Honeywell

Is Your Fall Protection Equipment A Silent Hazard?

Each year over 100,000 injuries and deaths are attributable to work-related falls. According to the National Safety Council, falls are one of the leading causes of deaths in the workplace. In addition to permanent injuries and lost lives caused by falls, businesses lose *billions of dollars* each year from significant increases in insurance premiums, workers' compensation claims, product liability costs, and other related expenses. According to Boston-based Liberty Mutual, the leading private provider of workers' compensation insurance in the United States, on-the-job injuries cost employers nearly $1 billion *per week* in payments to injured employees and their medical care providers.

Has anyone noticed?

The manufacture and sales of fall protection products have steadily grown over the past decade, however the number of injuries and deaths associated with falls from heights has also increased.

What's the problem?

Several factors have contributed to these alarming and disturbing statistics:

- All fall protection equipment deteriorates with use and exposure over time, regardless of brand and/or manufacturer.
- Equipment is not inspected often enough for wear and damage.
- Proper training is not provided – often, the wrong equipment is selected for a particular situation, and equipment is not worn properly.

Those specifying or using fall protection equipment know these factors to be valid (at least at some subliminal level). Yet, it is very likely that a high percentage of equipment used on jobsites throughout North America, today, would 'fail' to meet industry standards if exposed to a fall. Meaning, someone could be seriously injured or die.

How do we know?

On any given day, a visit to any jobsite in the country will unveil fall protection equipment being used that is potentially dangerous because of wear, neglect, misuse or age/exposure. Over the past several months shock-absorbing lanyards from a variety of manufacturers have been voluntarily removed from job sites for safety qualification, and 85% of the product samples FAILED standard safety tests (*in accordance with ANSI Standards*). These are surprising and

alarming facts that the fall protection community has overlooked, while touting the many standards and regulations to which their products are tested and deemed 'safe'.

The recent test program focused on shock-absorbing lanyards from eight manufacturers and showed a variety of performance failures:

- **100%** did not pass visual inspection criteria [weld splatter, webbing cuts/abrasions, broken stitching, frayed/burned webbing, chemical damage, discoloration, deformed hardware (cracks/rough or sharp edges) and/or loose, distorted or broken grommets, etc.]
- **6%** the webbing actually broke
- **24%** elongated over the 42 inch standard
- **83%** had fall arrest forces over 900 lbs. (ANSI), with 9% over 1,800 lbs. (OSHA)
- **6%** were previously deployed, but still in active service when removed from the job site
- **42%** had hardware with visible defects
- **9%** had snap hooks that opened during testing
- **9%** had webbing that was knotted

The safety community must recognize these facts and take a pro-active approach. Workers are being seriously injured in falls with equipment that *initially* passed industry safety standards. More troubling, worn and damaged equipment is still accessible even though it will not perform as designed in the event of a fall.

Best intentions.

Safety directors and supervisors need to make a concerted effort to keep unsafe and potentially life-threatening equipment out of the hands of those working at heights. Workers, through proper training and attentive daily inspection, will be safer and injury-free. Taking equipment out of service too early is a better alternative than explaining to a worker's family that there has been a serious accident . . . adopt a *Smart Policy* -- when in doubt, throw it out! In addition, some manufacturers have implemented a return-and-inspect program for equipment, ask your supplier for details.

Personal Fall Arrest System.

A Personal Fall Arrest System is comprised of three (3) key components – anchorage connector; bodywear, and; connecting device. While a lot of focus has been given to anchorage connectors and bodywear (full-body harnesses) when discussing fall protection, the connecting device (a

shock-absorbing lanyard or self-retracting lifeline) between these two components actually bears the greatest fall forces during a fall.

Historically, harnesses are replaced on the jobsite more often than connecting devices. The connecting device is by far the most critical component in surviving a fall safely and should be carefully inspected and replaced prior to use at the slightest indication of wear or damage. While each component of a personal fall arrest system is vital to worker safety, the connecting device -- selection, materials, construction and inspection/maintenance needs -- make it the *critical link* in assembling a safe fall protection system. Careful consideration and attention must be given before, during and after a connecting device has been selected.

For example, once an anchorage, such as an I-beam, is located, its strength or its ability to arrest a fall can be determined easily. Likewise, the full-body harness offers an inherently high safety factor, since fall forces are distributed throughout the body over many webbing components, including chest, shoulder, waist and legs. No single component is subjected to the total fall force; however, a shock-absorbing lanyard or self-retracting lifeline is comprised of only one strength member (i.e., webbing, rope, steel cable). Substandard design, poor-quality workmanship, excessive exposure to UV light or chemicals, physical damage, improper storage or inadequate inspection can lead to lanyard/lifeline failure.

What's needed?

Proper training, maintenance and inspection of all components of the Personal Fall Arrest System are crucial in creating a safe work environment. Even the highest quality products require regular inspection, especially when safety and well-being of the user are at stake. Remember: adopt a *Smart Policy* – when in doubt, throw it out.

Shock-Absorbing Lanyards (SAL)

The SAL is a flexible line connecting device positioned between a full-body harness and a point of anchorage. There are two basic categories of lanyards: non-shock-absorbing and shock-absorbing. Non-shock-absorbing lanyards are used for restraint only, while shock-absorbing lanyards (*tubular* and *pack* style) are designed to arrest a free-fall while keeping the fall arrest forces below standard requirements.

Tubular and *pack* style shock-absorbing lanyards extend deceleration distance during a fall, significantly reducing fall-arresting forces by 65 to 80 percent below the threshold of injury as specified by the Occupational Safety and Health Administration (OSHA) and recommended by the American National Standards Institute (ANSI).

The six-foot, *tubular* SAL is the most popular design and includes a special shock-absorbing inner core material surrounded by a heavy-duty tubular outer jacket that doubles as a back-up web lanyard. In accordance with OSHA regulations, all lanyards manufactured today are required to

have self-closing, locking snap hooks to reduce the possibility of unintentional disengagement, or "roll-out."

Shock-absorbing "*packs*" also are commonly available which can be attached or, in some cases, built-in to non-shock-absorbing lanyards to give them shock-absorbing capability. Should a fall occur, an inner core smoothly deploys to slow the fall. Better models feature a back-up safety strap inside the pack for greater security.

Self-Retracting Lifelines (SRL)

Self-Retracting Lifelines are available in an array of styles from palm-sized personal fall limiters to heavy-duty, permanently installed units; and in a variety of working lengths ranging from nine feet to over 175 feet. Lifelines are available in webbing, galvanized steel cable or stainless steel wire rope.

All designed with a quick-activating braking system to quickly arrest a free-fall, SRLs are an effective alternative to shock-absorbing lanyards when fall clearance is a concern. SRLs typically incorporate an integral load indicator that visually identifies when the unit has been involved in a fall and must be discarded or returned to the manufacturer for repair.

Know and Understand the Regulations

OSHA 29 CFR subpart M states:

"When stopping a fall, a personal fall arrest system must:

* Limit maximum fall arresting force on an employee to 1,800 pounds when used with a full-body harness; (*ANSI Z335.1 requires fall arrest forces stay below 900 lbs. during a six foot fall*)

* Limit free fall distance to less than 6 feet, and be rigged in such a way as to prevent contact with a lower level;

* Bring the employee to a complete stop while limiting maximum deceleration distance; and

* Have sufficient strength to withstand twice the potential energy of a worker free-falling from a distance of 6 feet (or the free fall distance permitted by the system, whichever is less)."

While these regulations apply primarily to construction activities, many other industries follow these guidelines for greater jobsite safety.

Selection Considerations

To select the appropriate SAL or SRL for a specific application, consider the following factors:

* Your company's fall protection plan, which may have specific requirements in addition to those of OSHA.

* The type of work being performed and the specific conditions of the work environment, including the presence of moisture, dirt, oil, grease, acids and electrical hazards, as well as the ambient temperature. For example, steel cable lanyards are particularly strong, heat-resistant and durable; however, they are not suitable for use around high-voltage sources because they readily conduct electricity.

* Potential fall distance. This distance is greater than most people think, since the length of the lanyard plus the length that the shock-absorber will elongate during deceleration both must be considered.

* The compatibility of system components. A personal fall arrest system should be designed and tested as a complete system. Components produced by different manufacturers may not be interchangeable.

* Selection criteria also should include a scrutiny of product quality. For example, OSHA regulations call for limiting fall forces on an individual wearing a full-body harness to 1,800 pounds. Likewise, the ANSI Z359.1 standard for equipment manufacturers suggest that non-shock-absorbing lanyards limit fall forces to 1,800 pounds -- an infeasible option with commercially available lanyard materials -- and 900 pounds for shock-absorbing lanyards. Most reputable lanyard manufacturers design to the 900-pound standard, and state this on the label of the lanyard. While OSHA regulations are the law and are enforced by a federal agency, ANSI standards are self-enforced by individual manufacturers – there is no enforcement body, and no inspectors. Hence, the buyer cannot take stated performance per ANSI guidelines for granted.

OSHA's non-mandatory guidelines for personal fall arrest systems states:

"Before purchasing or putting into use a personal fall arrest system, an employer should obtain from the supplier information about the system based on its performance during testing so that the employer will know if the system meets this standard. Testing should be done using recognized test methods."

It is imperative to underscore the importance of buying from well-known, reputable manufacturers that adhere to ANSI standards, and can readily supply documentation of test performance. Often, third-party certification is available from the manufacturer to assure compliance. Certification to ISO-quality is another measure of a reliable supplier.

Proper Use and Testing

Training employees in the proper use of a fall arrest system is required by OSHA. When it comes to the proper use and inspection of lanyards and self-retracting lifelines, always follow the manufacturer's instructions. The following guidelines may provide clarification:

* The maximum working load of shock-absorbing lanyards and self-retracting lifelines is 310 pounds, unless otherwise stated.

* All SALs and SRLs should be connected to the back D-ring of a full-body harness. The only exception is a personal fall limiter unit that is also designed to be attached to the back D-ring of a harness.

* The opposite end of a SAL or SRL should be connected to the anchorage or anchorage connector. Make sure all equipment is compatible by using products produced by the same manufacturer.

* Locking snap hooks with gate openings larger than 1 inch should not be connected to the back D-ring of a harness.

* Make certain the SAL or SRL has not been deployed/activated; or the shock absorbing lanyard does not exceed the length specified by the manufacturer before deployment.

* Do not use SALs with non-locking snap hooks.

* Always visually check that locking snap hooks and carabiners freely engage on harness back D-rings and anchor points, and that keepers are completely closed and locked.

* Be certain that locking snap hooks are positioned so that keepers are never load-bearing from the front or side, unless the snap hooks are engineered to withstand gate load capacity from any angle, such as with specially designed tie-back lanyards.

* Never disable or restrict snap hook locking keepers.

* Do not attach multiple SALs together; never tie knots in lanyards.

* Never use a SAL or SRL for purposes other than those for which they are designed.

SAL or SRL?

The available overall fall clearance will determine which connecting device should be used in a work situation. Always calculate your fall distance and check below the work area to make sure that the potential fall distance is clear from obstructions.

Proper SAL and SRL use requires calculating fall clearance whenever your work position changes. Employees should anchor in a manner that limits free fall to the shortest possible distance (6

feet, maximum). Employee training on calculating fall distance is required in all fall protection programs.

Environmental conditions also must be scrutinized. Synthetic materials, such as nylon and polyester webbing, must be protected from weld splatter, hot sparks, open flames or other heat sources, as well as from electrical hazards and moving machinery. Heat-resistant materials are advisable for these applications. Polyester is recommended in certain chemical or acidic environments. Never use natural materials (i.e. cotton, etc.) as part of a fall arrest system.

Continual Inspection

SALs and SRLs are designed for rugged work environments; however, to maintain long service life and to meet OSHA regulations, certain inspection procedures should be followed:

* Connecting devices should be visually inspected prior to each use, and defective units removed from service. A good rule is: When in doubt, throw it out!

* Any SAL or SRL that has been subjected to impact loading must be immediately removed from service.

To inspect webbing on SALs and SRLs, bend the webbing over a pipe or mandrel. Begin at one end and work to the opposite end. Slowly rotate, checking the entire circumference for cuts, snags or breaks. Swelling, discoloration, cracks, hardness, shiny spots, a brittle feel and/or charring are signs of chemical or heat damage. Paint which penetrates and dries on webbing restricts fiber movement. Drying agents and solvents in some paints also cause chemical damage. Observe closely for breaks in the stitching.

Follow the same web inspection procedures for *tubular* shock-absorbing units. In addition, inspect for signs of deployment. Some *tubular* shock-absorbing lanyards have a warning flag that is visible when the unit has seen an impact load. This indicates that the shock absorber has been activated, and that the unit must be removed from service.

Pack style shock-absorbing lanyards must also be inspected. Examine the outer portion of the pack for burn holes and tears. Stitching on areas where the pack is sewn to D-rings, belts or lanyards should be examined for loose strands, rips and deterioration.

Rotate the steel cable or wire rope whether on a lanyard or self-retracting lifeline, watching for cuts, frayed areas or unusual wear patterns. Cable or wire rope is the number one component to be replaced on self-retracting lifelines when they are returned for service.

To inspect rope lanyards, rotate the rope while inspecting it from end to end for fuzzy, worn, broken or cut fibers. Areas weakened from extreme loads will be noticeably smaller in diameter than the original rope. Following a short break-in period, the rope diameter should be uniform throughout. Inspect the thimble and ensure that it is firmly seated in the eye of the splice. The

splice should have no loose or cut strands. The edges of the thimble must be free of sharp edges, distortion or cracks.

On all connecting devices, inspect locking snap hooks closely for hook and eye distortions, cracks, corrosion or pitted surfaces. The keeper (latch) should seat into the nose without binding, and should not be distorted or obstructed. The keeper spring should exert sufficient force to firmly close the keeper. Keeper locks must prevent the keeper from opening until the user physically opens it.

Care and Maintenance

Simple care and adhering to the manufacturer's instructions will prolong the durable life of shock-absorbing lanyards and self-retracting lifelines and ensure reliable performance. Here are some other important tips:

* For all webbing components, wipe off surface dirt with a sponge dampened with plain water and squeezed dry. Dip the sponge in a mild solution of water and commercial soap or detergent. Work up a thick lather with a vigorous back-and-forth motion, then wipe with a clean cloth. Allow the webbing to dry away from excessive heat or sun.

* Store equipment after use in a clean, dry area, free from excessive heat, steam, fumes and corrosive agents. Avoid long exposures to sunlight.

Conclusion

* Train employees in regulations and proper equipment use.

* Closely follow the use and inspection guidelines and purchase only the highest-quality products from reputable manufacturers.

* Request performance test data or verification of third-party testing from the manufacturer.

* Call upon the manufacturer to help answer questions and to recommend appropriate equipment systems.

Building an enduring culture of safety can be the most cost-effective and proven accident-prevention process. Creating and internalizing this culture is the most successful way to minimize costly injuries and maintain a safer, more productive and engaged workforce. Honeywell Safety Products knows that building a safety of culture is not just a set of rules; it's a new philosophy of preventing injury in the workplace. Safety is no longer something defined and enforced by management,; rather, it becomes the right and responsibility of each and every employee. A culture of safety refers to the extent to which individuals and groups commit to personal responsibility for safety; act to preserve, enhance and communicate safety concerns; strive to actively learn, adapt and modify behavior based on lessons learned from mistakes; and strive to

be honored in association with these values. A culture of safety exists when safety is everyone's priority and workers make safe choices on their own.