Leading and Sharp Edge
Applications: What You Need to Know When It Comes to Fall Protection

Professional football players need the best protective equipment available to stay safe on the playing field, from helmets to pads to mouth guards and beyond. Construction workers who work on Lambeau Field, the historic football stadium in Green Bay, Wisconsin, face even greater hazards and need the best protective equipment as well—particularly fall protection when they are working at height. They also must use appropriate equipment and use it properly to stay safe.

Two construction crewmembers who worked on the renovation of Lambeau Field know the value of quality fall protection equipment and proper training firsthand: the first fell from a steel beam six stories above ground. Less than two months later, another worker slipped from a beam and fell. Both escaped injury and possible death because of their fall protection equipment. Fortunately, these workers not only walked away after these accidents—remarkably, they were able to go back to work the same day.¹

But what if they had been using the wrong products, or the wrong anchorage points, or had failed to take into account swing fall hazards or sharp edge hazards? Those workers may never have returned to work!

Many personal fall arrest systems rely on lifeline materials to perform under less than ideal conditions. But there are some applications where use of the wrong product—for example, where a lifeline contacts with a sharp edge—could have catastrophic results.

Product testing and certification organizations in the U.S. and around the world, including the American National Standards Institute (ANSI), the Canadian Standards Association (CSA) and CE in Europe, have been re-examining how lifelines in fall protection systems perform when subjected to these “sharp edge” applications. They’ve also placed a new focus on “leading edge” applications. Through this analysis, they have concluded that these two environments are unique in fall protection and involve increased risks due to the lifeline cutting, fraying or becoming otherwise compromised.

Understanding Leading and Sharp Edges

**Sharp Edge**
A sharp edge is one that, for practical purposes, is not rounded and has the potential to cut most types of lifelines. The ANSI standard for sharp edges, for example, involves testing the fall arrest device's lifeline over a piece of steel bar with a radius of no more than 0.005" (5 one thousands of an inch). If the lifeline is cut or severely damaged, the device fails the test and does not comply with ANSI.

**Leading Edge**
To visualize a leading edge, imagine a worker installing steel decking on a new building. Now imagine the worker’s fall protection system is anchored at foot level behind him. As the worker moves out and away from the anchor point while installing the decking, the worker is exposed to a potential fall over the edge of the building or the edge of an elevated platform.
Unique Risks of Leading and Sharp Edge Applications

In sharp edge applications the primary risk is the lifeline can be frayed or severed. Examples of other related risks with falls over leading edges include:

- **Increased Fall Distance:** When workers are attached at foot level, as they often are in leading edge applications, they will fall farther than they would if they were anchored at shoulder height or above. The image on the previous page (see Image A) demonstrates the sequence of events that happen when a worker falls off a leading edge, and why a worker needs additional clearance. The required clearance when anchored at foot level varies by product so make sure to reference the product instructions.

- **Lock-up Speed:** Self-retracting lifelines react to a fall when the lifeline accelerates out of the housing at a certain velocity, generally about 4.5 feet per second. When self-retracting lifelines are anchored at foot level, the lifeline does not achieve the required acceleration during a fall until after the user’s D-ring passes over the leading edge and below the level of the anchor. This means the user has already fallen about 5 feet before the self-retracting lifeline device will engage to arrest the fall.

- **Increased Fall Arrest Forces:** Falling further means the impact on the body through the fall protection system will potentially be higher when the fall is arrested. This is why many leading edge and sharp edge rated products contain additional energy-absorbing devices.

- **Increased Potential for Swing Hazards:** If a worker falls, and is off to one side, he may swing like a pendulum. While this in and of itself is dangerous, the danger is compounded if the worker is on a sharp edge and the lifeline saws back and forth across that edge.

New Standards Call for Different Equipment

Previously, the industry made attempts to prevent hazards in sharp and leading edge applications. These solutions included attaching an energy absorber to standard self-retracting lifelines, protecting edges and elevating anchor points. While these efforts have been helpful, many organizations have now incorporated leading edge/sharp edge criteria into their standards, or are working toward this. This includes ANSI, CSA and CE standards for self-retracting devices. Through their testing and analysis, ANSI confirmed a number of assumptions, including the fact that products not specifically designed for foot level tie-off—the type of anchoring most often used in these applications—will generate forces far exceeding accepted safety parameters in the event of a fall.
In August 2012, ANSI released a new standard—ANSI Z359.14 on Self Retracting Devices (SRDs)—to address leading edge or sharp edge applications for self-retracting devices (SRDs). The Z359.14 standard includes significant changes to the design and testing of leading edge (LE) SRDs. It provides a baseline for manufacturers to test their products against, in order to ensure they are safe and compliant. It also requires manufacturers to provide new information in product user instructions and on product markings.

Compliant Products Available Specifically for Leading and Sharp Edge Applications

In response to these new ANSI standards, Capital Safety has developed a range of leading edge and sharp edge products to comply, including:

- **Nano-Lok edge Self Retracting Lifeline (SRL):** The Nano-Lok Edge is Capital Safety’s newest advanced technology—a personal SRL that can pass the most stringent leading edge standard set by ANSI Z359.14. It includes an 8-foot (2.4 meter) working length, an ergonomic and compact/lightweight design, and comes in single or twin 100% tie-off units. It’s specifically designed for foot-level tie-off and sharp edge applications and is ideal for direct connection to most harnesses. In addition, the Nano-Lok locks quickly—stopping a fall within inches—and provides more protection at low heights. Tension is always kept on the lifeline, which reduces dragging, snagging and trip falls.

- **EZ-Stop Leading Edge (LE):** Capital Safety’s EZ-Stop LE shock absorbing lanyards combine a set of “industry-first” advancements. They feature the world’s smallest and lightest shock absorber and are built with cable lanyard legs for leading edge work, foot level tie-off or applications with abrasive surfaces or environments.

- **Ultra-Lok SRL-LE:** The Ultra Lok SRL-LE is made of galvanized steel wire for added wear resistance and is 35% stronger than standard SRL cables with approximately 15% more surface area. It includes an external energy absorber to control arresting forces and help reduce cable damage.

- **Rebel SRL-LE:** The Rebel SRL-LE is an economical solution that allows users to tie off at foot level and was put through extensive sharp edge testing to ensure absolute protection against sharp, abrasive and leading edges. It features a stackable space-maximizing design and an impact indicator to provide easy verification of whether the equipment has been involved in a fall.

*More information about these products can be found on the Capital Safety website.*

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Both Compliant Equipment and Training Needed to Keep Workers Safe

While ANSI-compliant equipment is needed to keep workers on leading edges and sharp edges safe, it’s only effective if crews understand how to use it and why they need it. Proper training is essential to ensure that crews fully engage and understand the unique hazards related to sharp and leading edges. Capital Safety has experienced training instructors that will come on-site to teach in and around workers’ normal environment to help them better understand and avoid the hazards of sharp and leading edges.

In addition to designing and supplying compliant fall protection equipment to use in sharp and leading edge applications, Capital Safety offers a variety of training options related to these applications. They also support a fleet of demo trucks that go on-site to customer locations to give demonstrations. These fall protection demos allow workers to see firsthand the impact of a fall on a human body and to learn about the extreme forces generated during a fall arrest event. This experience helps workers understand why they need to protect themselves while working at height.

Greater Awareness Also Leads to Greater Safety

Fall protection experts agree that in addition to complying with the applicable standards, keeping workers safe at height also involves a much greater awareness of the unique fall protection risks that exist in particular applications, such as sharp and leading edge applications. This is particularly true for workers who have worked in sharp and leading edge environments for many years and have developed habits over time that may not be the safest practices in today’s environments.

All workers—and their employers—should be up-to-date on products, applications and training so that the appropriate equipment is used properly for any application faced by workers. In sharp and leading edge work, using a traditional product anchored at foot level may increase the risk of injury and create a false sense of security. Fortunately, Capital Safety offers a number of products specifically designed for foot level tie-off in sharp and leading edge environments. Please contact a Capital Safety representative or visit www.capitalsafety.com for additional information.

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