

Working at Height Regulations: What it means...

Part 5: Fall Restraint vs Fall Arrest

Introduction

Within the hierarchy of measures there are 2 main fall protection bands once elimination has been ruled out.

- Passive Fall Protection
 - Passive Prevention
 - E.g. Guard Rail
 - Passive Arrest
 - E.g. Fall Arrest Nets
- Active Fall Protection
 - Active Fall Restraint
 - Active Fall Arrest



Across the world there seems to be a regular confusion over the topic of Active Fall Protection. Even though it is a clear and concise split.

- Fall Restraint: Zero Fall Risk - Provision of fall protection with the use of suitable PFPE and anchorages to provide a safe system of work where the worker is kept away from fall risks.
- Fall Arrest: Minimised Effects of a Fall - Provision of fall protection with the use of absorbing PFPE and suitable anchorages to minimise the forces generated in the event of a fall.

One of the most common misunderstandings is that of Shock Absorbing (or Fall Arrest) Lanyards and Restraint Lanyards.

It seems generally understood that you use a restraint lanyard for restraint, and a shock absorbing lanyard for fall arrest, and you cannot mix their use. This is most common amongst construction workers using MEWPs.

The truth of the matter is this: A restraint lanyard is just that. A restraint lanyard. No fall allowed. However, a shock absorbing lanyard only becomes such when a fall occurs. Until then it is a restraint lanyard.

The standard required for a shock absorbing lanyard is EN355. The standard for a restraint lanyard is EN354. However, under EN355, *even before any testing is discussed*, section 4.2 states

If an energy absorber is incorporated in a lanyard (i.e. the energy absorber cannot be removed without mutilating the lanyard, or without the use of a special dedicated tool), the lanyard shall conform to 4.2 and 4.3 of EN 354.

This means that the lanyard must meet the same specific strength requirements for the materials used (Section 4.2) and be terminated in the same way (Section 4.3). The main criteria for a restraint lanyard.

- Example: Steel Manufacture – Crane Safety

Several years ago, a member of the Bettersafe International team was involved with a Steel Manufacturer, working with an installer to provide safety systems to gantry cranes within the facility.

The end user requested a 600mm restraint lanyard for use on the horizontal lifelines mounted on the cranes, as he wanted his workers in restraint.

The installer did a survey of the area and highlighted 6 areas of open falls where no restraint was possible. Showing this to the Health and Safety officer for the end user he said that a fall arrest lanyard, coupled with a rescue plan, equipment and training was required. All very clear and obvious requirements.

The response from the HSO was that he wanted restraint lanyards as this meant the workers were in restraint. It took more time than you would believe to show him that the missing sections of walkway, the open sections in the crane and missing handrails prevented restraint from being possible on the 450mm wide gantry.

Fall Restraint

Fall Restraint is the provision of fall protection with the use of suitable PFPE and anchorages to provide a safe system of work where the worker is kept away from fall risks.

This can be achieved in different ways.

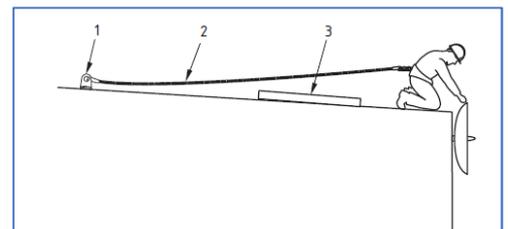
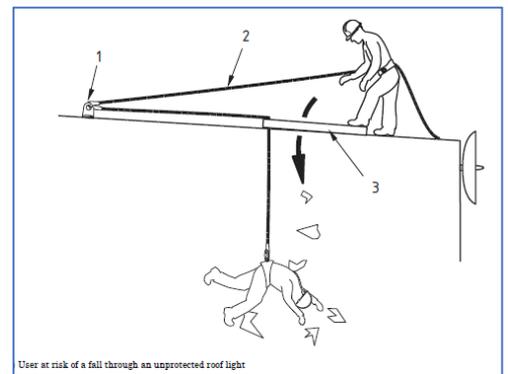
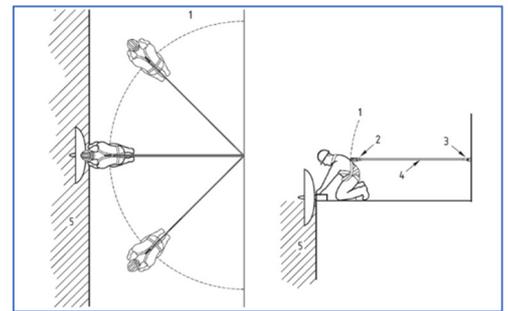
1. An anchorage placed in such a place and used with a fixed length lanyard short enough to prevent the worker from reaching the fall risk.
2. An anchorage point used with adjustable length rope or lanyard, with additional training for the user to ensure that restraint is always achieved.

Obviously, the latter is a higher risk, so option 1 should always be used where possible.

Where is Fall Restraint used?

Some examples of widely used restraint applications are:

- Mobile Elevated Work Platforms (MEWPs)
 - Suitable anchorage points in the lower section of the MEWP below the mid rail to prevent the worker from climbing, and also being thrown out in the case of an accident.
 - In the case of a "Cherry Picker" it is still advisable to use a shock absorbing lanyard in case the basket hydraulics fail causing it to tip.
 - Recommended Equipment
 - Full Body Harness to EN361
 - Shock Absorbing Lanyard to EN355



- Suspended Cradles / Work Platforms
 - Suitable anchorage points in the lower section of the basket below the mid rail to prevent the worker from climbing, and also being thrown out in the case of an accident.
 - In the case of a cradle it is still advisable to use a shock absorbing lanyard in case the basket hydraulics fail causing it to tip.
 - It is also advisable to use a twin lanyard to allow movement to different locations within the cradle.
 - Recommended Equipment
 - Full Body Harness to EN361
 - Twin Tail Shock Absorbing Lanyard to EN355

- Roof Safety Lines
 - Lifeline set at a suitable distance from the fall risk, with a suitable length lanyard. The distance should be the lanyard length plus 500mm as a minimum.
 - E.g. Lifeline set 2.3m from the risk with a 1.8m lanyard.
 - As with other examples it is still advisable to use a shock absorbing lanyard in case of an unforeseen failure of a roof sheet for example.
 - If multiple lines are in use on the roof, then a twin tail lanyard should be used to allow for transference from one line to another whilst maintaining 100% connection.
 - Recommended Equipment
 - Full Body Harness to EN361
 - Twin Tail Shock Absorbing Lanyard to EN355 or Shock Absorbing Lanyard to EN355 depending on the transference requirements.

Fall Arrest

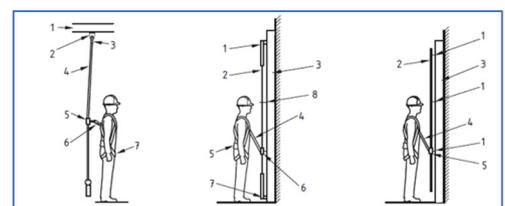
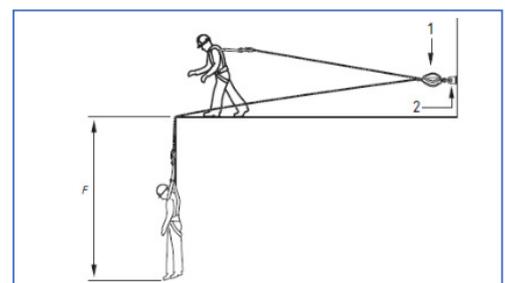
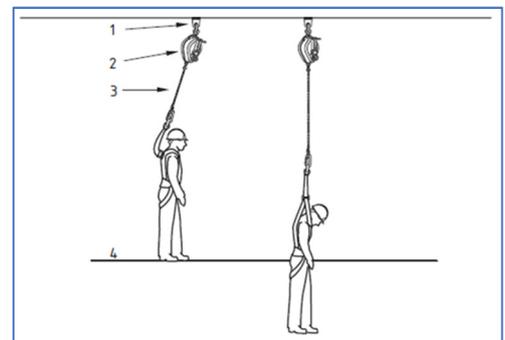
Fall Arrest is the provision of fall protection with the use of absorbing PFPE and suitable anchorages to minimise the forces generated in the event of a fall.

This can be achieved in different ways.

1. An anchorage used with a fixed length shock absorbing lanyard.
2. An anchorage used with a fall arrest inertia reel
3. An anchorage used with an adjustable lifeline.
4. A vertical fall protection system mounted to a ladder or to a fixed anchorage

All of these fall arrest solutions require the use of a full EN360 body harness.

1. Lanyard
 - a. Rear Attachment
2. Fall Arrest Inertia Reel used from overhead
 - a. Rear Attachment
3. Fall Arrest Inertia Reel used on the horizontal (if sharp edge tested)
 - a. Rear Attachment
4. Fall Arrest Inertia Reel used on a ladder
 - a. Front Attachment
5. Vertical Fall Arrest System
 - a. Front Attachment
6. Rope Adjuster on Flat Roof
 - a. Rear Attachment
7. Rope Adjuster on Inclined Roof
 - a. Front Attachment



Fall Arrest Safety Issues

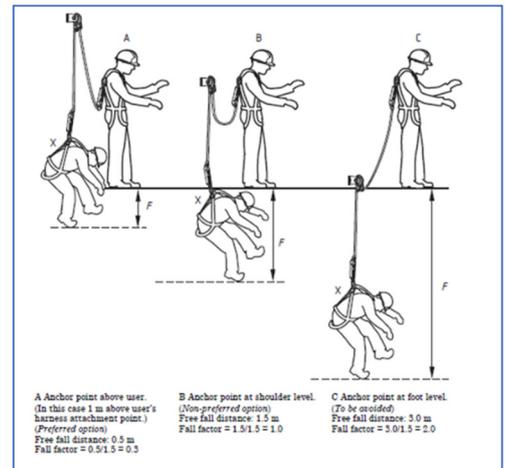
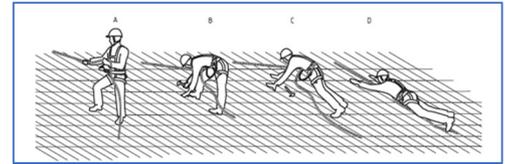
Several safety issues have been raised with respect to these products, as follows:

- Clearance distance below anchor points

Clearance distance below anchor points it is essential that enough clearance is allowed below the anchor point to allow for the full extension of the energy absorbing lanyard or inertial reel to arrest a fall.

The following calculation may be used as a guide to a suitable clearance distance from the work platform:

- **Lanyard**
 $\text{User height} + \text{lanyard length} + \text{energy absorber extension} + \text{safety margin}$
 $= 2\text{m} + 2\text{m} + 1.75\text{m} + 1\text{m}$
 $= \mathbf{6.75\text{m}}$
NOTE: This can vary with manufacturer so check the information supplied.
- **Overhead Inertia Reel**
 $\text{Free Fall, Lock Off and Deceleration} + \text{Harness Stretch} + \text{safety margin}$
 $= 1.4\text{m} + 0.25\text{m} + 1\text{m}$
 $= \mathbf{2.65\text{m}}$
NOTE: For other locations, such as horizontal use, the manufacturers must be contacted.



- Rescue Requirements

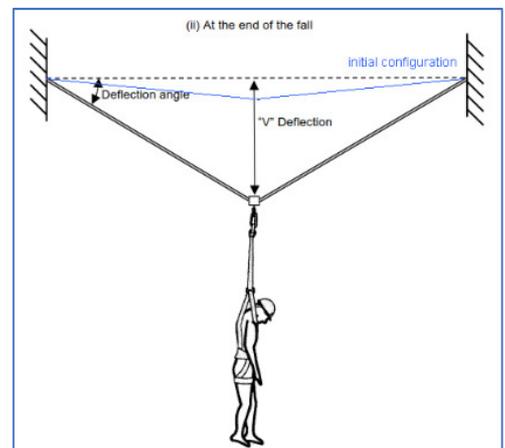
By allowing a worker to fall they are not only at risk of injury themselves, but they are automatically putting one or more co-workers at risk when a rescue has to be performed. In addition to this there is the requirement for detailed training, and regular practice to ensure that the workers are competent with the rescue equipment to consider.

We will be looking at the requirements for rescue in the 7th instalment of this 10-part series.

- Anchorage Deflection

If used in conjunction with flexible lifelines or deadweight anchors an additional deflection will occur. Further advice on ground clearance relative to the position of the anchor may be provided by the manufacturer.

Confirmation should be sought from flexible lifeline manufacturers that they are suitable for use with energy absorbing lanyards.

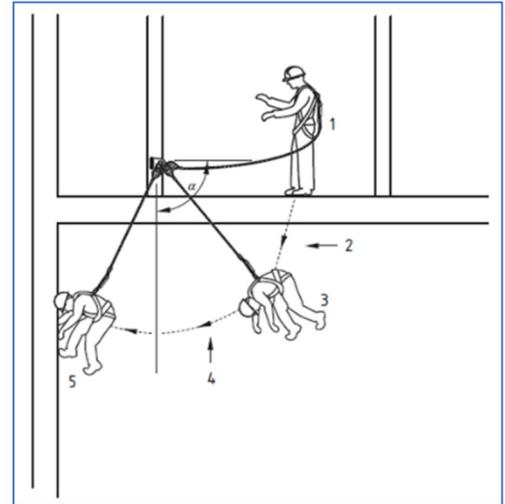


- Swing Falls / Pendulum Falls

Swing falls occur when the anchorage point is not directly above the point where a fall occurs. The force of striking an object while swinging (horizontal speed of the user due to pendulum effect) may cause serious injury. In a swing fall, the total vertical fall distance will be greater than if the user had fallen when directly below the anchorage point. The user must therefore account for an increase in the total free fall distance.

SRLs provide greater horizontal and vertical mobility than lanyards, increasing the opportunity for swing falls.

You can minimize swing falls by working as close to directly below the anchorage point as possible, or if the anchorage is on the same level as the work platform ensure that it is as close as possible to directly behind the worker as possible.



How do you select the right equipment to use for a job?

When selecting equipment for work at height, employers must:

- Provide the most suitable equipment appropriate for the work
- Take account of factors such as:
 - The working conditions (e.g. Weather);
 - The nature, frequency and duration of the work;
 - The risks to the safety of everyone where the work equipment will be used.
 - The clearance below the worker

Obviously, there are other stages in the hierarchy before you get to restraint but choosing between Fall Restraint and Fall Arrest is simple. If the worker does not need to be in a fall risk, don't let them get there by giving them just enough rope to NOT hang themselves!

Why should we leave Fall Arrest alone as often as possible?

Fall Arrest is the LAST OPTION in the hierarchy of measures, and it is for good reason.

If a worker falls, they are still at a high risk of injury:

- Impact injury (e.g. against exposed scaffold tube ends)
- Force injury from the harness (6kN in Europe) applied directly to the groin and lower abdomen
- Injury from ill-fitting harness

In addition to this there is the additional, avoidable risk placed on more people who have to perform the rescue. Not to mention the increased levels of training and equipment provision required for all personnel who will work at height in order to perform a rescue.

Conclusions

The order in which active fall protection is used is as follows:

1. Fall Restraint
Variants (in order of use)
 - 1.1. Fixed Length Lanyard
 - 1.2. Adjustable device e.g. rope adjuster

2. Passive Fall Arrest
Variants (in order of use)
 - 2.1. Fall Arrest Matting
 - 2.2. Fall Arrest Netting (this needs rescue procedures)

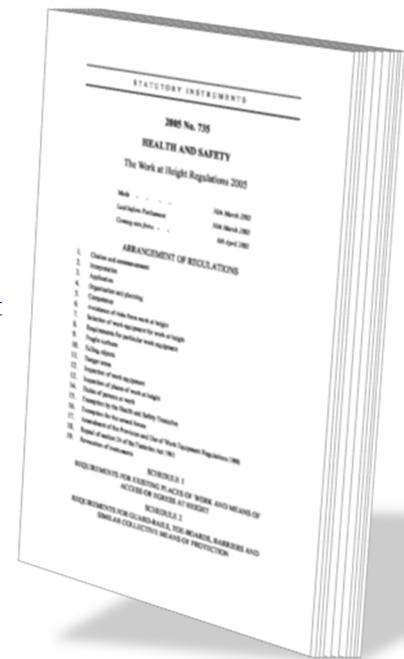
3. Active Fall Arrest
Variants (in order of use)
 - 3.1. Fall Arrest Inertia Reel
 - 3.2. Fall Arrest Lanyard

Prevention or elimination is ALWAYS the first call, but should this not be possible then a clear review of the above options will provide a clear answer as to what needs to be used. And remember, the use of a fall arrest system on a ladder still means that you need to have a rescue plan in place even if the anchorage on the roof is to be used as restraint!

We will be looking at Ladder Cages vs Fall Arrest Systems in our next issue.

Arrangement of the Regulations

- Reg. 1 Citation and commencement
- Reg. 2 Interpretation
- Reg. 3 Application
- Reg. 4 Organisation and planning
- Reg. 5 Competence
- Reg. 6 Avoidance of risks from work at height
- Reg. 7 General principles for selection of work equipment for work at height
- Reg. 8 Requirements for particular work
- Reg. 9 Fragile surfaces
- Reg.10 Falling objects
- Reg.11 Danger areas
- Reg.12 Inspection of work equipment
- Reg.13 Inspection of places of work at height
- Reg.14 Duties of persons at work
- Reg.15 Exemption by the Health and Safety Executive
- Reg.16 Exemption for the armed forces
- Reg.17 Amendment of the Provision and use of Work Equipment Regulations 1998 (PUWER)
- Reg.18 Repeal of section 24 of the Factories Act 1961
- Schedule 1 Requirements for existing places of work and means of access or egress at height
- Schedule 2 Requirements for guard-rails etc.
- Schedule 3 Requirements for working platforms
 - Part 1 Requirements for all working platforms
 - Part 2 Additional requirements for scaffolding
- Schedule 4 Requirements for collective safeguards for arresting falls
- Schedule 5 Requirements for Personal Fall Protection Systems
 - Part 1 Requirements for all personal fall protection systems
 - Part 2 Additional requirements for work positioning systems
 - Part 3 Additional requirements for rope access and positioning techniques
 - Part 4 Additional requirements for fall arrest systems
 - Part 5 Requirements for work restraint systems
- Schedule 6 Requirements for ladders
- Schedule 7 Particulars to be included in a report of inspection
- Schedule 8 Revocation of Instruments



Issue 7 Parts and Contents

- 7.01 An Introduction to the Working at Height Regulations 2005
- 7.02 Hierarchy of Measures
- 7.03 Advantages of Passive Safety
- 7.04 Advantages of Walkway
- 7.05 Fall Arrest vs Fall Restraint
- 7.06 Ladder Cages vs Fall Arrest Systems
- 7.07 Full personal fall protection systems (ABCDE)
- 7.08 Rescue Plan Requirements & Syncope
- 7.09 Requirements for Work at Height Training
- 7.10 8 Step Fall Protection Plan