



The content of this resource has been generously provided by the American Road & Transportation Builders Association.



# Advantages of Self-Retracting Lifelines for Bridge Work

A self-retracting lifeline (SRL) is a deceleration device. The SRL contains a drum-wound line that may be either slowly extracted from or retracted onto the drum under slight tension during normal worker movement. A fall automatically locks the drum and arrests the fall. In some cases, despite higher costs, the SRL provides distinct advantages over a lanyard or lifeline and lanyard combination:



Source: DBI Sala.

- **Reduced free fall compared with lanyard or lanyard-lifeline.** SRLs require less than two feet to arrest a free fall if the anchorage point is vertically above the worker versus 17.5 feet from an anchorage point for a shock-absorbing lanyard.
- **Reduced risk of impacting ground or other objects during a fall.** SRLs provide lower risk of hitting the ground or any other object at a lower level compared with the greater risk due to longer fall distance with a standard lanyard.
- **Easier rescue.** SRLs provide safer and easier rescue of a fallen worker compared with a standard lanyard. With an SRL, the fallen worker may self-rescue using a self-rescue pulley system attached near the SRL anchorage point. Some SRLs have built-in raise or lower options allowing coworkers to perform rescue with little risk. This must be part of the Rescue Plan. (A **Sample Fall Rescue Plan** is available from ARTBA.)
- **Reduced chance of tangles and trips while working.** SRLs reduce the chances of getting tangled and tripping compared with a standard lanyard or lanyard and lifeline because the SRL retracts automatically.

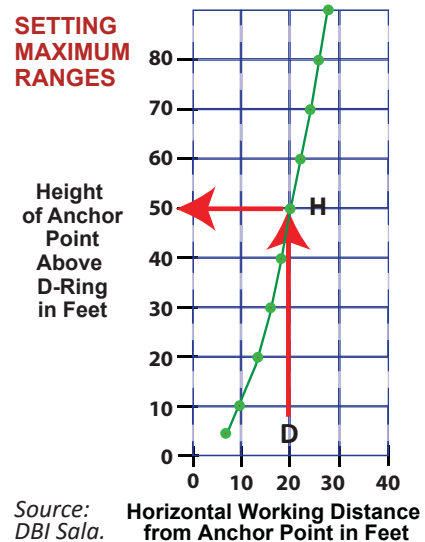
### Limitations

The horizontal distance for work from the anchor point with an SRL is limited, as it is with a lanyard and standard lifeline. The chart below shows safe maximum horizontal working distances for an SRL. Exceeding the distance shown in the chart may result in a hazardous pendulum swing. (**Preventing Swing Falls** is available from ARTBA.)

### Examples

Horizontally, the distance a worker in an SRL can move from the anchor point is limited – as it is with a lanyard and standard lifeline. Evaluate the examples below to see how the chart works.

1. If a worker would like to be able to work 20 feet from the anchor point of the SRL, how high above must the anchor point be placed?
  - Look across the chart horizontally on the horizontal working distance axis to the 20-foot mark. This is the desired horizontal working distance from the anchor point (D).
  - Follow the vertical up to intersect the green line. Then follow the green line back to the height line of anchor point above D-Ring on the left (H). In the example to permit 20 feet of horizontal movement, the anchor would have to be at 50 feet above D-Ring height.
2. If the only anchor point available is 30 feet above, how much horizontal working distance from the anchor point will be permitted?
  - In this case find the the height of anchor point above D-Ring (H) on the vertical axis. Follow it across to intersect the green line.
  - Now follow that point down to the axis for horizontal working distance from anchor point (D). The answer is about 15 feet working distance.



Not all SRLs are created equal! Some use wire rope; others use webbing. The choice is frequently based on the work performed. Some SRLs are small and lightweight, good for light duty jobs or where work takes place near the anchor location. Others are heavier for long-term work and may have retractable lines up to 100 feet or more in length. Some can switch between fall restraint or fall arrest modes, and some have built-in automatic rescue options, which are more protective and expensive. Some SRLs are designed for leading edge work where a wire rope or web can pass over a sharp angle or edge, or when workers must anchor near their feet. In every case workers must know the limitations of their SRLs. Several of the important SRL selection and use considerations appear on page 2.

### Important SLR Selection and Use Considerations

In bridgework SRLs may be used for leading edge work or where anchorage ends up near the worker's feet. These circumstances result in additional hazards addressed only by SRLs rated for leading edge work. These hazards, listed below, have resulted in the American National Standards Institute (ANSI) August 2012 Standard Z359.14 on Self Retracting Devices (SRDs).

● **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 required clearance when anchored at foot level varies by product. Therefore, contractors must follow the manufacturer's instructions.

● **Lock-Up Speed:** Self-retracting lifelines react to a fall when the line 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 farther 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:** Depending on a worker's position when a falls begins, the worker may swing like a pendulum after the fall is arrested. While swinging is a hazard under any circumstances, the danger is compounded if the worker's lifeline is strung taut over a sharp edge and saws back and forth. (See ARTBA's *Preventing Swing Falls in Bridge Work*.)



Source: New York State DOT.

Failure to use an SLR rated for leading edge work may result in excess fall forces applied to the worker's body or to the wire rope or webbing being severed by the edge over which the fall has occurred resulting in serious injury or death.



Source: CalTrans.

### Further Considerations

The Occupational Safety and Health Administration (OSHA) fall protection regulation for construction, CFR 29.1926 Subpart M, contains a non-mandatory Appendix C for use by employers in complying with fall protection requirements of 1926.502(d). Appendix C, Part II (a) provides guidance for "selection and use considerations" that impact SRLs and associated fall protection equipment. ([https://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=STANDARDS&p\\_id=10925](https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10925))

(1) ...Consideration should be given to the particular work environment. For example, the presence of acids, dirt, moisture, oil, grease, etc., and their effect on the system, should be evaluated. Hot or cold environments may also have an adverse effect on the system. Wire rope should not be used where an electrical hazard is anticipated. ...

(2) Where lanyards, connectors, and lifelines are subject to damage by work operations such as welding, chemical cleaning, and sandblasting, the component should be protected, or other securing systems should be used. ...

For example, if hot work of some kind – welding, torch-cutting, or burning – is performed, SRLs lines must meet American Society for Testing and Materials (ASTM F887) Arc Test and OSHA 1926.954(b)(1)(ii) requirements to show material will not burn through when slag hits it. Typically, wire-rope or para-aramid webbing meet these standards. Other synthetic fiber web SRLs can be cut, burned, melted, or otherwise damaged during such operations. In addition to the SRL, remember that workers' harnesses, slings, or other fall protection webbing may need to be fire-resistant.

---

The American Road & Transportation Builders Association's (ARTBA) membership includes private and public sector members that are involved in the planning, designing, construction and maintenance of the nation's roadways, waterways, bridges, ports, airports, rail and transit systems. Our industry generates more than \$380 billion annually in U.S. economic activity and sustains more than 3.3 million American jobs.

NSC Construction & Utilities Division is comprised of leading professionals and subject matter experts in this field. Thanks to these authorities, the National Safety Council can further its mission of eliminating preventable deaths at work, in homes and communities, and on the road. To learn more or join an NSC Division, visit [nsc.org/divisions](http://nsc.org/divisions).