UNITED STATES DEPARTMENT OF ENERGY - SLAC SITE OFFICE

Fall Protection Clearance Distances When Using a Leading Edge SRL

White Paper

Scott Wenholz, CIH

Tom Rizzi, CSP

9/18/2014

Revised 3/24/2015

Workers using Leading Edge Self-Retracting Lifelines (SRL-LE) mounted below the dorsal D-ring may not be adequately protected from striking a lower level because the information in equipment instruction manuals may not accurately represent the full payout of the fall arrest system.

Clearance Distances When Using a Leading Edge SRL

White Paper

Workers using Leading Edge Self-Retracting Lifelines (SRL-LE) mounted below the dorsal D-ring may not be adequately protected from striking a lower level because information in equipment instruction manuals may not accurately represent the full payout of the fall arrest system. It is important for those planning to use this type of equipment to call the manufacturer to obtain the information pertinent to the specific piece of equipment to be used.

When calculating clearance distances for a fall protection systems that use a SRL, a Competent or Qualified person would obtain the information needed from the equipment cut-sheets and instruction manuals for each piece of equipment. Typically, manuals are for an entire SRL model series and the maximum arresting distance is the same, regardless of a leading edge or non-leading edge rating. Each SRL of a particular manufacturer model series has the same clutch mechanism. Therefore, the documented arrest distance is based on an overhead placement only (Capital Safety engineer, personal communication, July 23, 2014; Miller I267 SRL Manual). The difference is the SRL-LE models may have an integrated shock pack, but the length of that shock pack is not listed. Some manufacturers have released technical bulletins, but only one manufacturer's technical bulletin has addressed the SRL-LE shock pack length to date. Therefore, the typical clearance distance calculation does not account for a potential full payout of the shock pack in addition to the SRL clutch mechanism.

For example, one company lists a maximum arrest distance of 42 inches (3'6") for their SRL-LE. This is the same arrest distance for all other SRLs in that series. Based on this information the clearance needed for a leading edge application, without accounting for the shock pack deployment, would be calculated as shown in Figure 1. (Note: this is for a fall perpendicular to the anchorage point and does not account for swing.)

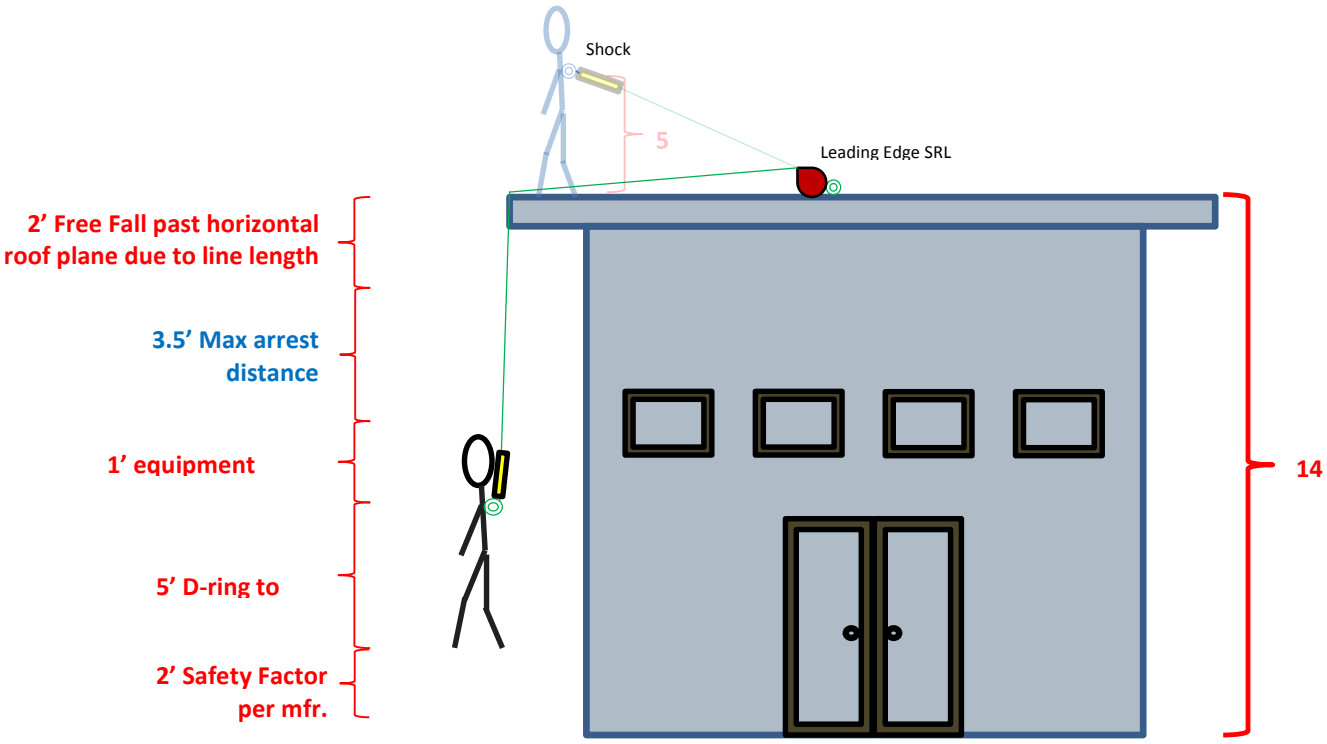

Figure 1 – 13.5 feet of clearance needed if shock pack does not deploy

Unlike the other models in that series, the LE version has an incorporated shock pack, but the length of that shock pack is not included in the cut-sheet, instruction manual, tech bulletins, or on the housing of the SRL-LE. After talking to a corporate engineer it was discovered that the integrated shock pack has a possible payout of 60 inches (5'). This means that the total possible payout of the system (SRL + shock pack) is 102 inches (8'6"). If a worst case scenario is assumed, the calculated clearance distance when using this model of SRL-LE would need to be five feet greater than what the manufacturer's instructions appear to require.

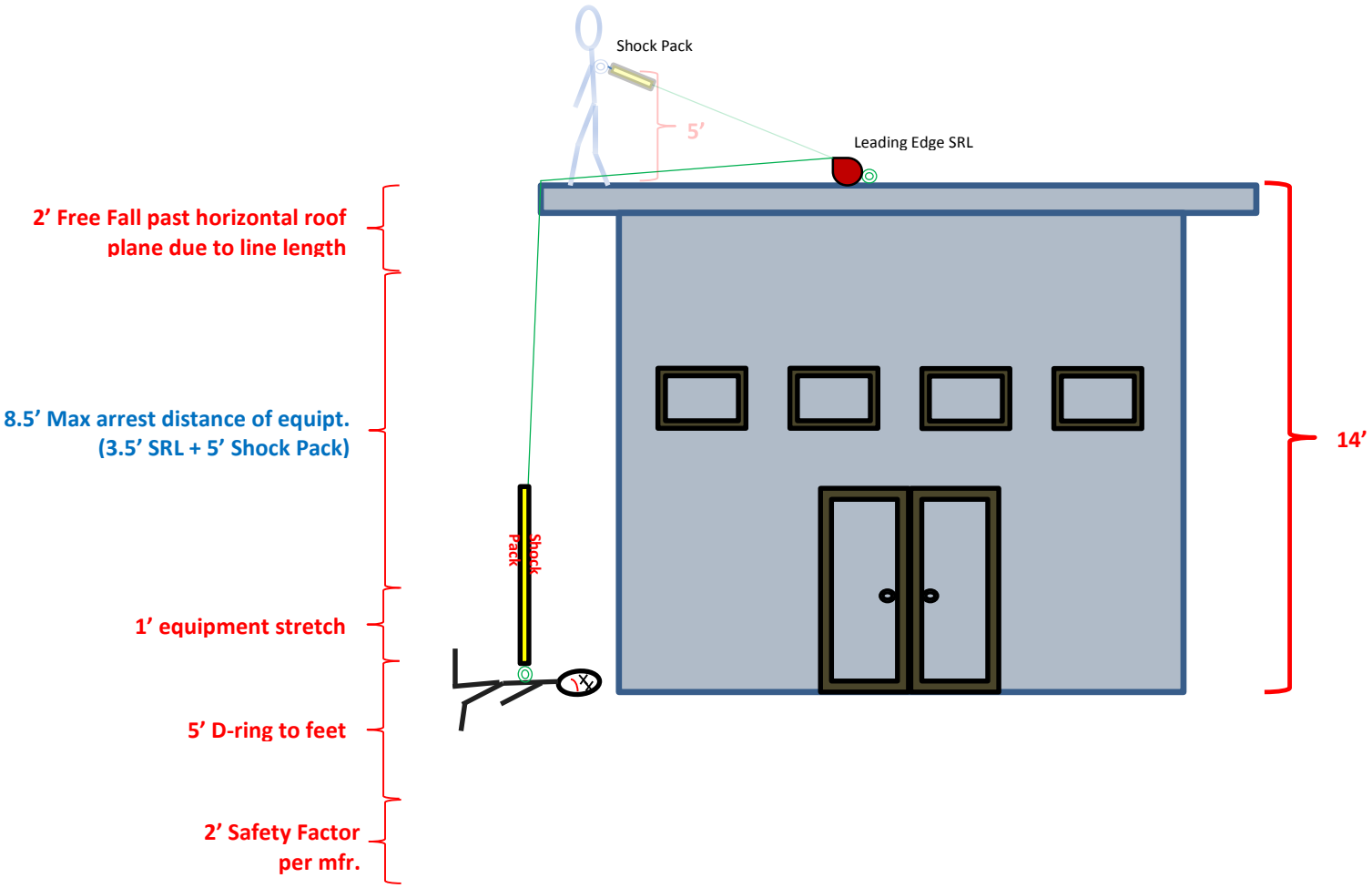

Figure 2 - 18.5 feet of clearance needed if SRL and shock pack fully deploy

This issue is not isolated to one SRL manufacturer. SRL-LE instruction manuals from other manufacturers also lacked information regarding the shock pack for SRL-LEs. Each manufacturer may have different specifications for their particular equipment. Data from the ANSI Z359.14-2012 testing protocol for one manufacturer's SRL-LE show arrest distances 75%-115% greater than the 42 inch maximum arrest distance listed in the equipment manual. Therefore, the conservative approach in calculating fall clearance distances would be to assume full payout of the fall arrest components (e.g. SRL + shock pack). Since this information is not available in the instruction manuals, the current information needs to be requested from the manufacturer. Additionally, it should be requested, in writing, from a manufacturer's engineer if possible.

Once this information is gathered, if the calculated clearance distance is still not adequate for full deployment of the arrest system, the following equation derived from ANSI Z359.6-2009 4.4.3.2.2.2 can be used to calculate the arrest distance based on the height and weight of individual workers[1].

$$x = \frac{ff_{max} \times w}{F_{avg} - w}$$

Where: x = Payout of the arrest system in feet.

ff_{max} = Maximum freefall distance in feet. Height of the worker will affect the potential freefall distance when tied off below the dorsal D-ring. This would be 7' for the above examples.

$w =$ Weight of the worker, tools, and equipment in pounds. Include a safety factor.

$F_{avg} =$ Average arresting force in pounds. Most fall protection components limit arresting forces to 900 lbs., but some may begin to pay out at lower magnitudes so a Qualified person should contact a manufacturer's engineer to fully understand this variable.

NOTE: this calculation does not consider the performance variations due to environmental factors, such as temperature and moisture.

In conclusion, although the probability of a full payout of the arrest system is low, it is important for fall protection Competent persons to evaluate clearance distances assuming a worst-case full deployment of the arrest system components. If there is not sufficient clearance distance in the worst-case scenario, a Qualified person should be consulted to calculate the arrest distance based on the above formula. It is important for Competent and Qualified fall protection persons to fully understand all components they intend to use in a fall arrest system so they can accurately inform workers of the limitations of that system and any additional risk.

For questions or comments, please contact Scott Wenholz at scott.wenholz@science.doe.gov or Tom Rizzi at Thomas.rizzi@science.doe.gov.

[1] Recommend arrest distance calculation be performed or verified by a Qualified fall protection person.