



Fall Arrest; Then, Now and Tomorrow.

Height Safety Equipment, a brief history

Over the past five decades the Height Safety industry has undergone a progressive change working to provide solutions to situations where personnel are required to work in areas which were once deemed as safe working practice. There has been a constant series of developments, from the use of waist belts with short rope lanyards and chain lanyards as recent as the 1980s, to the vast array of different shock absorbing devices and full body harnesses now available on the market. It is only a handful of key manufacturers that have consistently provided the innovations that have led the Height Safety Industry to where it is today.

The developments were driven by the desire of employers to ensure that personnel achieve the given human right to return home safely, whilst also ensuring that the work they are required to do is still completed. With industry leaders working to improve the working environment in which their employees are required to operate, whilst still managing to remain competitive, there has been a complex and continuous evolution of working practices, which has driven the development of thousands of innovations over the past 20 plus years.

Health and Safety bodies have worked alongside industry leaders to ensure that workable Regulations are put into force, that the working practices necessary to conform to these regulations are possible, and where they are not possible, Height Safety equipment manufacturers have been involved to develop innovative solutions to the increasing number of current and new working at height situations produced by development in construction methods and industry practices.

From using waist belts and static lanyards for many years, the industry saw the first Full Body Fall Arrest Harnesses entering the European market in the 1970s, but these were not widely accepted until later in the 1980s as the standard for personnel working at height. The innovation of 'tear-web' saw the birth of the shock absorbing lanyard, which vastly improved the safety of the worker by reducing dramatically the loads impacting the body, and also the anchorage point. Used in conjunction with a full body harness this became, very quickly, an industry standard.

The first Self Retracting Lifeline was developed in Sala, Sweden in the 1940s for use in the mining industry, and this design has remained relatively unchanged ever since. Now available in many different guises, with different materials being used for casings and cables, for use in different environments and situations, these devices have seen a dramatic rise in acceptance for use in many applications where lanyards were once the standard option.

The biggest change to the UK industry of late has been the introduction of the Working at Height Regulations in 2005. Bringing together the most important points from many industry regulations ranging back to the 1980s and 1990s, and used hand in hand with the Health & Safety at Work Act 1974, these Regulations have driven employers to become increasingly vigilant and professional in their approach to the provision of Height Safety protection.

This WAHR:2005 have also forced a vast shift in the awareness of employers and employees alike in the area of rescue provision. All workers who have the potential for a fall must also be provided with the means of being rescued.

Suspension Related Syncope has been a major issue behind this, and has led to the development of 'Suspension Relief Straps' by a small number of leading manufacturers, with the sole intention of providing a longer period in which the fallen person can be suspended before rescue is completed. This simple and low-cost addition to every worker's harness provides a major increase in the safety of workers and rescuers alike, as the increased time leaves the rescuer able to perform the rescue without the need to rush, reducing the potential for error.

Working at height has never been safer than it is today, but innovations in construction methods, materials and changes in the industries that feed the world in which we live will continue to offer up new challenges, which Health and Safety professionals, employers, governments and equipment manufacturers shall work together to overcome. As the industries change, and awareness is increasing within the health and safety divisions and management of the companies employing any company working at height, the quality and longevity of products is increasingly becoming more evident.

Increasingly Legislated: What the industry faces

Globally the height safety industry is gearing up to be one of the most legislated and policed of all the safety sectors. Falls from height still remain as one of the principle and largest causes of fatality and major injury in the construction industry, and with the increasing development of construction methods, the Health and Safety sector is set to ensure that companies are forced to reduce the injury and fatality rate.

As legislation drives industry leaders to protection for their workers, whatever industry they are in, and whatever task they are performing the demand for new and innovative products and solutions to the working at height issue is growing ever more intense.

The UK remains one of the leaders in this fight for increased worker safety, and as such the government has finally delivered on its promise to make it easier to prosecute companies for manslaughter. The Corporate Manslaughter and Corporate Homicide Bill is expected to become law in 2007/08. The existing common law offence of corporate manslaughter will be abolished and replaced with a new statutory offence.

Critics of the Bill say that it does not go far enough, as no-one will be imprisoned under the legislation; they are campaigning for the introduction of personal liability for directors and senior managers. The government has so far refused these demands but the new offence will lead to the police investigating more work-related deaths. This will have an effect on the construction industry, as 28% of work-related deaths in 2005/06 were construction-related. Companies should already be prepared for the new legislation by carrying out a compliance check on safety policies and systems and, if necessary, seeking specialist advice.

The Requirements for Worker Training

Recent changes in UK legislation governing working at height have placed a much needed emphasis on the training of workers, and the responsibility of the employers to ensure that this is carried out. The Working at Height Regulations:2005 stipulate that all workers who perform their task in an area where a fall risk is present is both provided with equipment to minimise or negate the risk, and are also trained in its use. Competency training not only enables companies and individuals to comply with legislation, but also leads to a massive reduction in the risks the workers are exposed to.

This training should ensure that all users of Personal Fall Protection Equipment (PFPE) are competent in its selection, use and daily inspection, and are also competent to work safely at height.

BS 8437:2005 *Code of Practice for selection, use and maintenance of personal fall protection systems and equipment for use in the workplace* gives detailed guidance on which equipment should be used for given situations, and training given to personnel at different levels of the organisation should cover the requirements of this standard, specific to the level required by the trainee.

For example, a user should be provided with pre-selected equipment suitable for his task by his employer, but should then be trained in its use and inspection. A manager/supervisor, and Health and Safety personnel should be trained to perform Risk Assessments and specify the equipment to be used, and have an understanding of the legislation which they and the worker must conform to.

There are ten considerations that every worker must give to the PFPE and the situation they are working in when selecting the equipment necessary to complete their task safely and in compliance with the legislation in force. These are: -

Suitability, Condition, Traceability, Compatibility, Security, Anchorages, Harness Fit, Product Age, Available Clearance, Product Selection.

Training should also cover the need for, and the details needed in a rescue plan. The selection of, the safe use of and maintenance of any equipment needed is then essential to ensure that each and every worker is aware of the procedures, what they are, what their responsibilities are within the plan, and how to perform a rescue if necessary.

The correct and accurate selection of Rescue Equipment is vital, as the incorrect equipment can not only place the injured person at more risk, but can also mean that the rescuing party is placed in an area of heightened risk of a fall. Complicated procedures are to be avoided where necessary, and in-depth training in the use of any equipment is absolutely essential. Rescues are performed in hazardous and stressful situations, so complete familiarity with the procedures and equipment can be the difference between saving and losing a life.

Height Safety during Construction and Maintenance Phases

Whether during construction, or once the building is complete and occupied and maintenance is required, working at height is dangerous. UK HSE statistics over the past ten years has shown that the largest cause of death in construction is falls from height and nearly half of them are from or through roofs and frequently involve fragile materials.

There are five main reasons for this high accident rate:

- Poor Workplace design
- Access Support collapsed
- Worker was required to work beyond the confines of the safe system
- Inadequate, poorly designed or absent edge protection
- Work environment restrictions ignored due to being impracticable

In construction falls occur from open edges, through gaps or holes, and through fragile roof materials and roof lights. High safety standards are essential however long or short term the work is. The nature of the precautions needed may vary from one job to another, but not providing any safeguards is unacceptable.

Designing for Management of Working at Height

Depending on the type of work to be carried out, there are different requirements. Wherever the requirements for working safely at heights are reviewed, be it with the architect, the main contractor or subcontractor level during construction, or by a building owner for maintenance purposes, the involvement of specialists in height safety is invaluable.

If the work is during the construction phase, then fall protection should be a mix of scaffold, netting where appropriate or possible, and Personal Fall Protection Equipment (PFPE) in the remaining areas. Protection in this phase is predominantly of a temporary nature, and can utilise temporary edge protection, anchorage straps for the attachment of fall arrest devices, such as lanyards or Self Retracting Lifelines to the structure, or indeed Mobile Elevated Work Platforms.

If the work is in the maintenance phase of the building's life, then the requirements are totally different. If access to any area for maintenance is needed then a risk assessment needs to be performed, and fall protection provided for each and every noted risk. For maintenance the protection systems tend to be more permanent in their nature.

Hand rails, installed horizontal lifeline systems, single eyebolts and parapet walls are all recognised methods of providing safety on roofing areas for maintenance. The provision of these safety systems is initially the responsibility of the Architect and Main Contractor under the CDM Regulations for new-build projects. However, once the building is complete, any changes to the fabric of the structure which results in a change in requirements on the roof, safety becomes the responsibility of the building owner to ensure the provision of correct safety measures.

Incorrect design at all stages can be fatal. Human nature dictates that we take 'the line of least resistance'. A system that is too complex, requiring a great deal of input or excessive travel to get to the place of work is not deemed as a suitable solution as the worker will not use it.

By assessing the risks in accordance with the Working at Height Regulations the correct equipment can be specified, also therefore providing conformity to BS 8437:2005 *Code of Practice for selection, use and maintenance of personal fall protection systems and equipment for use in the workplace.*

The Hierarchy of Measures

Detailed in the WAHR:2005, the hierarchy of measures should be used when performing a risk assessment for work at height. Beginning with altering working practices to eliminate the risk, to collective safety and resulting with fall arrest equipment, the hierarchy of measures is a sure fire way of ensuring the provision of the correct equipment for the worker.

If a safe system is installed, the worker should be able to perform all necessary works within its confines, without fear of the structure collapsing. Many edge protection systems are totally inadequate to support the load of a person falling against them. Aging of components, poor installation, or incorrect choice can make a barrier lethal.

In each and every case where PFPE is used, the minimizing of the fall distance is essential, as it removes loads and also reduces the difficulties and additional risks of rescue situations.

Fall Protection: An overview

Fall protection, as described in the Working At Height Regulations:2005 falls into four main categories.

1. Process Change:
The change of working practice to remove the fall risk.
2. Collective, or Passive Safety
Provision of fall protection without the use of Personal Fall Protection Equipment (PFPE).
3. Fall Restraint
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.
4. Fall Arrest
Provision of fall protection with the use of absorbing PFPE and suitable anchorages to minimise the forces generated in the event of a fall.

The risk assessment for any work to be carried out at height *must* include reference to these four areas, and care should be taken to ensure that the first of the four solutions reviewed that can fulfil the needs of the worker's safety *must* be implemented. Failure to provide the correct fall protection method, essentially poor workplace design as mentioned earlier, can lead to failure of the safety measure completely, often resulting in fatalities or major injuries.

Personal Fall Protection Equipment (PFPE)

Solutions to the final two sections of the Hierarchy of Measures invariably shall involve the use of Personal Fall Protection Equipment (PFPE). The types of PFPE available on the market are split into different product 'families', each section vital for the correct function of all the other elements in the fall protection system.

Full Body Fall Arrest Harness

A harness is designed to provide comfort and safety in the event of a fall by the transfer of loads around the body to major muscle groups.

There are several different designs, for use in specific situations. In the EU all harness must conform to EN361 and should be supplied with a rear fall arrest anchorage point as a minimum. Specific work requirements may then require additional points such as chest points or work positioning belts.

Restraint Lanyard

Restraint lanyards come in a variety of lengths to a maximum of 2m and with a variety of hooks, dependent on the physical requirements of the user to enable complete restraint to be achieved. As these are not equipped with a shock absorber they must never be used for fall arrest. Restraint Lanyards must conform to EN354 in Europe and be attached directly to a full body harness.

Shock Absorbing Lanyard

In Europe shock absorbing lanyards must conform to EN355 and must limit the amount of force passed to the user in the event of a fall to less than 6kN. A minimum clearance of 6.75m from anchor to impact point is required as described in EN355.

These are available in various lengths and with various attachments, in either single leg or double leg configurations. The maximum legal allowable length for a lanyard is 2m. Specific hook arrangements are available as required for different anchorages and work environments.

Lanyards should always be attached directly to the rear attachment point of the full body harness, and should never be extended or have the hooks changes without consultation with the manufacturer.

Self Retracting Lifeline (SRL)

Also known as a Fall Arrest Block, this is a cable or webbing device, which self-retracts inside a housing unit to ensure that the cable or webbing remains taut at all times. Available in a variety of lengths up to 60m, these units are used in conjunction with a full body harness and a suitable anchorage point. With a built-in shock absorber, they arrest the falling worker in distances of less than 1m. Extension of the unit is not allowed without the manufactures approval, and the attachment of Shock Absorbing Lanyards is strictly prohibited under EU Law.

All SRLs should be attached directly to the Full Body Harness on the rear D-Ring, and positioned above the user, unless otherwise stipulated by the manufacturer.

Vertical Fall Arrest Device

Conforming to EN353, these devices are travelling units with a cam device and shock absorber, using cable, rope or rail to travel on. These devices are either temporary (rope) or permanent installs (cable/rail) and should be used in conjunction with a front attachment harness. Attachment to the side D-ring of a belt, even if incorporated into a full body harness, is strictly forbidden, as is the extension of the device by attachment of any other lanyard.

Final Thoughts

The shift in the 1990s to 'low-cost' Safety for Compliance equipment is being increasingly replaced by the correct view of Safety for Safety, with user competency training becoming a must, whatever level they work at within an organisation. The market for height safety is finally catching up to the idea that a person's life is worth more than the cost of the equipment used to protect him, and it is this realisation that is changing the face of our industry.

This philosophy is best documented by an author from the 19th century, John Ruskin, who wrote:

"It is unwise to pay too much, but it is unwise to pay too little. When you pay too much you lose a little money. When you pay too little you sometimes lose everything, because the thing you bought was incapable of doing the thing you bought it to do. The common law of business balance prohibits paying a little and getting a lot. It cannot be done. If you deal with the lowest bidder, it is well to add something for the risk you run. And if you do that, you have enough to pay for something better."

Put into the context of Height Safety Equipment, this speaks for itself.