## Length of Fall (LOF) 6ft Free Fall Example
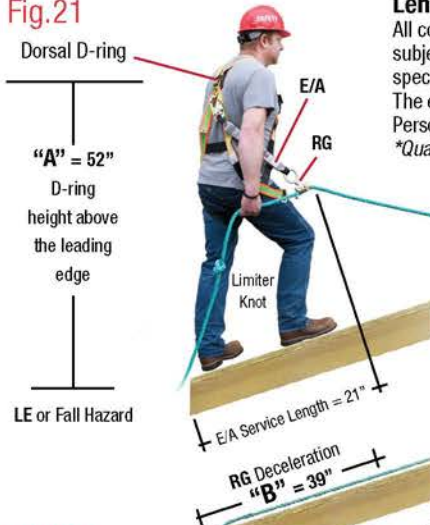
All components of a fall protection system are subject to stretch, elongation and deceleration when subjected to a free fall. To prevent striking a lower level, the ground below, or exceeding **PPE** performance specifications, the **LOF** plus ground or obstacle clearance must be calculated as accurately as possible. The examples shown in this manual apply to equipment mfg. by **SAS** and are intended as an example only. Personnel* responsible for project safety are required to draft their own Length of Fall Plan **LOFP**.
*Qualified or competent* person or a safety consultant as defined by OSHA.*

### Fig.21

Dorsal D-ring

E/A

RG

"A" = 52"
D-ring
height above
the leading
edge

Limiter Knot

LE or Fall Hazard

E/A Service Length = 21"

### LOF Example

Standing at the **LE** with no slack or angle in the Lifeline, the **RG** should be placed on the lifeline no closer than its service length of 21" from the **LE** to reduce free fall to a minimum. **E/A** in tension see Fig.21.
To prevent free falls greater than 6ft, the **E/A** should not be allowed to hang vertically when positioned at the **LE** Fig.24.

Note: The example plan specifies a 39" **RG** deceleration and **E/A** deployment of 48".

**Key Code:**
E/A = Energy Absorber
RG = Rope Grab
LE = Leading edge
LOF = Length of fall

**Calculating Free Fall Lengths**
Two factors are required to limit free falls to 6ft:
1) D-ring height above the leading edge, fall hazard or work surface Fig.21.
2) The amount of slack/angle in the lifeline and the service length of the E/A that is allowed to hang vertically Fig.24.

RG Deceleration
"B" = 39"

### Fig.22

"C" = 20"
Line Slack
or E/A
Length

72"
Free Fall +
39"
RG
Deceleration
=
111

"A" = 52"
D-ring
Height

### Free Fall Event

Fall arrest occurs in 2 different phases.
The worker steps over the **LE**, Fig.22, and immediately free falls. The free fall length is equal to the D-ring height of 52" + any line slack or **E/A** length that is allowed to hang vertically.
In this example, 20" of line slack + 52" = 72" total free fall before any force is applied to the **RG**.
**Phase 1:** After free falling 6ft, the **E/A** and lifeline are in tension and the force of the fall is applied to the **RG**. This initiates the **RG's** locking function. As it decelerates a max. length of 39" down the lifeline, the force of the fall causes the **RG** to lock fully onto the lifeline.

This action will initiate **Phase 2**.
Note: A limiter knot positioned below the **RG** on the lifeline at the **LE** can be used to reduce the **RG's** deceleration distance to less than 39", Fig.25.

### Fig.24

## E/A Service Length

When the **E/A** is allowed to hang vertically at the **LE**, the total service length must be added to the free fall length.

Total Service Length 30"
E/A Service Length 25"
FA=5"

**Leading Edge Swing Fall Hazard**
Horizontal travel along the leading edge exposes the worker to a swing fall hazard. The free fall length will not increase provided the **E/A** and lifeline remain in tension. **LOF** will be increased by the angle of the lifeline off-center from the anchor point above.

### Fig.23

LOF Factors

"B" = 39"
Rope Grab
Deceleration

"D" = 66"
E/A Maximum
Deployment

"D" = 66"
E/A Deployment

"E" = 14"
Harness Stretch

"E" = 14"
Harness
Stretch

"A+C" = 72"
Free Fall

Net LOF
Ground
Clearance not
Included
191"/16'

72"
Free
Fall

Ground/Obstacle Clearance
Minimum 24"

### Fall Arrest

**Phase 2 E/A Deployment:** When the **RG** locks onto the lifeline, the **E/A's** tear webbing begins to deploy (tear out), reducing the free fall velocity and avg. arrest force to 1,350lb or less, while limiting the **G** forces to humanly sustainable levels. As the **E/A** gradually deploys, it brings the free fall to a complete stop (fall arrest). The **E/A's** tear webbing has a max. deployment length of 66". Deployment lengths will vary based on the workers weight and the length of the free fall. It is typically less than 66".

**Harness Stretch:** The force of the free fall combined with the weight of a suspended worker takes up any slack in the harness webbing causing the D-ring's D-Plate to slide upward. Harness stretch is approx.14", provided the harness has been properly adjusted to fit the worker, and reducing webbing slack to a minimum.

**Ground Clearance Warning!**
A 2ft safety margin should be added to the net **LOF** to avoid striking a lower level or the ground below. A failure to do so can result in serious injury or death.

Leading Edge

**Example Free Fall Calculation**
**D-ring Height** = 52"
**E/A + RG** Service Length = 30"
Total Free Fall Length = 82"

**Limiter Knot/Failsafe**
A termination knot is used to adjust the worker's position on the lifeline as a means to gauge the free fall length and will prevent unintentional disengagement of **RG** from the lifeline.

### Length of Fall Calculation

| | | |
|---|---|---|
| "A" = D-ring height above LE | 52" | |
| "B" = Rope grab deceleration | 39" | |
| "C" = E/A length over the LE | 20" | |
| "D" = E/A Max. Deployment | 66" | |
| "E" = Harness stretch | 14" | |
| Net LOF Total | 191"/16' | |
| Min. Ground Clearance | 24" | |
| Length of Fall Plan (LOFP) | 215"/18' | |

**Note:**
The LOF example shown here specifies No.4015-Z fall arrester deceleration Length of 39". No.4015-M, SuperGrab and ValueGrab decleration lengths are shorter reducing the LOF. Figs. 5,6.

### Fig.25

Termination Knot