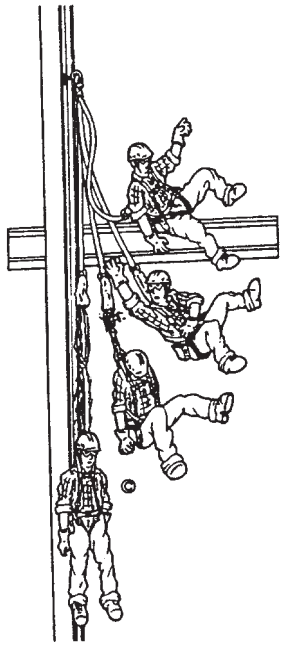
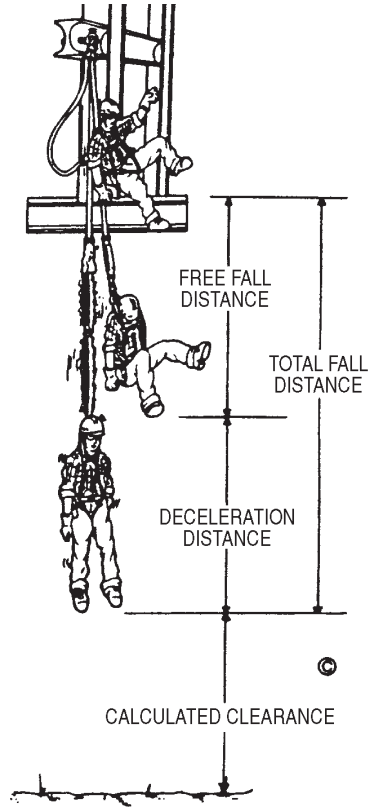
SWING FALL HAZARD

Swing fall is a pendulum-like motion that can occur when a worker moves in a horizontal direction away from a fixed anchorage, and then falls. While the force generated in a swing fall is the same as the force in a vertical fall, there is a potential hazard of colliding with a structure such as a building or platform.



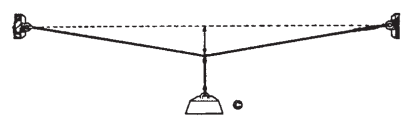
ENERGY ABSORBER

A fall of even a few feet will create tremendously high impact forces to both the fallen worker and the entire fall protection system. High impact forces could cause significant injury, even if a worker is in a full body harness. This force could also stress the anchor point beyond a safe working load. The best method of reducing impact force is to use a personal energy absorber (EAP); this is usually achieved by creating friction as it dissipates energy of the fall through distance. The energy absorber will reduce impact forces considerably, effectively reducing impact loading to the fallen individual, connecting means, anchorage connector and the anchor. A lanyard with an integrally connected energy absorber offers uncomplicated use; this type of lanyard is also less likely to be altered. NOTE: With the use of an energy absorber, one must take into account extended fall distance with elongation and deployment.



TOTAL FALL DISTANCE

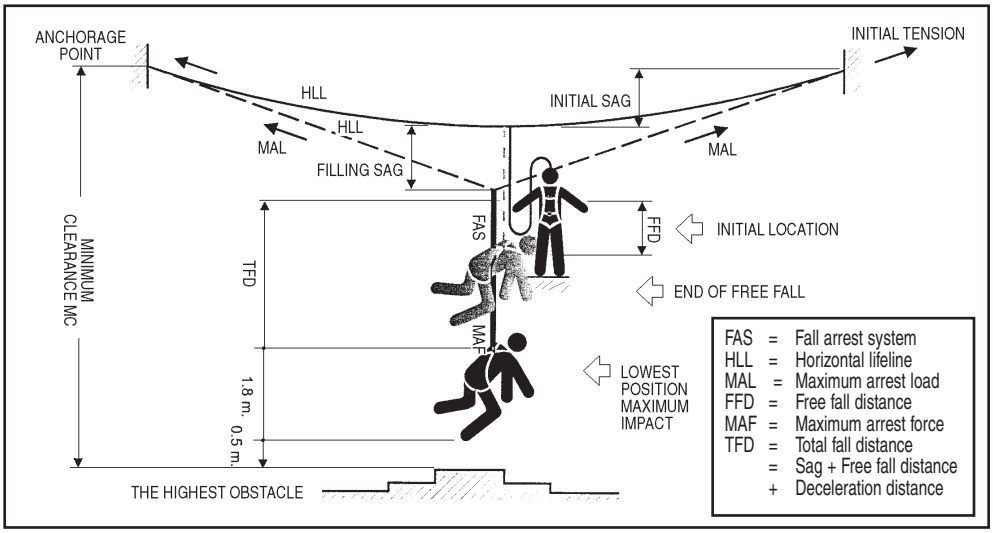
Total fall distance is the maximum vertical change in distance from the bottom of the individual's feet at the onset of a fall to the position of the feet after the fall is arrested—including free fall distance and deceleration distance. Total fall distance can be affected by many factors including: (a) Length of connecting means, (b) Position and height of anchorage relative to work platform, (c) Position of attachment and D-ring slide on the full body harness, (d) Deployment of shock absorber, (e) Movement in lifeline, (f) Initial position of worker before free fall (i.e. sitting, standing, etc.)



FORCE VECTOR

Recognizing a force vector is very important when tensioning ropes or cables in the horizontal plane, as occurs with a lifeline or deflection line. Allowing sufficient sag in the line is one method of reducing forces to end anchorages. Other methods would include the use of inline energy absorbers.

Follow manufacturer's recommendations for erecting temporary horizontal lifelines. It should be noted that there are no defined standards for horizontal lifeline anchorages. When an energy absorber is not used, the anchorages should each be rated for at least 16,000 lbs., unless the entire system is designed by a professional engineer. Engineering considerations include length of span, nature of lifeline, number of users, amount of pretension required, in-line energy absorption, and the dynamic or static nature of the connecting means.



HORIZONTAL LIFELINE SAFETY

Horizontal lifelines often act as a "floating" anchorage allowing a worker to travel horizontally for long distances without the risk of large pendulum or swing falls. When a worker falls into a horizontal lifeline, the forces acting on the anchorages are multiplied several times from their vertical component. This must be taken into account when selecting the anchorages and the anchorage connectors. The lifeline must be made of low stretch material to limit the amount of sag produced during a fall thereby limiting the amount of required clearance to obstructions below.

INSPECTION & MAINTENANCE

HARNESS INSPECTION

FREQUENCY

- Before each use, visually inspect per steps listed below.

- The full body harness must be inspected by a competent person other than the user at least annually. See section 5.2 and 5.3 for guidelines. Record the results of each formal inspection in the inspection log found in section 9.0.

IMPORTANT

If the Full Body Harness has been subjected to fall arrest or impact forces, it must be immediately removed from service and destroyed. Extreme working conditions (harsh environments, prolonged use, etc.) may require increasing the frequency of inspections.

INSPECTION STEPS

Step 1. Inspect harness hardware (i.e. buckles, D-rings, back pad, keepers, etc.); these items must not be damaged, broken, distorted, or have any sharp edges, burrs, cracks, worn parts, or corrosion. Check any PVC coated hardware for cuts, rips, tears, holes, etc. in the coating. Make sure buckles work freely. Inspect parachute buckle spring.

Step 2. Inspect webbing; material must be free of frayed, cut, or broken fibers; check for tears, abrasions, mold, burns, discoloration, etc. Inspect stitching; check for pulled or cut stitches. Broken stitches may be an indication that the harness has been impact loaded and must be removed from service.

Step 3. Inspect labels; all labels should be present and fully legible. Labels must be replaced if illegible or missing.

Step 4. Inspect each system component or subsystem per associated manufacturer's instructions.

Step 5. Record the inspection date and results in the inspection log.

If inspection reveals a defective condition, remove unit from service immediately and destroy or contact factory authorized service center for repair.

HARNESS MAINTENANCE, SERVICING, STORAGE

- Clean full body harness with water and mild soap solution. Wipe off hardware with clean, dry cloth, and hang to air dry. Do not force dry with heat. An excessive buildup of dirt, paint, etc. may prevent the full body harness from working properly, and in severe cases, degrade the webbing to a point where it weakens and should be removed from service.

- If you have any questions concerning the condition of your harness, or have any doubt about putting it into service, contact Bairstow.

- Additional maintenance and servicing procedures (i.e. replacement parts) must be completed by a factory authorized service center be in writing. Do not attempt to disassemble the unit.

- Store full body harnesses in a cool, dry, clean environment out of direct sunlight. Avoid areas where chemical vapors may exist. Thoroughly inspect the full body harness after any period of extended storage.

LANYARD INSPECTION

IMPORTANT

Extreme working conditions (harsh environment, prolonged use, etc.) may require increasing the frequency of inspections.

INSPECTION STEPS

Step 1. Inspect Energy Absorbing Lanyard or Energy Absorber component hardware (i.e. snap hooks, adjusters, swedges, thimbles, etc.) These items must not be damaged, broken, distorted, or have any sharp edges, burrs, cracks, worn parts, or corrosion. Make certain the connecting hooks work properly. Hook gates must move freely and lock upon closing. Make certain adjusters (if present) work properly.

Step 2. Inspect the Energy Absorbing Lanyard or Energy Absorber component per the following, as applicable:

WEBBING AND STITCHING: Inspect webbing. Material must be free of frayed, cut, or broken fibers. Check for tears, abrasions, mold, burns, discoloration, etc. Inspect stitching. Check for pulled or cut stitches. Broken stitches may be an indication the Energy Absorbing Lanyard or Energy Absorber component has been impact loaded and must be removed from service. The webbing must be free of knots, excessive soiling, heavy paint buildup, and rust staining. Check for chemical or heat damage (this type of damage may show up as a brown, discolored, or brittle areas). Check for ultraviolet damage (this type of degradation is indicated by discoloration and the presence of splinters or slivers on the webbing surface). All of the above factors are known to reduce webbing strength. Damaged or questionable webbing should be replaced. NOTE: For Model ZM901, inspect for cuts or tears in the tubular jacket, if core web (white color) is exposed, remove from service immediately.

SYNTHETIC ROPE: Inspect rope for concentrated wear. Material must be free of frayed strands and broken yarns, cuts and abrasions, burns, discoloration, etc. The rope must be free of knots, excessive soiling, heavy paint buildup, and rust staining. Rope splices must be tight, with five full tucks, and thimbles shall be held by the splice. Check for chemical or heat damage (this type of damage may show up as brown, discolored, or brittle areas). Check for ultraviolet damage (this type of degradation is indicated by discoloration and the presence of splinters and slivers on the rope surface). All of the above factors are known to reduce rope strength. Damaged or questionable ropes should be replaced.

WIRE ROPE: Inspect entire length of wire rope. Always wear protective gloves when inspecting wire rope. Inspect for broken wires by passing cable through your gloved hands, flexing it every few inches to expose breaks. Broken wires can be removed by bending the wire back and forth parallel to the rope length. Do not attempt to pull wires out of rope. Replace the wire rope if there are six or more randomly distributed broken wires in one lay, or three or more broken wires in one strand in one lay (A "lay" of wire rope is the length of wire rope that it takes for a strand [the larger groups of wires] to complete one revolution or twist along the rope). Replace the wire rope if there are any broken wires within 1 inch of the metal compression sleeves (swedges) at either end of the assembly. Wire rope should be free of corrosion.

Step 3. **ENERGY ABSORBING COMPONENT:** Inspect Energy Absorber to determine if it has been activated, there should be no evidence of elongation. Make certain energy absorber cover is secure and not torn or damaged.

BEFORE EACH USE of any fall protection equipment, carefully inspect it to assure that it is in serviceable condition. Check for worn or damaged parts; ensure all hardware (i.e. snap hooks, swedges, thimbles, etc.) are present and secure and are not distorted, or have any sharp edges, burrs, cracks, or corrosion. Make sure self locking snap hooks or carabiners work properly. Inspect rope/webbing/wire rope for wear, cuts, burns, frayed edges, breaks or other damage. Do not use if inspection reveals an unsafe condition.

Safety Standards for Fall Protection in the Construction Industry (OSHA 1926.501 - Duty to have fall protection)

(a) General. (l) This section sets forth requirements for employers to provide fall protection systems. All fall protection required by this section shall conform to the criteria set forth in 1926.502 of this subpart.

(b)(l) Unprotected sides and edges. Each employee on a walking/working surface (horizontal and vertical surface) with an unprotected side or edge which is 6 feet (1.8m) or more above a lower level shall be protected from falling by the use of guardrail systems, safety net systems, or personal fall arrest systems.

Editors Note: The requirements stated in (b)(l) are similar for: leading edges, hoist area, holes, formwork and reinforcing steel, ramps, runways and other walkways, excavations, dangerous equipment, overhead bricklaying and related work, roofing work on low-slope roofs, steep roofs, precast concrete erection, residential construction and wall openings.

(OSHA 1926.502 - Fall protection system criteria and practices)

(a) General. (l) Fall protection systems required by this part shall comply with the applicable provisions of this section.

(2) Employers shall provide and install all fall protection systems required by this support for an employee, and shall comply with all other pertinent requirements of this subpart before that employee begins the work that necessitates the fall protection.

(d) Personal fall arrest systems. Personal fall arrest systems and their use shall comply with the provisions set forth below. Effective January 1, 1998, body belts are not acceptable as part of a personal fall arrest system. Note: The use of a body belt in a positioning device system is acceptable and is regulated under paragraph (e) of this section.

(5) Snaphooks shall be sized to be compatible with the member to which they are connected to prevent unintentional disengagement of the snaphook by depression of the snaphook keeper by the connected member, or shall be a locking type snaphook designed and used to prevent disengagement of the snaphook by the contract of the snaphook keeper by the connected member. Effective January 1, 1998, only locking type snaphooks shall be used.

(15) Anchorages used for attachment of personal fall arrest equipment shall be independent of any anchorage being used to support or suspend platforms and capable of supporting at least 5,000 pounds (22.2 kN) per employee attached, or shall be designed, installed, and used as follows: (i) as part of a complete personal fall arrest system which maintains a safety factor of at least two; and (ii) under the supervision of a qualified person.

(16) Personal fall arrest systems, when stopping a fall, shall: (i) limit maximum arresting force on an employee to 900 pounds (4 kN) when used with a body belt; (ii) limit maximum arresting force on an employee to 1,800 pounds (8 kN) when used with a body harness; (iii) be rigged such that an employee can neither free fall more than 6 feet (1.8m), nor contact any lower level; (iv) bring an employee to a complete stop and limit maximum deceleration distance an employee travels to 3.5 feet (1.07m); and, (v) have sufficient strength to withstand twice the potential impact energy of an employee free falling a distance of 6 feet (1.8m), or the free fall distance permitted by the system, whichever is less.

(e) Positioning device system. Positioning device systems and their use shall conform to the following provisions:
(l) Positioning devices shall be rigged such that an employee cannot free fall more than 2 feet (.9m).
(2) Positioning devices shall be secured to an anchorage capable of supporting at least twice the potential impact load of an employee's fall or 3,000 pounds (13.3 kN), whichever is greater.

(OSHA 1926.503 - Training requirements)

(a) Training Program. (l) The employer shall provide a training program for each employee which might be exposed to fall hazards. The program shall enable each employee to recognize the hazards of falling and shall train each employee in the procedures to be followed in order to minimize these hazards.

Fixed Ladders (OSHA 1910.27)

(d.5) Ladder safety devices may be used on tower, water tank and chimney ladders over 20 feet in unbroken length in place of cage protection. No landing platform is required. All ladder safety devices, such as those that incorporate life belts, friction brakes, and sliding attachments, must meet the design requirements of the ladders that serve.

Ladder Safety Devices (ANSI A14.3-1992)

7.1.3 The ladder safety device shall be designed to absorb the impact of a solid object weighing at least 500 pounds in a free fall of 18 inches.

7.1.4 Design and installation of mountings shall not reduce the design safety factors of the fixed ladders.

7.3.1 The safety sleeve shall be of a type which can be operated entirely by the person using the ladder safety device. It shall permit the person using the ladder safety device to ascend or descent without having to continually manipulate the safety sleeve. 7.3.3 The maximum length of the connection between the centerline of the carrier and the point of attachment to the body belt shall not exceed 9 inches.

Powered Platforms For Building Maintenance (OSHA 1910.66)

(j) Personal Fall Protection. Employers must provide personal fall arrest systems meeting the requirements outlined. Requirements include the following:

Anchorages to which personal fall arrest equipment is attached shall be capable of supporting at least 5,000 pounds (22.2 kN) per employee attached, or shall be designed, installed and used as part of a complete personal fall arrest system which maintains a safety factor of at least two, under the supervision of a qualified person.

Personal fall arrest systems shall, when stopping a fall: 1) limit maximum arresting force on an employee to 900 pounds (4 kN) when used with a body belt; and 2) limit maximum arresting force on an employee to 1,800 pounds (8 kN) when used with a body harness.

Personal fall arrest systems shall be rigged such than an employee can neither free fall more than 6 feet (1.8m), nor contact any lower level.

Personal fall arrest systems or components subjected to impact loading shall be immediately removed from service and shall not be used again for employee protection unless inspected and determined by a competent person to be undamaged and suitable for reuse.

Before using a personal fall arrest system, and after any competent or system is changed, employees shall be trained in accordance with the requirements of paragraph 1910.66 (i)(l), in the safe use of the system.

Personal fall arrest systems shall be inspected prior to each use for mildew, wear, damage and other deterioration. Defective components shall be removed from service if their strength or function may be adversely affected.

Permit-Required Confined Spaces (OSHA 1910.146)

(a) Scope and application. This section contains requirements for practices and procedures to protect employees in general industry from the hazards of entry into permit-required confined spaces.
(k)(3) To facilitate non-entry rescue, retrieval systems or methods shall be used whenever an authorized entrant enters a permit space, unless the retrieval equipment would increase the overall risk of entry or would not contribute to the rescue of the entrant. Retrieval systems shall meet the following requirements:
(i) Each authorized entrant shall use a chest or full body harness, with a retrieval line attached at the center of the entrant's back near shoulder level, above the entrant's head, or at another point which the employer can establish presents a profile small enough for the successful removal of the entrant. Wristlets may be used in lieu of the chest or full body harness if the employer can demonstrate that the use of a chest or full body harness is infeasible or creates a greater hazard and that the use of wristlets is the safest and most effective alternative.
(ii) The other end of the retrieval line shall be attached to a mechanical device or fixed point outside the permit space in such a manner that rescue can begin as soon as the rescuer becomes aware that rescue is necessary. A mechanical device shall be available to retrieve personnel from vertical type permit spaces more than 5 feet deep.