

# ROOFTOP SAFETY: Protecting Your Employees and Company Property



## **Falls from heights are avoidable.**

Read our Rooftop Safety whitepaper for advice on how to protect your workers from serious injury or a fatality and protect your company from risk.

## SUMMARY

Industrial rooftops can be crowded areas. Many contain a multitude of plant, equipment, structures and systems, all of which need to be maintained and repaired regularly.

Employers, facility managers, building owners and contractors should by now be well aware that the biggest cause of workplace fatalities are falls from height. More often than not falls from height occur because of non-compliance with fall protection regulations, inadequate equipment or lack of training, not because of equipment failure.

It goes without saying that the cost of a fall from height can be catastrophic for the victim and their family. For a business, the costs can also be immense. Financial and operational costs, legal fees, fines, medical expenses, disability compensation, increased insurance premiums and time lost on the job can cripple a business. In fact, it's estimated that a fall could cost a company as much as USD 3 million to offset loss.

In our Rooftop Safety whitepaper we explain what areas present the greatest risk and how having a fall protection safety plan in place will help you to protect your workers and contractors from injury, and your company from risk.

It can also contribute to a company's bottom-line. According to America's National Safety Council, every USD 1 invested in preventing an injury can generate a return of between 2 to 6 US dollars through increased productivity, greater worker satisfaction, reduced staff turnover and recruitment costs.



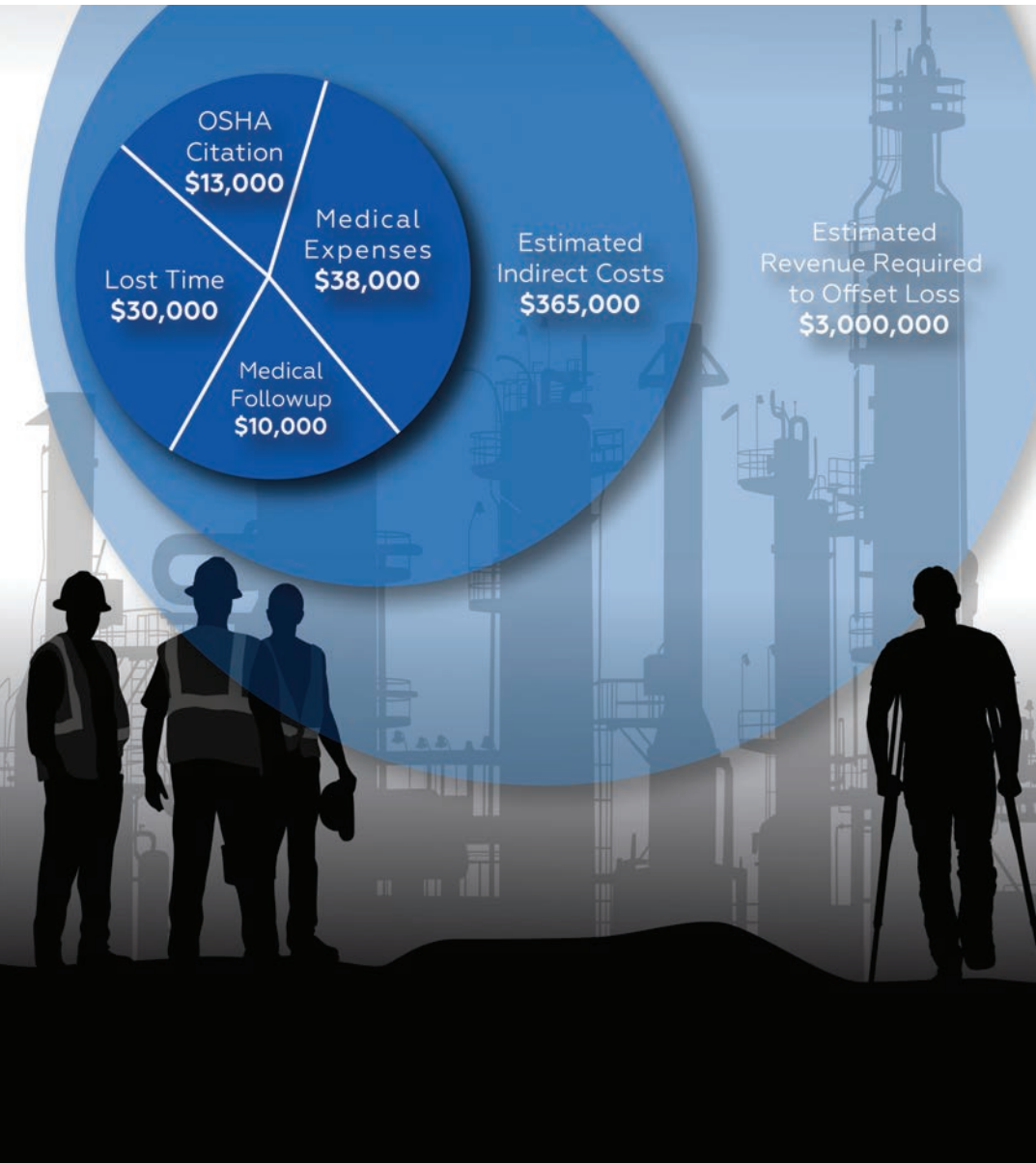
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# THE COST OF DOING NOTHING

## THE TRUE RISK AND LIABILITY OF UNPROTECTED ROOFS



Falls from height are the most common causes of serious occupational injuries. The consequences of a fall are devastating for the victim and their family, while the financial, operational and legal costs to the company can be significant. These include fines, disability claims, medical expenses, insurance premiums, loss of time on the job and legal fees. It is estimated that in the USA the revenue needed to offset loss when a fall occurs is around USD 3,000,000.

Countries across Asia-Pacific are imposing increasingly larger fines in order to make companies more accountable for safety in the workplace. MOM in Singapore is also becoming stricter on offences. So far this year, USD 639,000 worth of penalties have been imposed on those convicted under the Workplace Safety and Health Act. In 2020, the figure was over USD 3.6 million and included several cases of imprisonment.

Although it is accepted that safety records have increased considerably in the Middle East over recent years, OSH statistics for individual countries are still relatively unknown. However, from the data available, it is clear that the injury and fatality rate is still high in construction. Nearly half of occupational injuries in Saudi Arabia happened in construction, while around a third of construction injuries in Kuwait are attributed to the result of falls from height.

The most recent research into the ME economic costs of work-related injury and illness was carried out in 2014 by the International Labor Organization (ILO) and found that the costs varied between 1.8 and 6% of a country's GDP, averaging at 4%. When you think that the UAE's GDP was \$354.28bn in 2020, a loss of 4% would equate to \$14bn, while Saudi Arabia's GDP of \$701.47bn would have meant a loss of a staggering \$28bn.

In India, under the Occupational Safety, Health and Working Conditions Code introduced 2020, employers have to ensure the workplace is free from hazards that could cause injury or occupational disease. It also places obligations on the architect, project engineer or designer responsible for building, construction work or the design of any project, to ensure consideration is given at the planning stage to the safety and health of the building workers and employees employed in the "erection, operation and execution of such projects."

### THE COMPLETE APPROACH TO FALL PROTECTION

Carrying out an assessment of the hazards on your roof is the first step towards mitigating the risk to workers and your liability. Once the assessment has been completed the findings should be used to develop a comprehensive fall protection plan. Following our Hierarchy of Fall Protection strategy will help you to eliminate the hazard or determine how to manage exposure to danger and focus your efforts on fall prevention.

If avoiding work at height is not possible, protecting workers on your rooftop does not end once you install a fall protection system. You also need to make sure the work is planned, supervised and carried out by a competent and properly trained person. Training and competency must also include anyone responsible for the organisation, planning or supervision of the work.

# KEEP SAFETY HIERARCHY OF FALL PROTECTION

At Kee Safety we are committed to “separating people from hazards” and partner with companies in all sectors to help them protect their workers, contractors, visitors and the public. We understand the problems you face when protecting people working at height and have created an easy to follow hierarchy of fall protection which takes you through 4 simple steps to prevent falls from height.

By following our hierarchy of fall protection process you will gain an understanding of what control measures you should have in place to either eliminate or reduce the risk of someone falling.

## Step 1 – Avoid working at height

Eliminating the need to work at height by designing out risks or changing working practices should always be your priority.

This can be achieved quite simply by removing the need to work at height completely. For example, by locating air conditioning units at ground level instead of on the roof.

## Step 2 – Use collective protection to prevent falls

If it is not possible to avoid work at height, collective measures such as guarded platforms or Roof Guardrails should be installed to protect people from a hazard and prevent a fall.

These systems are the preferred form of protection as they protect everyone on a roof or from a hazard. They also have the added benefits of not relying on correct use and needing little training and maintenance.

Collective protection is ideal when frequent access is required to a roof or work area such as for routine maintenance of plant and equipment.

## Step 3 – Use personal protective equipment to prevent a fall

This is the last measure you should consider in preventing falls from height. Step 3 involves the use of PPE (personal protective equipment) and includes systems which are often called fall restraint, work restraint or a restraint line which comprise an anchor point and fixed length lanyard. The aim of the system is to allow the user to move within a specified area but prevent them from reaching a fall risk or hazard.

This form of protection can be used when collective measure are not possible such as for general roof repairs, gutter maintenance or when working beside a fragile unprotected skylight.

Although the system is to be used as a fall restraint, it must be designed to correct standards and tested to make sure it meets the current fall arrest load requirements.

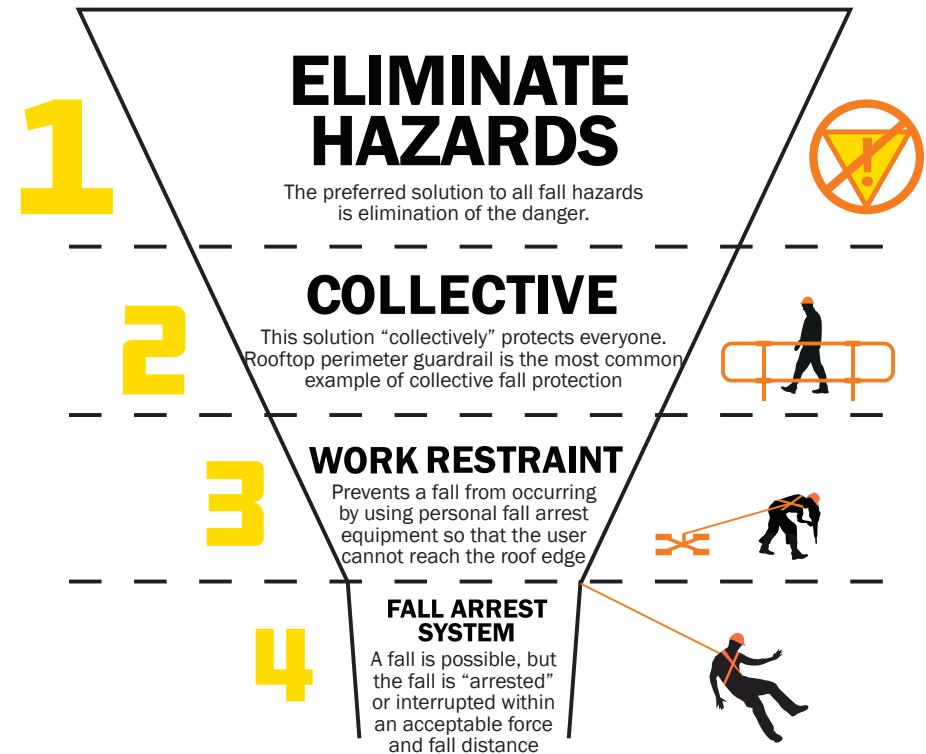
## Step 4 - Use personal protective equipment to minimise the distance of a fall

If you are not able to prevent a fall from height, you should try to mitigate the consequences of the fall. This means arrest the person's fall before they hit the ground or an object.

Fall arrest systems usually consist of an anchor point, lanyard and a full body harness and are designed to allow the worker to move freely around a roof or where there is a fall potential. If the worker falls, the system will absorb the shock and force placed on their body and decelerate their fall over a short distance.

As these systems depend on correct usage, they should only be considered as a last resort and used by people who have had the relevant training and instruction on the equipment.

## HIERARCHY OF FALL PROTECTION



# THE CHALLENGE OF PROTECTING PEOPLE ON YOUR ROOFTOPS

People will need to access your rooftops throughout the year. This could be for planned maintenance of plant and equipment on the roof or for emergency repair of a leaking roof hatch or faulty air conditioning unit. Whatever the reason, you must ensure that you have proper fall protection measures in place and can separate workers from the hazards on your rooftop.

Before any work is carried out on your roof you should always carry out a thorough rooftop risk assessment to identify hazards and determine where workers are exposed to the greatest risk.

Once the hazards have been identified, measures can be put in place to protect people on your rooftops and to avoid potential liability should an accident occur.

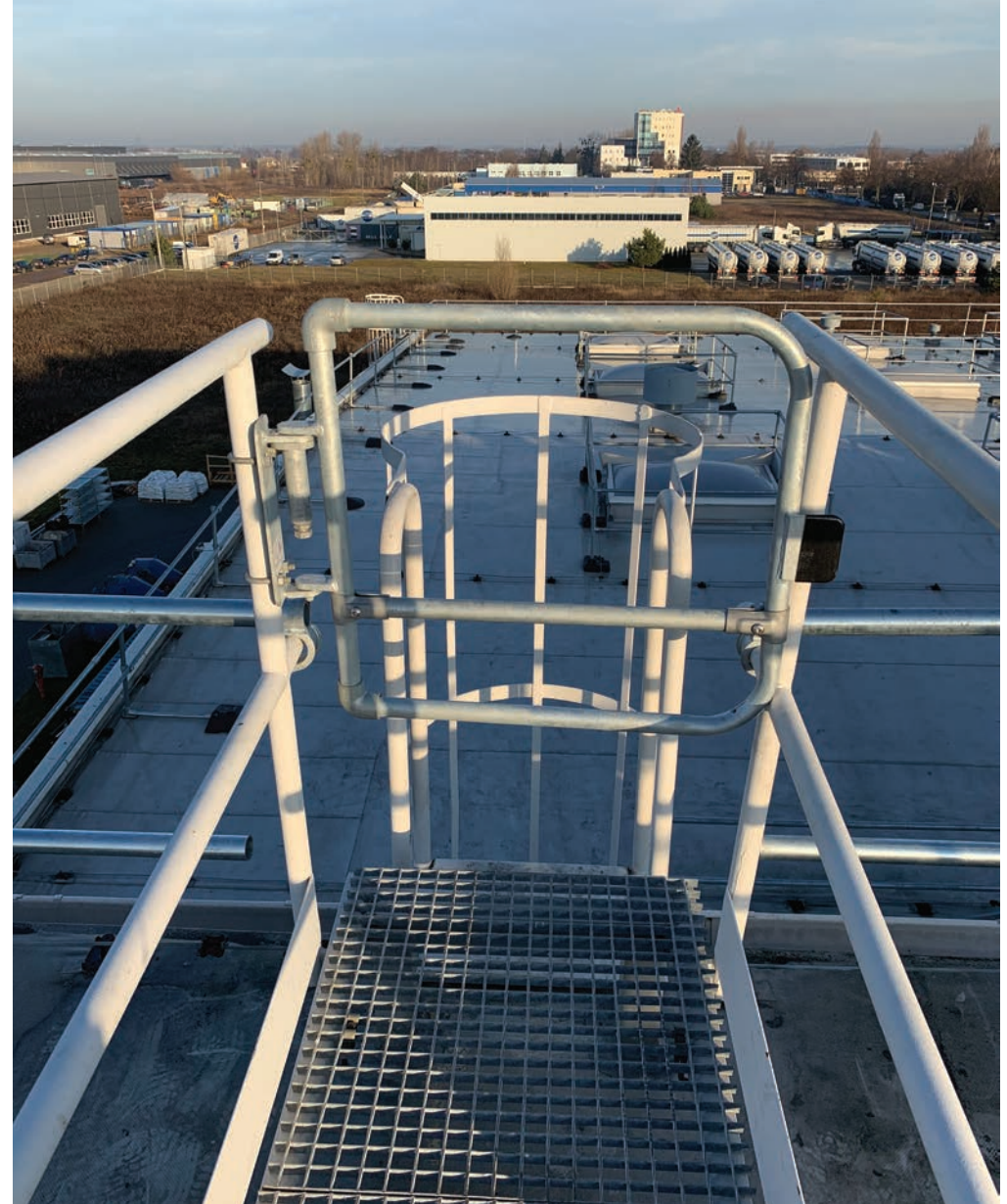
## THE COMMON HAZARDS ON INDUSTRIAL ROOFS

### 1. Entrance and exit point hazards

Safe access on to a roof needs careful planning. People quite rightly focus on the need to protect people working on roofs. However, there's no point going to the expense of installing a rooftop safety system, if workers are put at risk before they even get onto the roof. When planning work at height you need to look at the whole picture.

Firstly, understand how your workers will get onto and then off the roof. Entrance and exit points are where workers are exposed most frequently to a hazard on the roof. Each time someone works on the roof, they encounter the risk twice. So, if a worker needs to work on your roof 8 times a year, they are exposed to the fall hazard a minimum of 16 times. This number will increase if they have to access and exit the roof more than once during a task, for example, to pick up additional tools or parts.

Typical methods of gaining access onto a roof include general access scaffolds, mobile elevated work platforms (MEWPS), ladders and roof access hatches. OSHA and EU regulations require ladders and roof hatches to be equipped with self-closing safety gates and safety compliant guardrails to reduce the risk of someone falling as they step onto or off a roof. Self-closing gates perform exactly as the name suggests. They automatically close behind the user to protect the void.



OSHA has also recently determined that chains do not provide suitable protection for ladderways or hatches as they rely on the user putting them back in place once they've accessed the roof.

## ENTRANCE AND EXIT POINT PROTECTION – THE KEE SOLUTION

**Kee Gate**® self-closing gates provide a durable solution that separates workers from the danger of falling.

## 2. Fragile surfaces and rooftop openings

Once safely on a roof, workers can be exposed to hazards as they move around to carry out their tasks. Some hazards may be obvious, others not.

Fragile surfaces account for a large proportion of fatal falls and serious injuries. A fragile surface is an area that is unable to support a person's weight. It could be a fibre cement or old metal sheet roof but is more likely to be a fragile rooftop opening

such as a skylight or rooflight. These are openings, or holes, in a roof which are designed to allow light into the building below.

Falls through fragile surfaces occur mainly during building maintenance and roof works when people are carrying out short-term maintenance and cleaning tasks. International regulations including OSHA 1910.28(b)(3) and The UK Work at Height Regulations require employers to protect workers passing across or near to a fragile surface or rooftop opening.

Unprotected skylights are a particular problem. If a worker falls through an unprotected skylight, they could suffer severe lacerations and potentially injure anyone working below. Simple measures such as installing sturdy screens over skylights will protect workers on the roof from falling through the glazed areas.

### FRAGILE SURFACES AND ROOFTOP OPENINGS – THE KEE SOLUTION

**Kee Cover**<sup>®</sup> skylight and rooflight protection has been designed specifically for metal profile roofs. The skylight is protected by a strong mesh panel that sits on a sturdy metal frame. The protection is then clamped to the standing seam without penetrating either the roof or skylight.

Larger rooflights and skylights can be protected with a free standing **Kee Dome**<sup>®</sup> modular system. Constructed from galvanised steel structure and PVC feet with clamping rings, the system stands firmly around the perimeter of the skylight, overcoming the potential for costly leaks. Being modular in design it can also be easily dismantled, moved and reinstalled wherever needed.

Both **Kee Cover**<sup>®</sup> and **Kee Dome**<sup>®</sup> have the added benefit of providing protection without blocking the sunlight into the building.



### 3. Unprotected roof edges

Now that people are protected getting onto the roof and navigating across it, you need to make sure that they can work safely whilst they're on the roof.

The edge of the roof presents the most obvious danger and is often the first thing people think about when it comes to rooftop safety. Roofs need to be accessed throughout the year for maintenance and repair purposes so it's essential to make sure workers are protected from slips, trips and falls from the roof edge in all weather conditions.

If a generator on your roof breaks down in wet slippery conditions, you will need to get it repaired quickly as an outage could cost you a lot of money. The last thing you want is for the engineer to have to wait for the roof to dry before they can go onto the roof to repair it.

The location of all plant and equipment on a roof including HVAC systems, air vents and ductwork should be documented, especially if it is close to an unprotected edge. EU and OSHA regulations require workers to be protected on a roof. OSHA 1910.28(b) (13) stipulates that when work is to be carried out on low-slope roofs within 4.6m (15 feet) from an exposed edge, workers must be protected by an approved safety system such as a guardrail.



The OSHA regulations identify 3 different work categories and the required levels of protection for each area of the roof:

- **Category 1:** When work needs to be carried out within 1.8m (6 feet) from the roof's edge, employers must be protected by a guardrail system, a travel restraint system (fall restraint) or a personal fall arrest system.
- **Category 2:** When working between 1.8m (6 feet) to 4.6m (15 feet) from the roof edge, you must protect workers from falling with the same systems as in Category 1, but you can also implement a designated area when the work is both infrequent

and temporary. According to OSHA, "Infrequent means that the work is performed occasionally. Infrequent work is usually performed once a year, once a month or as needed. Daily, regular or routine tasks are not infrequent. Temporary means that the work is brief or short. Temporary tasks usually take less than two hours to complete and are not complicated.

- **Category 3:** Working 4.6m (15 feet) or more from the roof edge you should apply the same measures as in Category 2. You are permitted to introduce a work rule which prohibits access within 4.6m (15 feet) of the edge unless fall protection is being used. However, this only applies if the work is both temporary and infrequent.





## UNPROTECTED ROOF EDGES - THE KEE SOLUTION

**KeeGuard**® free standing roof guardrails, which do not penetrate the roof's membrane, are the preferred form of edge protection on flat roofs. These systems comply with local, European and American standards and prevent workers from reaching the edge of the roof or a fall hazard.

**KeeGuard**® Topfix has been designed to provide protection on metal profile or standing seam roofs up to 45 degrees. The system is attached to the cladding panel via a special base plate which has been engineered specifically for metal roofs to provide reliable edge protection.

**KeeGuard**® Premium has been designed for roofs with limited space. The free standing system features galvanised components for superior durability and base weights constructed from recycled PVC for long life. **KeeGuard** Premium is a modular system, so it is quick and easy to assemble and is suitable for roofs with a pitch of up to 10 degrees pitch.

There will of course be occasions when guardrails are not suitable or a virtually invisible solution is required. **KeeLine**® horizontal lifeline is a wire based system where the user is connected to the safety line via a traveller, allowing them to move freely around the roof. **KeeLine** is fully compliant with international standards including EN795:2012, CEN TS 16415:2013, ANSI Z359 and CSA Z259, and the Indonesian National Standard SNI 8603: 2018.

Working on roofs is hazardous and should only be carried out by those with the correct training and supervision. We can help you to protect your workers and contractors by carrying out a free risk assessment, including on-site assessment to identify the risks on your roofs.

We can also provide recommended solutions that comply with all relevant local, OSHA and EU regulations, based on our 4 Step Hierarchy of Control for working safely at height.

# ROOFTOP SAFETY HAZARDS

Before any work is carried out on your roof you should always carry out a thorough roof top risk assessment to identify hazards and determine where workers are exposed to the greatest risk.

## 1

### ACCESS POINTS

Access points are the **most frequented** hazard on any rooftop. Workers are exposed to this risk twice - every time they enter and exit the roof to perform tasks. If a worker is required to access the roof 8 times per year, they are exposed to the access point hazard 16 times. All ladders and hatches should be secured with a self-closing gate and safety-compliant railing.

## 2

### ROOFTOP OPENINGS

Openings are the most often overlooked hazards, so they are extremely critical to protect. Skylights and rooflights are considered to be a hole in the rooftop and all rooftop openings should be a serious risk concern.

Statistically, more people fall through skylights than over the open edge of a roof. As a worker is traversing the middle of the rooftop, they have a false sense of security. Operating far from the roof edge, carrying equipment, or focused on the job at hand, it is easy to misstep and fall through an unprotected skylight opening.

## 3

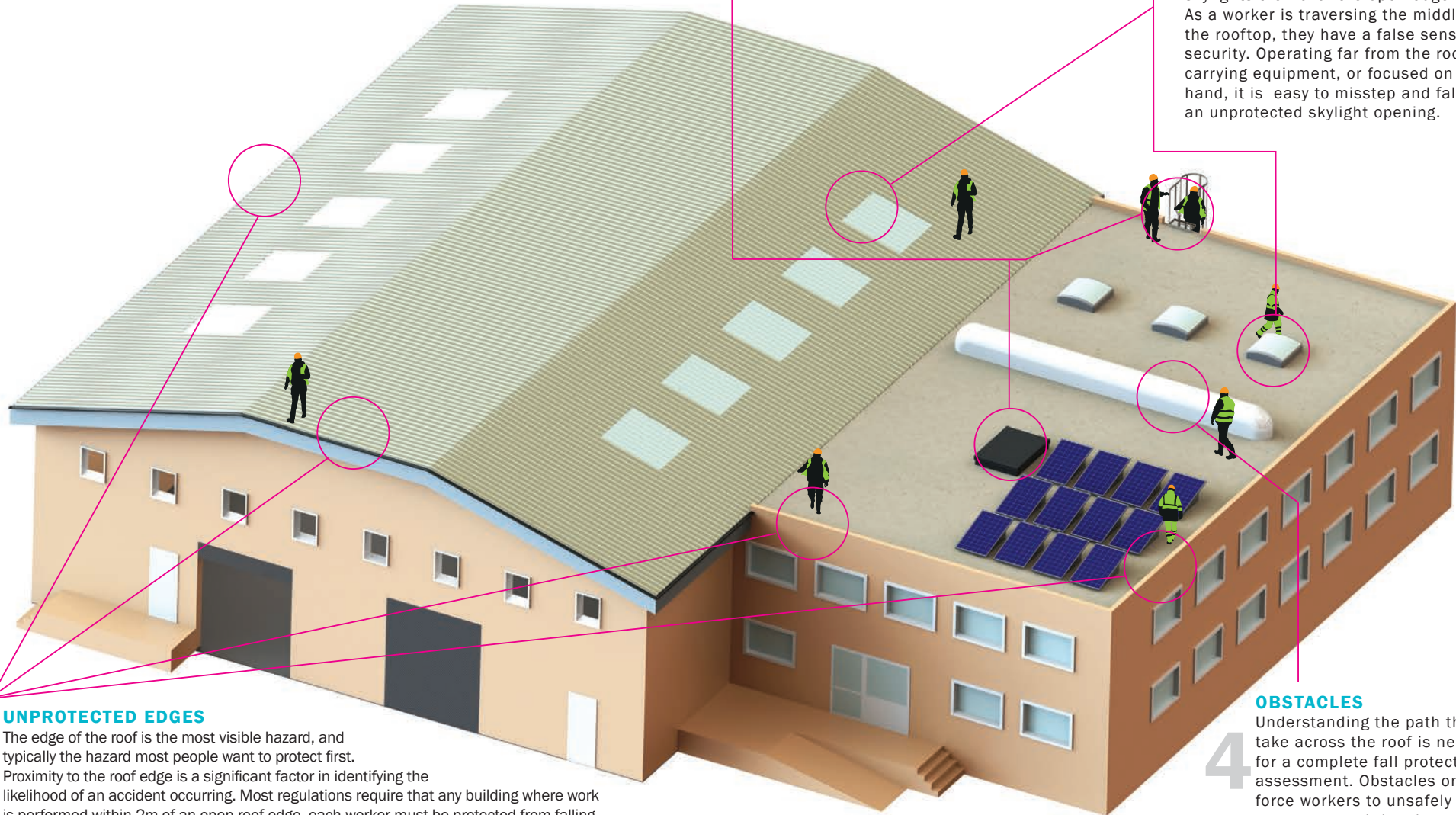
### UNPROTECTED EDGES

The edge of the roof is the most visible hazard, and typically the hazard most people want to protect first. Proximity to the roof edge is a significant factor in identifying the likelihood of an accident occurring. Most regulations require that any building where work is performed within 2m of an open roof edge, each worker must be protected from falling with a guardrail system or other approved safety system. Frequently, a worker's purpose for accessing the roof is to service a piece of equipment. It is important to document if the equipment is too close to an unprotected edge.

## 4

### OBSTACLES

Understanding the path that workers take across the roof is necessary for a complete fall protection assessment. Obstacles on the roof force workers to unsafely climb over or step around the obstructions, often placing workers at risk by walking too close to the roof edge and slipping off.



# ROOFTOP FALL PROTECTION:

## The Kee Solution

When access to the entire roof is required, the safest, most comprehensive solution is a perimeter railing system that surrounds and protects all roof edges.

### KeeGuard® Topfix

Dependable railing for all metal roof types provides non-penetrating safety at the highest level.

### Kee Cover® Rooflight Protection

Rooflights are considered a hole in the roof - a safety hazard. The unique construction and mounting design allow the Kee Cover Rooflight Protection to be attached without penetration, maintaining the integrity of the roof and the skylight.

### Kee Line®

Horizontal lifeline fall protection provides continuous protection when working at heights. Our system accommodates up to 3 users and can be mounted either directly onto the roof surface or on to the building structure.

### Kee Anchor® Weightanka

A modular, dead-weight anchor fall prevention system, used with personal fall protection equipment allows for safe freedom of movement around the roof space.

### Kee Walk®

On a standing seam metal roof, or metal profile roof, a level walkway system provides a safe, anti-slip and level surface to avoid tripping over the seams, crowns and valleys.

### Kee Dome®

A safety access and railing system designed for secure egress/ingress through a dedicated roof hatch. Railing protection supports safety when the hatch is open. Self-closing gate protects workers when entering and exiting the rooftop.

### Kee Gate®

Self-closing gate provides permanent protection for any openings, ladder/stair access points, roof hatches and restricted areas, where access for roof maintenance is required.

### Safe Access Platform

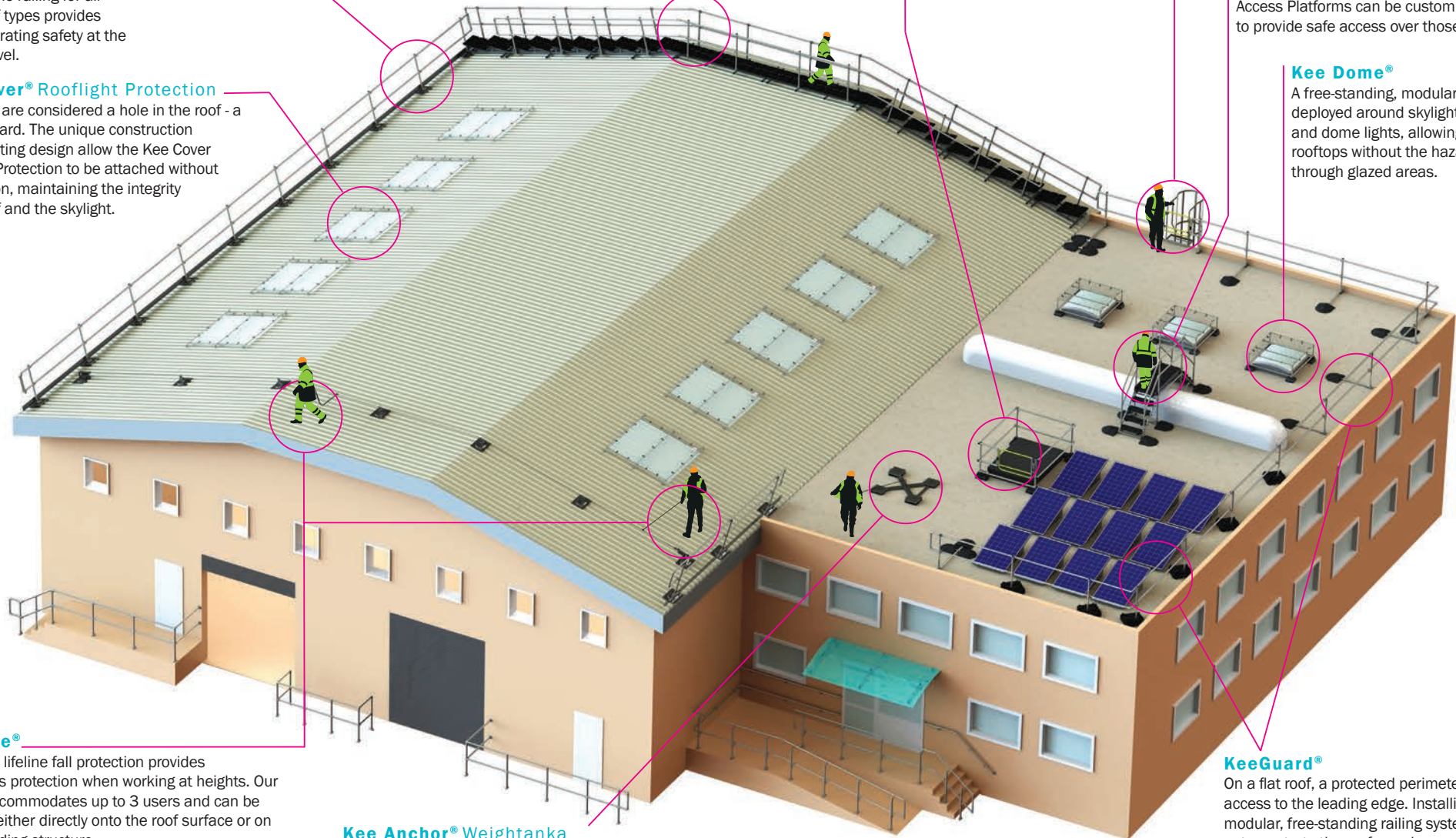
When obstacles exist on the rooftop (piping, ventilation systems, partitions between buildings or level changes) Safe Access Platforms can be custom designed to provide safe access over those hazards.

### Kee Dome®

A free-standing, modular solution deployed around skylights, roof lights and dome lights, allowing access to rooftops without the hazard of falling through glazed areas.

### KeeGuard®

On a flat roof, a protected perimeter limits access to the leading edge. Installing a modular, free-standing railing system that does not penetrate the roof membrane provides a safe barrier to the roof edge.



## IN CONCLUSION

Slips, trips and falls account for nearly 20% of all work-related accidents. Sadly, rooftop falls remain one of the main causes of serious occupational injuries and fatalities.

Working at height on rooftops is naturally dangerous and no matter how careful people are, accidents can happen. However, that does not mean employers, facilities managers, building owners and contractors should not do all they can to protect people working on roofs.

The price of complacency can be enormous. If an accident occurs, the fines for non-compliance are extremely high. Your entire rooftop could be shut down while the incident is investigated, or hazards are protected. This lost time will affect important MRO (maintenance, repair and operations) which is essential for any plant or facility, particularly manufacturing and engineering.

Claims, insurance premiums and legal fees reflect a company's reputation and will impact on its bottom line. The only way to truly protect your company from future risks and liabilities and create a culture of safety and trust is to use a fall protection solution that meets the relevant regulations.

Addressing the areas we have covered in this whitepaper will help you to protect your employees and your business.

As experts in fall protection and safe access, we understand the pressures businesses face in ensuring everyone working at their sites are not exposed to hazards. Our fall protection experts are readily available to guide you through the right safety solution for your individual requirements.

**Please contact one of our qualified Fall Protection Experts to schedule a free, non-obligatory rooftop safety assessment today!**





# ABOUT KEE SAFETY

Founded in 1934 Kee Safety is one of the world's largest manufacturers and suppliers of fall protection, safe access solutions and components for safety railing systems. Kee Safety has offices and distribution arrangements in over 60 countries around the world including the United Arab Emirates, the United States, Canada, Germany, France and India.

The company has a strong Asia-Pacific presence and operates across the region from its offices in China and Singapore. We also have a representative in Vietnam and work with a number of approved Kee Safety distributors and installers in the region.

Kee Safety provides customers with expert project consultations, ongoing safety education and advice and the best and safest solution for their unique requirements. These include rooftop guardrails, safety gates, skylight fall protection, access platforms and roof top walkways, anchor points and lifelines and safety rail and handrail systems. All are designed to meet or exceed international standards and regulations including EN and OSHA compliance requirements.

## THE STATE OF THE ART TEST & TRAINING FACILITY

As the continued evolution and development of new product standards drives compliance across the globe, Kee Safety has ensured it remains at the forefront of global innovation by investing in its own testing and training facility at its Cradley Heath, UK Head Office.

The facility also serves as the group's training center to enable employees to become fully conversant with all the company's products before presenting them to customers or attending site to install a dedicated safety solution.

The main function of our test and training facility is to develop, test and enhance the range of Fall Protection products sold by Kee Safety. The centrepiece of the facility is a 30' drop tower used primarily for lifeline testing but also doubling up as a rescue training tower. The layout of the facility allows for walls or roof structures to be built to mirror actual installations so testing of product in exactly the required substrate can be delivered to give clients total peace of mind as to exactly how the products will perform when installed.

Many customers require third party verification of test results for added reassurance that what they are buying is properly tested and complies fully with the recognised standards. Kee Safety works with a number of internationally recognised test houses and a number of leading consultants during its development programmes to ensure it produces optimum products for clients.



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