Internal Brake vs. Energy Absorber

Correcting a Common Misunderstanding with
ANSI Class 1 SRLs

By Zack Winters
Director of Product and Applied Engineering

FALLTECH®

Table of Contents

1. Introduction

For many years, safety professionals relied on a simple rule of thumb:

If a Self-Retracting Lifeline (SRL) has an energy absorber ("shock pack"), it must be a leading-edge device. If it doesn't have one, it must be an overhead SRL (now Class 1).

This idea became deeply ingrained in purchasing decisions, training materials, and field conversations. Over time it evolved into a broader assumption:

ANSI Class 1 SRL = Internal Brake Only

While common, this belief is not supported by the ANSI standard. It reflects historical product design trends—not an actual requirement.

Understanding how SRLs manage fall energy helps clarify why.

2. What Defines a Class 1 SRL

The ANSI Class 1 classification is based on performance and intended anchorage location, not on internal design.

A Class 1 SRL is engineered for anchorage at or above the worker's dorsal D-ring, where fall energy is generally lower than in below-D-ring applications.

Two Class 1 SRLs: external absorber (left) vs. internal brake (right). Note the size difference—internal brakes require more components and lifeline.

The ANSI Z359.14-2021 standard sets limits for:

- Maximum Arrest Force (MAF)
- Average Arrest Force (AAF)
- Arrest Distance (AD)

ANSI **does not** prescribe how an SRL must absorb fall energy.

A device may meet Class 1 performance limits using:

- An internal braking system
- An external tearaway energy absorber

The classification is determined by how the device performs during testing—not how it looks from the outside.

3. Why Internal Brakes Became Associated with Class 1

Historically, the first SRLs used internal brakes.

These systems typically use a pawl-and-ratchet locking system combined with friction braking inside the housing:

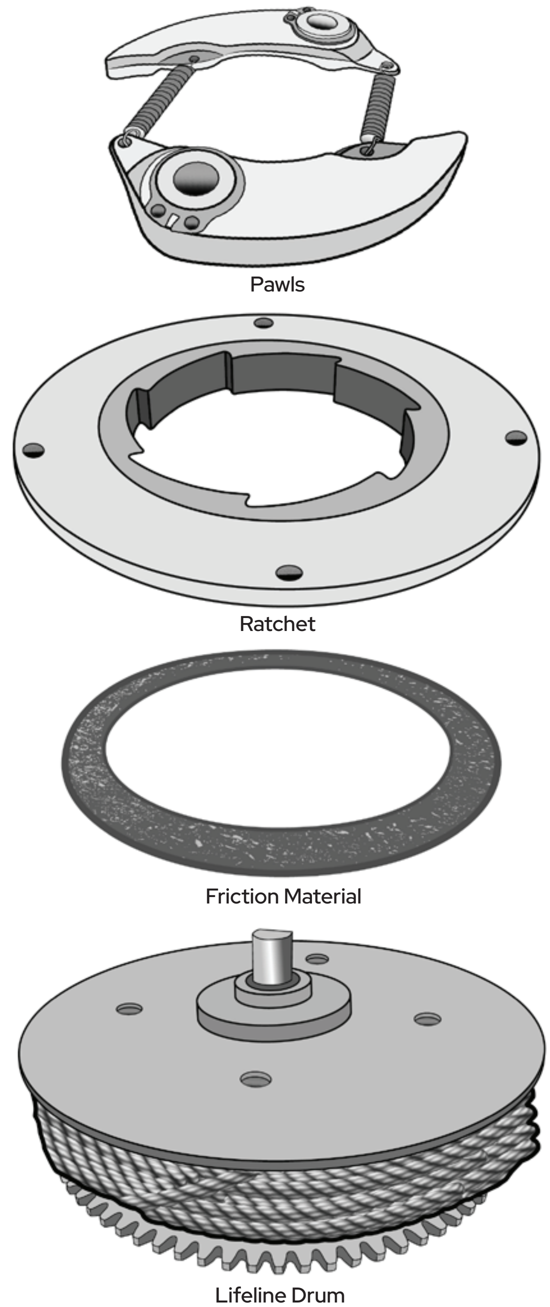
1. A sudden increase in lifeline speed triggers the pawl.
2. The pawl engages the ratchet, locking the drum.
3. The drum rotates against the friction material.
4. Friction slows the fall until the worker stops.

The ANSI Z359.14-2014 standard introduced leading-edge performance requirements, which drove manufacturers to add external shock packs to compliant designs. In ANSI Z359.14-2021, the standard formally defines Class 1 for overhead applications and Class 2 for leading-edge applications.

For a time, it seemed simple:

- Shock pack = leading edge
- No shock pack = overhead

But that distinction was never written into the ANSI standard. It reflected design conventions—not regulatory definitions.



4. A New Approach: External Energy Absorption

Modern SRL designs increasingly manage fall energy outside the housing using a tearaway-style energy absorber.

These absorbers are constructed by stitching layers of webbing together in a controlled pattern.

During a fall:

1. The SRL locks.
2. The energy-absorption webbing begins to tear.
3. Energy is absorbed as the webbing progressively deploys.

This controlled tearing reduces the force transmitted to the worker while slowing the fall.

A view of an external energy absorber in transparent cover. Notice the multiple layers of stitched webbing inside.

Functionally, both systems accomplish the same goal:

- Lock during a fall
- Manage deceleration
- Keep arrest forces within ANSI limits

The difference lies in where and how that energy is managed.

5. Lock-Up vs. Stopping: Understanding the Difference

Another source of confusion is the difference between lock-up and deceleration. When a tearaway energy absorber deploys, the process is visible. When an internal brake manages deceleration, it occurs inside the housing, out of view.

This visibility sometimes creates the impression that:

- Internal brakes stop the fall immediately.
- External absorbers add extra fall distance.

All SRLs include both phases:

1. **Lock-Up Distance**
   The short distance required for the device to engage.
2. **Deceleration Distance**
   The distance required to safely absorb fall energy.

Internal brakes manage deceleration within the device housing. External absorbers manage deceleration outside the housing. Both must still meet the same ANSI performance limits.

The difference is design architecture—not additional fall distance.

6. The Move Toward External Absorbers

Internal braking systems require a number of precise mechanical components:

- Brake discs
- Torque calibration
- Drum friction surfaces
- A reserve length of lifeline stored on the drum

That reserve lifeline is necessary so the drum can rotate during braking even when the device is near full extension. In practice, this often leads to larger housings and increased device weight.

External energy absorbers approach the problem differently.

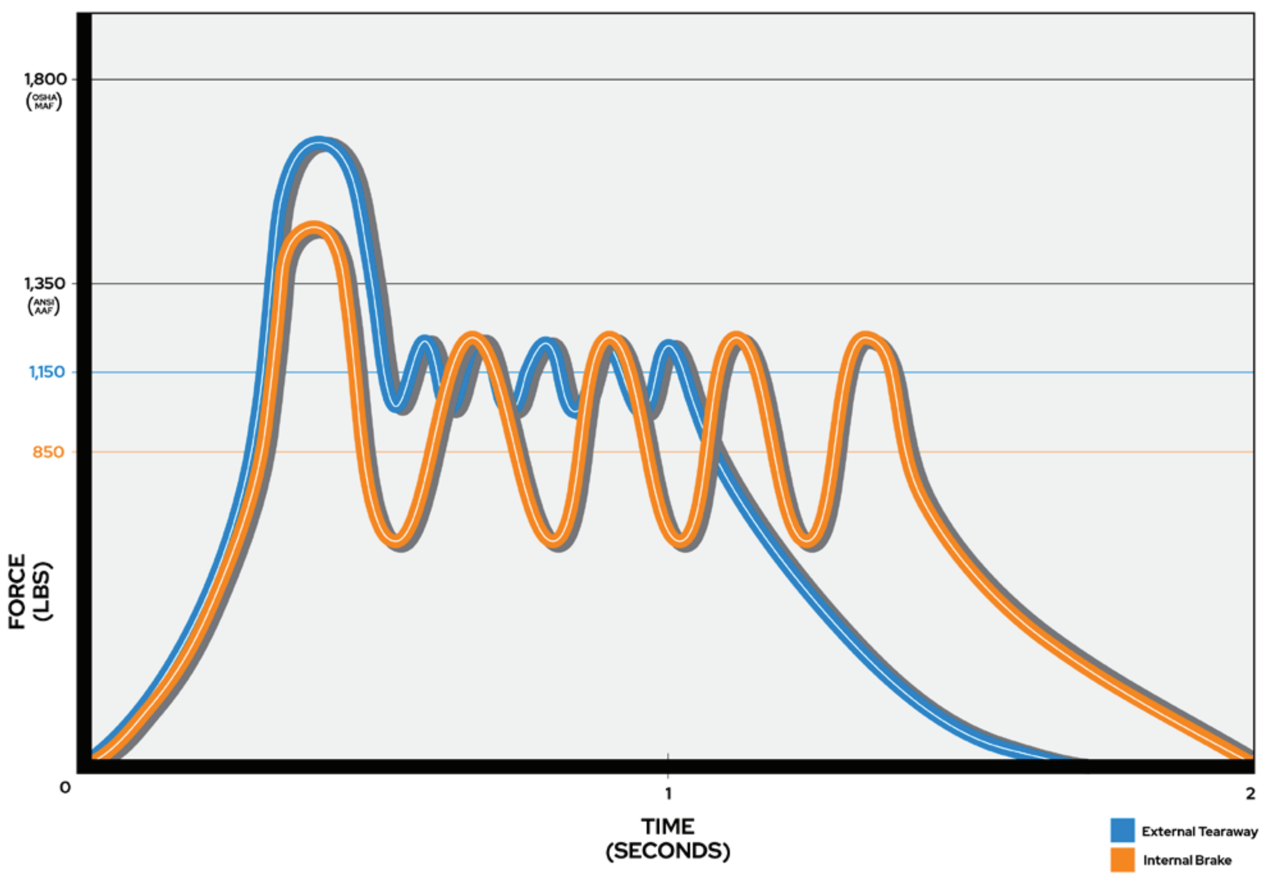
Because energy management occurs outside the housing, the internal mechanism can remain simpler and more compact. This approach can allow for:

- Reduced internal mechanical complexity
- More compact device architecture
- Lower overall weight

These advantages are particularly valuable for workers who carry SRLs throughout the workday or frequently reposition tie-off points.

As product engineering continues to evolve, many manufacturers have implemented external absorbers to achieve Class 1 performance while improving usability in the field.

Arrest Forces During a Fall



For reference only. Not real testing data.

7. What Safety Professionals Should Focus On

When evaluating SRLs, visual cues can be misleading.

Instead, selection decisions should focus on:

- ANSI classification
- Performance specifications
- Intended anchorage location
- Manufacturer documentation

A device without a visible shock pack is not automatically overhead only (Class 1). A device with an external energy absorber is not automatically leading-edge rated (Class 2). What matters is whether the device meets the required ANSI performance criteria for the intended application.

More manufacturers are adopting external energy absorbers on their ANSI Class 1 SRLs. This example shows an energy absorber in a protective body.

8. Conclusion

ANSI Class 1 SRLs are defined by performance and intended use—not by the presence or absence of an internal brake.

Internal braking systems were once the common design for all SRLs, which led to the widespread belief that Class 1 SRLs must rely on internal brakes. But that association reflects historical product design—not a requirement of the standard.

Today, Class 1 SRLs may use either:

- Internal friction braking, or
- External tearaway energy absorption

Both approaches can meet the same ANSI performance limits. However, modern external absorber designs can offer advantages in simplicity, weight, and compactness—factors that increasingly matter in real-world jobsite environments.

For safety professionals, the key is to evaluate SRLs based on performance data and proper application, rather than relying on visual assumptions about how the device manages fall energy.

Find the Resources to Keep Crews Safe:

FallTech.com

FALLTECH®

1306 S. Alameda St.
Compton, CA 90221-4803

Tel / 323.752.0066
Fax / 323.752.5613