The Work at Height Safety Association

Technical Guidance Note 4

"Guidance on the use of single and twin energy absorbing lanyards"

A series of informative notes for all industries involved with work at height or rescue.

The Work at Height Safety Association (WAHSA) is a UK trade association for manufacturers of equipment for work at height and rescue. This series of guidance notes is published by WAHSA to provide information on topical issues relating to work at height which may be a source of confusion, or where other information may be lacking. The information provided is only intended to apply within the UK.

They should be regarded by readers as a source of information only and are not intended to be exhaustive, or to indicate any specific course of action.

It is the responsibility of readers to judge the relevance and applicability of this information to their own situation.

WAHSA technical guidance note no. 4

Guidance on the use of single and twin energy absorbing lanyards

Introduction

This information sheet gives guidance on the use of energy absorbing lanyards for work at height. Several safety issues have been raised with respect to these products, as follows:

- clearance distance below anchor points
- methods of use of twin energy absorbing lanyards
- the use of energy absorbing lanyards for restraint purposes
- the effects the weight of the user may have on the performance of energy absorbers
- degradation and limited lifespan of lanyards

Although this leaflet cannot give definitive guidance on all aspects of the problems indicated above, it is hoped to clarify some misconception and to highlight safety critical aspects when possible.

Background

Fatalities have occurred in the UK and elsewhere owing to the failure of energy absorbing lanyards. As is the case with most accidents, the failures could be attributable to a failure of the product, a failure of the user to use the product correctly, or a combination of both.

Although energy absorbing lanyards may appear to be straightforward to use, there are simple rules which must be followed to ensure that the product is in proper condition for use, and that the chosen product is suitable for the intended application.

Some of the fatalities referred to above could have been avoided if a simple pre-use check had been carried out, or the user had followed some elementary rules about how the product should be used.

What are energy absorbing lanyards?

An energy absorbing lanyard is an element of a fall protection system, formed by a combination of two single elements which can otherwise be used independently; e.g. lanyards (which may be used only for restraint) and energy absorbers (which may be used in various points in fall protection systems to limit the force of a fall).

Lanyards

A lanyard is a flexible link between other components (e.g. a harness and an anchor device) of a fall protection system. They are typically made from textile rope or webbing, with an eye at each end to allow connectors to be fitted, or constructed as a closed circular loop.

Lanyards should conform to European standard EN 354, which requires an ultimate tensile strength of 22KN.

If lanyards are used on their own, as a link between the user's harness and an anchor, they must only be used for work restraint, i.e. typically on a level surface to prevent the user from entering a zone where a fall might occur. They should not be used on their own in this manner in any situation where the user could slip or experience a fall. The only load placed on a restraint lanyard should be that resulting from a "fall on the level", i.e. a slip or trip.

Energy absorbers

The European Committee for Standardisation (CEN) specifies that products designed for fall arrest purposes within the European Union must limit the maximum impact force during the arrest of a fall to 6 KN.

If a user weighing around 100 kg were to fall 4m onto a 2m long textile lanyard (without an energy dissipating element), the force on the user and the anchor could be as high as 20 KN (around 2,000 kg). Clearly this is unacceptable.

All fall arrest systems must therefore contain an energy absorbing element, which limits the impact force to 6KN. The item most commonly used to achieve this is typically known as an "energy absorber", comprising a block of webbing which is either woven or stitched together, and which opens progressively in the event of a fall.

Energy absorbers must conform to EN 355, which requires a minimum force of 2KN required to initiate deployment (approximately 200 kg), a maximum impact force of 6KN during deployment and a minimum tensile strength of 15 KN after deployment.

Energy absorbers are generally designed to be used in conjunction with a lanyard such that the combined length of all elements is no more than 2m before deployment of the energy absorber.. To ensure that the impact force is less than 6KN in the event of a worst case fall with such a product (e.g. a fall of 4m) the energy absorber may need to extend up to 1.75 m, thus providing a relatively gentle braking effect.

Energy absorbing lanyards

These combinations of lanyard and energy absorber are used to link a fall arrest harness to a suitable anchor – this is probably the most widespread type of fall arrest system used in industry.

Some energy absorbing lanyards are formed as single products which perform both of the functions described above. Energy absorbing lanyards may be attached separately to a harness or may be integral within the harness.

The performance requirements for energy absorbing lanyards are the same as for an energy absorber alone (EN 355). They should have a minimum tensile strength of 15KN. It is likely that future versions of EN 355 will increase the tensile requirement to 22 KN in line with EN 354.

If energy absorbing lanyards are used in a situation where the anchor is positioned close to a surface which the user might fall onto (e.g. the ground), it is essential that enough clearance is allowed for extension of the energy absorber.

The following calculation may be used as a guide to a suitable clearance distance in such situations

User height + lanyard length + extension + safety margin = 2m + 2m + 1.75m + 1m = 6.75 m

Note: 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.

Using energy absorbing lanyards

Energy absorbing lanyards are used in single, twin or double configurations. Lanyards are available in lengths of up to 2 m but shorter versions should be considered wherever possible to reduce the potential free fall distance and associated risks.

No matter what type of lanyard is being used, it is important to ensure that certain critical safety measures are observed:

- the item is in good condition
- the user has checked the condition and security of all elements before use
- the lanyard is CE marked and tested to the relevant standard
- the lanyard has not been in use for more than 5 years
- the terminating connector is suitable for the type of anchor
- the terminating connector is CE marked to EN 362
- a suitable anchor is being used (strength and type of connection)

- the position of the anchor is appropriate (as high as possible above the user)
- sharp edges are avoided
- the absorber element is positioned next to the body not to the anchor
- sufficient clearance has been allowed
- the lanyard has not been extended or elongated
- the lanyard is not kinked, knotted or twisted
- the user should avoid climbing substantially above the anchor point

NOTE: see WAHSA TGN 01 "**10 points for the use of fall protection equipment**" for further guidance on essential considerations when using this equipment.

Single lanyards

Single lanyards are generally used when the area of work is close to a suitable anchor point.

It is a popular misconception that energy absorbing lanyards should not be used for work restraint.

The British Standard Code of practice for selection and use of fall protection equipment in the workplace (BS 8437:2005) specifies at 8.2.2 that… "an energy absorbing lanyard of the correct length may be used for restraint provided …it will not be subjected to a force that could cause the energy absorber to deploy (i.e. a force in excess of 2 kN).

Double lanyards (two single lanyards used simultaneously)

This method may be used when it is necessary to move around a structure which does not have another method of fall protection fitted, e.g. a lattice telecom tower. The user attaches each lanyard in turn, always ensuring that the second one is attached before the first one is removed.

When using double lanyards, therefore, the user should always remain as low as possible below the anchor point(s) and that the only time that both lanyards are connected to an anchor is when the user is transfer from one point to another.

This is because if the user falls while both lanyards are attached to an anchor, the impact force will be twice what it would be if only one lanyard was attached. It would not be difficult in such a situation to exceed the CEN recommended value of 6 KN.

WAHSA therefore strongly recommends that twin lanyards are used in preference to double lanyards. See below.

Twin lanyards

Twin lanyards are sometimes known as Y-shaped lanyards. They have two lanyards (or "arms") which are attached to a single shared energy absorber. These items are used in similar situations to double lanyards, but are recommended by WAHSA. They are lighter, less bulky and avoid the potential of high impact forces as described above..

It is important to be aware of safety critical aspects of using twin lanyards and to note especially that the spare arm of a twin lanyard should never be attached to a different load bearing point on your harness e.g. side attachment rings. . Incorrect attachment might prevent the energy absorber from opening fully in the event of a fall.

Depending on the design of the twin lanyard and the relative lengths of the arms and the energy absorbing element, the eventuality described above could cause the junction between the arms of the lanyard to fail, leading to total catastrophic failure of the lanyard itself. At least one fatality is known to have occurred as a result of this.

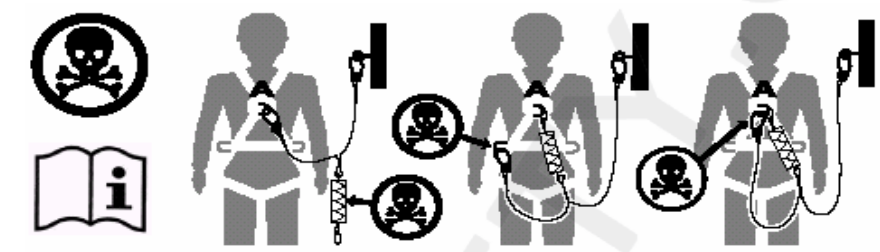
Some lanyards may employ a metal connection at the junction of the arms to prevent this catastrophic failure.

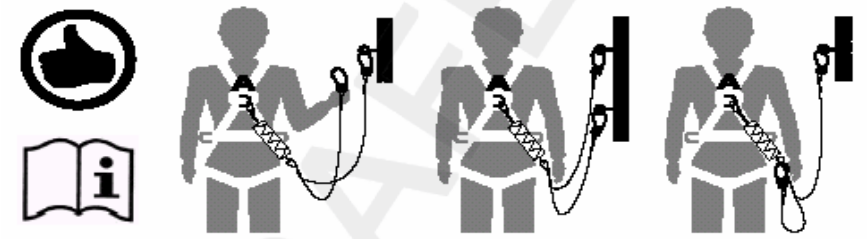
When only one arm of the lanyard is attached, the spare arm should only ever be stored in one of the following ways:

- clipped back to a point or ring on the energy absorber itself on the side away from the body
- clipped to a “sacrificial” loop on the harness which will easily detach, but only if it has been tested and approved by the manufacturer.
- allowed to hang free

Depending on the intended use, some twin lanyards may have shorter arms than standard lanyards to reduce entanglement when ladder climbing or working on steel structures.

Correct and incorrect methods of use of twin energy absorbing lanyards





Lanyard life

It is important that lanyards do not remain in use for periods which exceed the obsolescence date given by the manufacturer – or in cases of degrading environments, the lifespan specified by a competent person. For detailed guidance on inspection procedures, see WAHSA TGN02.

The weight of users of energy absorbing lanyards

It should be noted that the European standards for the testing of energy absorbing lanyards employ a 100 kg test mass, which should produce a maximum arrest forced of 6KN and not extend a tested lanyard greater than 1.75m.

If lanyards are expected to be used with a person heavier than 100 kg, the manufacturer should be consulted for specific data about suitable lanyard length, anticipated arrest forces and probable deployment lengths.

Training

WAHSA strongly recommend that all users of fall protection equipment are trained by a competent organisation. Training should include information on the selection of the correct products for intended work situation and pre-use checks for specific equipment.

Useful References

WAHSA Technical Guidance Notes (available from www.wahsa.org.uk)

TGN 01	10 points for the use of fall protection equipment
TGN 02	Guidance on the selection, use, maintenance and inspection of retractable type fall arresters.
TGN 03	Guidance on inspecting personal fall protection equipment
TGN 04	Guidance on the use of single and twin energy absorbing lanyards.
TGN 05	Guidance on rescue after a fall from height
TGN 06	Guidance on inspecting eyebolts used for personal fall protection purposes
TGN 07	Sources of information relating to work at height

Regulations

The Work at Height Regulations 2005

The Lifting Equipment and Lifting Operations Regulations 1997

Product standards

BS EN 354, *Personal protective equipment against falls from a height — Lanyards.*

BS EN 355, *Personal protective equipment against falls from a height — Energy absorbers.*

BS EN 358, *Personal protective equipment for work positioning and prevention of falls from a height — Belts for work positioning and restraint and work positioning lanyards*.

BS EN 361, *Personal protective equipment against falls from a height — Full body harnesses.*

BS EN 362, *Personal protective equipment against falls from a height — Connectors.*

BS EN 363, *Personal protective equipment against falls from a height — Fall arrest systems.*

BS EN 364, *Personal protective equipment against falls from a height — Test methods.*

BS EN 365, *Personal protective equipment against falls from a height — General requirements for instructions for use, maintenance, periodic examination, repair marking and packaging.*

BS EN 795:1997, *Protection against falls from a height – Anchor devices - Requirements and testing*

Codes of practice

BS 7883:2005, *Code of practice for the design, selection, installation, use and maintenance of anchor devices conforming to BS EN 795.*

BS 8437:2005, *Code of Practice for selection, use and maintenance of personal fall protection systems and equipment for use in the workplace.*

BS 8454:2006, *Code of Practice for delivery of training and education for work at height and rescue*