

## **OSHA Training Toolbox Talk: Personal Fall Arrest Systems – Figuring “Total” Fall Clearance Distance**

*Reference 1910 Subpart D / 1926 Subpart M]*

The whole idea of wearing a personal fall arrest system is to stop you before you strike the ground or other object below should you accidentally fall. A previous toolbox talk discussed how the length of your lanyard and the height of the anchor point you tie off to are the two factors that determine the distance you will free fall before your lanyard begins to slow your fall (*refer trainees to the handout for this toolbox talk for information on calculating free fall distance*).

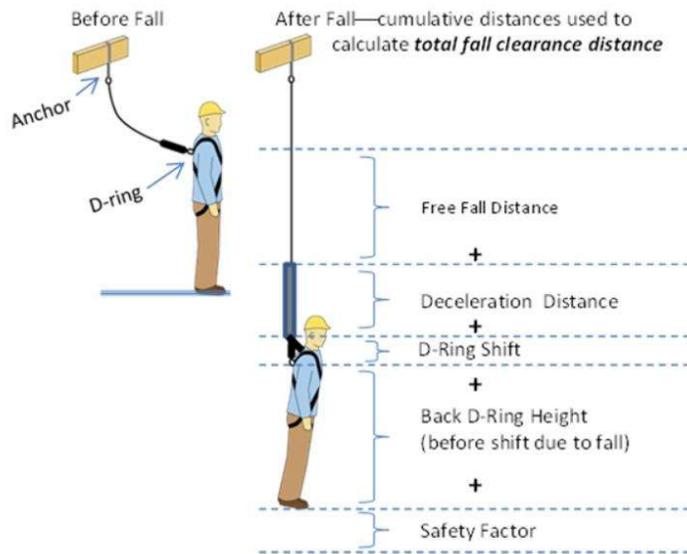
However, there are a few other factors that play into how far you could ultimately fall; this is usually referred to as the total fall distance. And total fall clearance distance calculations must consider these other factors, in addition to your free-fall distance. These additional factors include:

- Deceleration distance: This is the maximum extra distance a shock-absorbing lanyard is designed to stretch or extend in order to decelerate, or slow down, your fall. Deceleration devices must be manufactured so that the deceleration distance is no greater than three and one-half feet, per OSHA regulations.
- D-ring shift: This is the distance the D-ring moves and the harness shifts as they are jerked upwards when the lanyard begins to slow your free-fall. This force results in the D-ring location ending up higher on the worker’s back than it was before the fall occurred. This D-ring shift is often assumed to be one foot, but it can vary, depending on the equipment design and the manufacturer, so read those manufacturer’s instructions.
- Back D-ring height: The D-ring height is measured as the distance between the D-ring and the worker's shoe sole while the worker is wearing the harness. This height is often standardized as five feet for six-foot-tall workers, and shorter workers would also be protected using this default distance. But it will be necessary to adjust the assumed back D-ring height calculation accordingly for workers taller than six feet in height. And last but not least;
- Safety factor: This is an additional distance added to the total fall clearance distance to ensure there is enough clearance between the worker and the lower level after a fall is completely arrested. The safety factor is typically figured to be two (2) feet.

So, before you use a personal fall arrest system, figure the total fall clearance distance by adding the values above, which in some cases may add up to an additional eleven to twelve feet, to your free fall distance. As demonstrated on the handout, if the actual distance measured from your back D-ring to the ground or other surface below is not greater than the total fall clearance distance you calculate, it is inappropriate to use the personal fall arrest system as configured. In that case, try to raise your anchor point or shorten your lanyard to achieve an acceptable fall clearance distance. If that is not possible, get with your Competent Person to determine if a self-retracting lanyard, fall restraint system, or another means of fall prevention will be used instead.

Does anyone have any questions about today’s discussion on figuring total fall clearance distances? Thank you for your participation, and please be sure to sign your name on the training certification form so you will get credit for attending today’s toolbox training session.

# CALCULATING TOTAL FALL CLEARANCE DISTANCE FOR PERSONAL FALL ARREST SYSTEMS



Calculating free fall distance based on D-ring location:

<i>D-ring ABOVE anchor</i>	Free fall distance	=	Lanyard length	+	Distance from D-ring to anchor
<i>D-ring BELOW anchor</i>	Free fall distance	=	Lanyard length	-	Distance from D-ring to anchor
<i>D-ring LEVEL with anchor</i>	Free fall distance	=	Lanyard length		

This table applies to a worker using a shock-absorbing lanyard (e.g., ripstitch lanyard). Self-retracting lanyards typically activate, and thus limit free fall distance, within 2 feet. Refer to manufacturer specifications for activation details.

The **total** fall clearance distance for personal fall arrest systems equipped with a shock-absorbing (rip-stitch) lanyard is calculated by adding the free-fall distance (calculated using table above) together with the following values (*common assumptions are used in this example*):

**Deceleration distance:** 3.5 feet\* (the maximum per OSHA requirements)

**D-ring shift:** 1 foot\*

**D-ring height:** (bottom of your shoes to the point between your shoulder blades): 5 feet\*

**Safety factor:** typically, 2 feet\*

Clearance Distance	=	Free Fall Distance	+	Deceleration Distance (lanyard/lifeline stretch/elongation)	+	D-Ring Shift (harness slip)	+	Back D-Ring Height	+	Safety Factor
Calculate	=		+	Assume 3.5 feet*	+	Assume 1 foot*	+	Assume 5 feet*	+	Typically 2 feet

\* If actual workplace values or manufacturer specifications are available, or if circumstances dictate the need to use alternative values, use them instead.