



3M Science.
Applied to Life.™

Elevate personal safety in construction work at heights.

Discover best practices for key applications involving work elevated platforms, scaffolding and leading edge activities. Get the information you need to help improve the standard of safety for construction workers at heights.

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arco®
Experts in Safety



Every day, nearly one million workers globally suffer a workplace accident, and close to 6,300 people will die due to an occupational accident or disease.¹ Through collaboration and science, we believe that together we can help change that.

Construction safety. Backed by science.

Head impact and eye injuries. Hearing and respiratory hazards. Falls from height and dropped objects. Construction workers face all of these and more day in and day out, so they rely on integrated safety and health solutions from 3M to help keep them protected and comfortable.

Our approach goes well beyond providing quality personal protective equipment. With knowledgeable industry experts committed to developing worker-inspired innovations, our team delivers new technology and in-depth training that can make a measurable impact on worker health and safety.

 **300+**
Technical service/application
engineers and regulatory
specialists worldwide

 **70+**
Countries with local
standards professionals

 **3,100+**
Active patents on safety technologies

 **100+**
Training professionals and
15 training centers globally²

Introduction

As we all know, the construction industry can be one of the most dangerous working environments, where the worker is exposed to a multitude of potential hazards. According to a Eurostat report, 'Accidents at work – statistics by economic activity', in absolute terms, 815 workers suffered fatal accident in the EU in 2015. This figure represents 21% of all fatal accidents across all industry types.³

The construction worker is exposed to a wide range of potential hazards and some of the most common types are listed below.

- ▶ Work at height, including roof, leading edge and mobile elevated work platform activities that can lead to falls resulting in serious injuries, sometimes catastrophic
- ▶ Dropped objects from height, including masonry, tools and other items that can cause serious injuries to workers at lower levels
- ▶ Dust, including respirable crystalline silica and asbestos which can cause acute chronic health issues such as lung cancer
- ▶ Noise and vibration from the use of heavy tools, including hand-held equipment, that can lead to irreversible hearing loss and hand/arm injuries
- ▶ Flying dust particles and liquid splash which may include chemicals or concrete, can result in serious eye/facial injuries
- ▶ Nail guns misfiring and striking the eye leading to serious eye injuries or even blindness
- ▶ Manual handling and poor ergonomics which can result in long-lasting injuries

To mitigate these hazards, safety managers must carry out a suitable risk assessment and implement appropriate control measures following the hierarchy of control.

Continued...

Introduction

Using personal protective equipment (PPE) is the last line of defence, and when selecting PPE, consideration should be given to the wearer, work task and work environment.

As mentioned, although there are a wide range of hazards on a construction site, this eBook will focus on mobile elevated work platform, scaffolding and leading edge applications.

You may be ‘working at height’ if you are working in any place where a person could fall to a lower level causing injury. This includes working on a ladder, scaffolding, flat or sloped roofs, near a floor or wall edge, fragile surfaces and many other locations.

There are key challenges of working at height:

- ▶ leading edges
- ▶ fall clearance
- ▶ dropped objects

Whether conducting a hazard assessment or developing a comprehensive fall protection plan, you must address these key challenges before the work begins in order to prevent a fall from height. Recognise the importance of personal safety in construction work at height by considering best practices in order to help raise the standard of safety for construction workers.

This eBook will walk you through the information you need to protect yourself and your colleagues. We’ll cover some of the hazards, best practices and suggested PPE for working on mobile elevating work platforms and scaffolding applications at height.

Table of contents

Use the following pages to explore construction hazards, best practices and suggested PPE for each of your employees. It's important to remember that PPE should be considered the last line of defense in construction safety and health, as engineering controls (physical workplace changes) and administrative work practice controls should be established first to protect workers. When safety for employees who work at heights is a priority, everyone on your team stands to benefit.

The ABCs of fall protection 6

Learn about personal fall arrest system components, understanding fall clearances, typical leading edge applications and product weight capacity.

Hazards of Mobile Elevating Work Platforms (MEWPs) 10

View common elevating work platform safety challenges, solutions and suggested PPE.

Hazards of scaffolding work at heights 16

See scaffolding challenges, safety measures and PPE options that construction crews should consider.

References 23

See references to sourced information.



The ABCs of fall protection

With thousands of products designed for the specific needs of many industries with work at-height hazards, we can help find the combination of anchorages, body support and connector solutions to meet the requirements of many applications in the construction industry.

A Anchorage

Is a secure point of attachment on the structure for a personal fall arrest system (PFAS). Anchorage connectors vary by industry, job, type of installation and structure. They must be able to support the intended loads and provide a sufficient factor of safety for fall arrest. Under European Standards, single person anchors for personal fall protection are required to be tested to 12kN. They must be able to be connected into from a safe position.

B Body support

Harnesses distribute fall forces over the upper thighs, pelvis, chest and shoulders. They provide a connection point or points on the worker for the personal restraint and/or fall arrest system.

C Connectors

Devices such as self-retracting lifelines or restraint lanyards connect a worker's harness to the anchorage.

D Descent and rescue devices

Descent devices allow a person to lower themselves or be lowered to a work location. Another application for descent devices is for rescue. Rescue equipment may also include pulley systems, winches to raise a casualty and automatic rescue systems like the 3M™ DBI-SALA® Ultra-Lok™ RSQ™.

E Education

Appropriate training is essential for all persons planning, supervising or undertaking work at height. 3M offers a variety of training and consultative services to fit your needs.

F Fall protection for tools

Solutions that help make work environments safer and more productive by reducing dropped object incidents.

21%

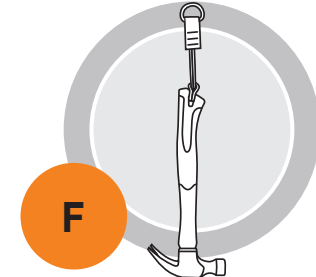
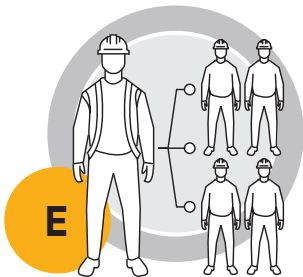
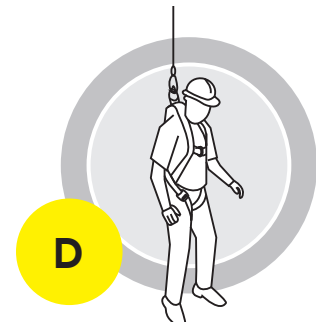
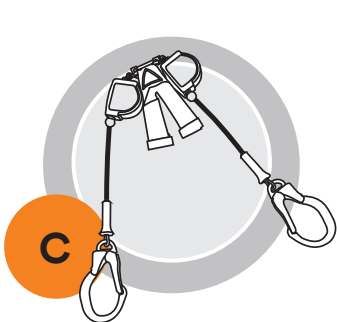
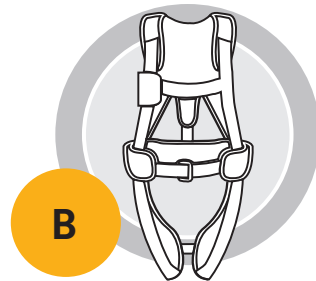
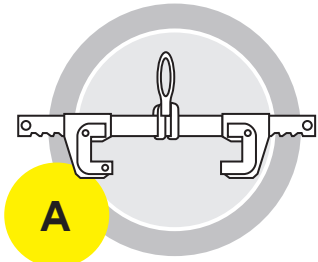
of all fatal accidents were attributed to construction within EU-28 recorded in 2015⁴

25%

of fatal accidents in the United Kingdom occurred with people working from height⁵

54%

of US fall deaths in construction were workers with no fall arrest system⁴



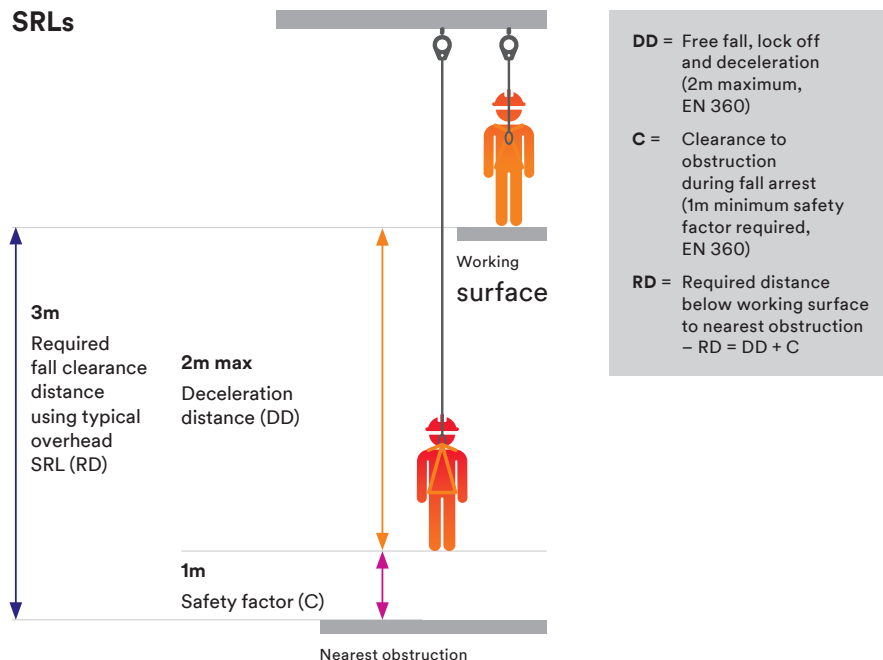
Fall clearances – shock absorbing SRLs vs lanyards

Determining your fall clearance distance

To determine the required Fall Clearance we add the appropriate factors together, this allows us to provide to the user in the user instructions, the safe Required Distance (RD) below the working surface for work which is to be carried out where there is any risk of falling.

A free fall calculator helps you understand the distance you will fall before your fall arrest system starts to slow you down, stops your fall, plus an additional safety factor of 1m (as required by European standards). Properly installed personal fall arrest systems should protect workers from contact with any lower level or obstruction. This is why understanding the proper calculation of required fall clearance distance from your working surface is so important.

SRLs

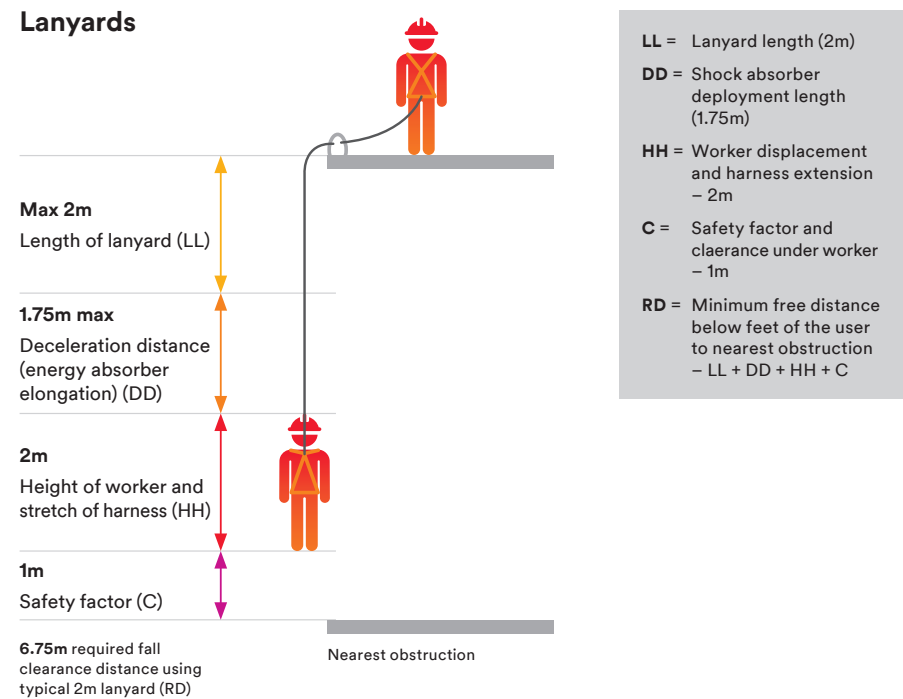


Note:

This information is provided as a general explanation.

In use the specific manufacturer's product instructions must be read, understood and followed.

Lanyards



Note:

This example of fall clearance requirements is of an CE Energy Absorbing Lanyard complying to EN 355 standard.

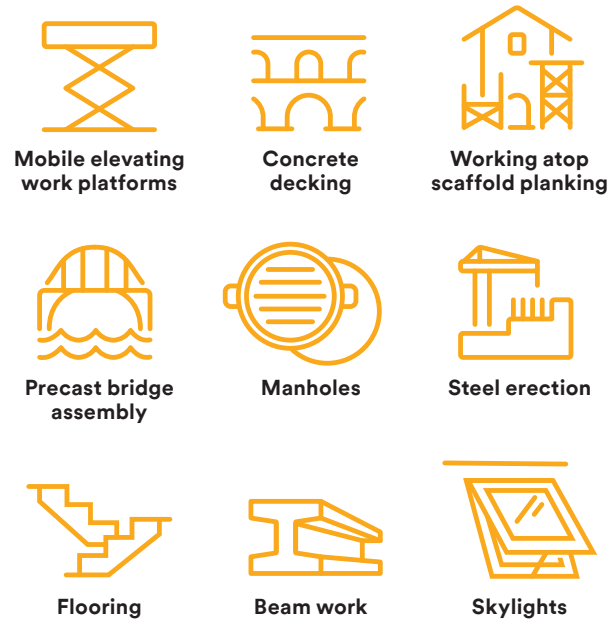
Whenever possible, when attaching a fall arrest lanyard, choose an anchorage point located ABOVE the position of the user.

Leading edge applications

A leading edge application includes any situation where a connecting device has the potential to contact an edge during a fall. These circumstances are common to a wide range of construction worksites. It's essential to carefully evaluate whether a leading edge compatible connecting device should be used any time the device could contact an edge during use.

Where do leading edges exist?

Leading edge means the unprotected side and edge of a floor, roof, or formwork for a floor or other walking/working surface (such as deck) which changes location as additional floor, roof, decking or formwork sections are placed, formed or constructed.

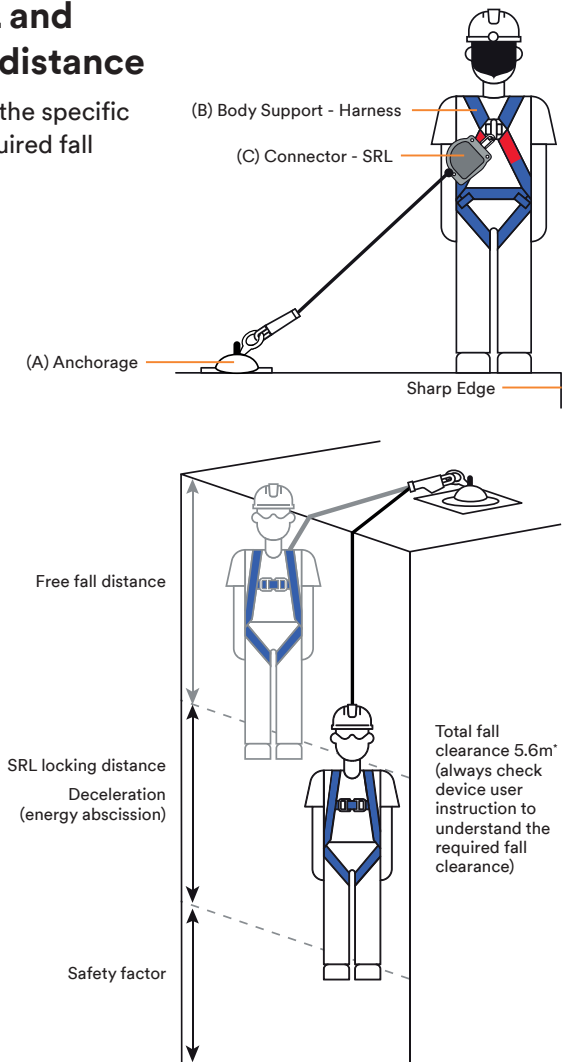


Using a leading edge SRL and checking your clearance distance

Always check the User Instructions of the specific device to properly understand the required fall clearance for safe working.

Virtually all construction crews will encounter worksite leading edges. That's why it's critical to use fall protection components designed, tested and certified to help be resistant to leading edge hazards. These connecting devices should integrate shock absorption to compensate for increased leading edge fall distances.

Always consider leading edge rated connecting devices for applications that have leading or sharp edges.



*Example: DBI-SALA® Nano-Lok™ Edge CE product

Understanding weight capacity

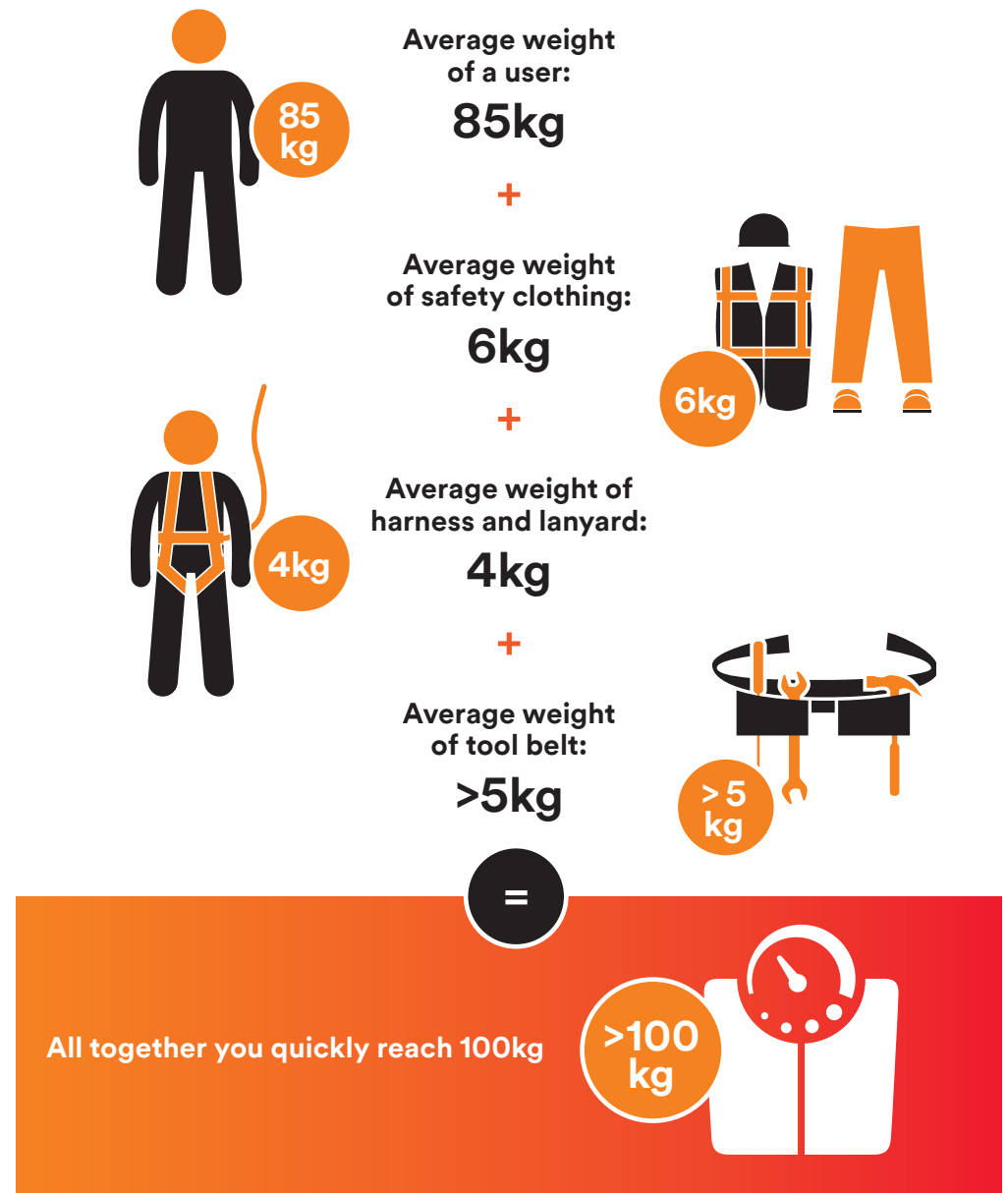
Understanding fall prevention product capacity

Steps should be taken to ensure that the selected personal fall protection systems are suitable for the task and the individual worker. When selecting the right personal fall protection system, one of those considerations is the overall user weight, and the capacity of the products planned to be used.

Consider user weight

Although the 100kg test mass used to validate common fall protection equipment may seem adequate, think about the added weight that workers carry at height including essential tools and other personal protective equipment. Take a look at the diagram and calculation here, you will see its quite possible for a user to be in excess of 100kg.

The total weight of the user, including all they wear and carry, must be lower than the manufacturers capacity of the fall prevention products.





Hazards of Mobile Elevating Work Platforms (MEWPs)

Most MEWPs also have built-in guardrail systems, so you might think that fall protection is taken care of, right? Wrong.

In some jurisdictions, fall protection by guardrail only is an acceptable practice in a specific set of circumstances, for example, if its use complies with all three of the following conditions:

- ▶ The device being used is a scissor lift, operating on a firm, substantially level surface
- ▶ The MEWP manufacturer permits fall protection by guardrail only
- ▶ The worker is not required to exit the work platform at height

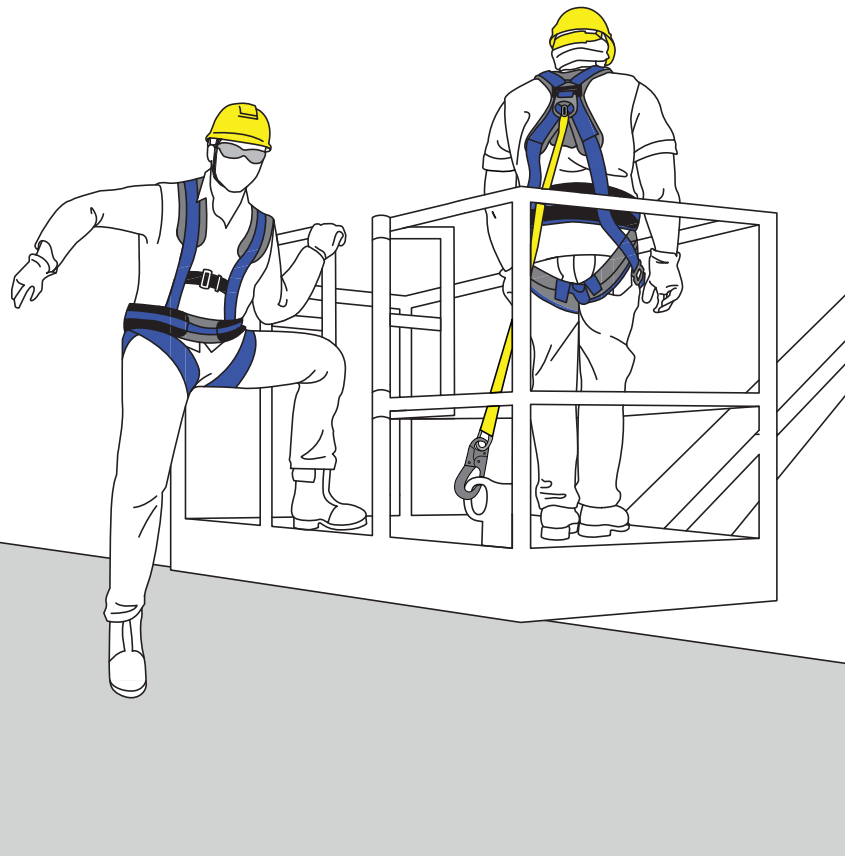
However, regulatory compliance for work at height is merely a starting point. MEWPs are different from scaffolds and other work platforms; the major difference is that they are mobile. To truly help protect people from harm, personal fall protection is strongly recommended when using this equipment.

Falling over guardrails is the cause of many injuries and fatalities with MEWPs. Typically, falling over MEWP guardrails is caused by workers reaching out beyond the guardrail system because the MEWP cannot adequately reach the required work

location, or the guardrail itself inhibits the work in some way. The fundamental cause is poor planning, and this leads some workers to inappropriately extend their vertical reach by standing on mid rails, or even stand and balance themselves on top rails. They may also try to extend their reach horizontally over top rails or in between top rails and mid rails.

Falling while entering or exiting a MEWP is also a concern. In some instances, workers use MEWPs solely for access. Work may need to be performed on a roof, mezzanine or other platform with limited access, therefore requiring workers to transition from a MEWP onto another platform. Fatal falls can occur if the worker does not use a personal fall arrest system (PFAS) and maintain 100% tie-off, or if the MEWP:

- ▶ Does not have a well-designed gate for ease of access/egress
- ▶ Is not situated in close proximity to the landing surface



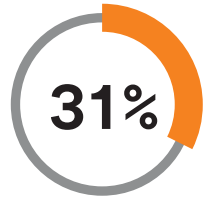
Tip-over and ejection is another serious hazard. Generally speaking, a MEWP can become unstable if not operated on a firm, flat, level surface capable of withstanding all load forces imposed by the MEWP while operating.⁴ Any of the following circumstances can also lead to potential instability:

- Moving the platform while elevated
- Exceeding the platform capacity
- Disregarding warning alarms and signals
- Using excessive manual force
- Hoisting materials with the MEWP
- Using the MEWP as a jack
- Altering, disabling, or overriding safety features/devices (e.g., tilt alarm, limit switches)
- Failing to deploy stability-enhancing devices if the MEWP is so equipped (e.g., outriggers, stabilisers)
- Collisions with other vehicles, objects or structures
- Inadequate maintenance
- High wind speeds

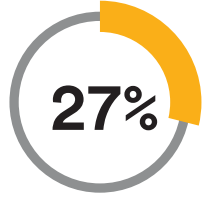
Tip-overs are extremely dangerous not only to occupants of the MEWP, but also to other people in the vicinity. Ejection of an occupant or equipment, whether or not they are connected to an approved anchorage point with a PFAS or tool tethers, can be fatal or cause severe injuries.

In Europe, work involving MEWP follow specific practices varying across countries and regions. Please check locally for details and compliance. Occupants of a boom type MEWP should be restrained within the basket as the main causes of injury and fatalities include over-reaching and ejection whilst travelling over uneven grounds due to the leverage effect of the boom. In certain circumstances this can be addressed through appropriate risk assessment e.g. working over water.

19 
fatalities related to mobile elevated work platforms occur each year in the global construction industry⁶

31% 
of elevating work platform deaths are from falls⁷

15% 
of elevating work platform deaths are from electrocution⁷

27% 
of elevating work platform deaths are from overturns⁷



“Some MEWP manufacturers recommend using a fall restraint system.”

As already noted, regulatory compliance is only a starting point. Both manufacturers and users of MEWPs have a responsibility to ensure that this equipment is operated as safely as possible.

Major manufacturers of MEWPs follow standards outlined by European or national regulatory authorities in designing their equipment, for instance, ensuring appropriate safety devices are in place. In terms of direction for users, manufacturers typically make general statements that users are responsible to conform to applicable national, territorial/provincial and local health and safety regulations. However, MEWP manufacturers could cite specific safety precautions to be observed by MEWP operators, including those related to fall protection. Where additional fall protection is required, 3M and some MEWP manufacturers recommend using a fall restraint system to keep workers within the confines of the platform, and not exposing them to any hazards requiring a fall arrest.⁸

Organisations that employ this machinery can create site rules, such as making the use of a PFAS mandatory during operation. Many safety-conscious and high-performing Organisations in fact do this, placing an astute and appropriate emphasis on risk reduction to keep their people from harm. Furthermore, some have rules to help protect workers against ejection as well to keep their people from harm.

Wherever you work, good planning well ahead of the task goes a long way. Assuming of course the task at hand cannot be practically executed from ground level or by other safer means, operational managers, line supervisors and safety professionals alike must consider if:

- 1** The MEWP selected for the task can adequately reach the working area, eliminating any need for workers to extend their reach beyond what the guardrail system allows by design
- 2** The worker is adequately protected by the guardrails as well as personal fall protection in the form of fall restraint, wherever possible, in any case by a fall prevention system
- 3** The worker can safely exit and re-enter the MEWP at height should the task require it and if permitted by the manufacturer
- 4** Any worker required to operate a MEWP is adequately trained for the specific model they will operate to prevent causes of tip-over/ejection
- 5** Any worker required to occupy a MEWP, including an operator, is adequately trained in fall protection, to recognise all potential fall hazards

Depending on the specific jurisdiction (country, province/territory, industry, employer location) where the work is taking place, there are several options for personal fall protection.

[Learn more about fall protection solutions](#) or [register for training with 3M's Fall Protection Group](#).

There are many solutions available for MEWPs; here are some commonly used options to consider for use of personal fall prevention systems for work at height.

A Anchor

Most MEWP manufacturers will have appropriately identified anchorages installed for use with personal fall prevention systems.

B Body support



3M™ DBI-SALA® ExoFit™ XE Series Harnesses:

Specially developed for enhanced safety and fit whilst working at heights. The back D-ring plate design with Personal Self-retracting Lifeline (PSRL) tunnel allows quick and easy connection of personal SRLs. This harness is compatible with optional accessories for back/shoulder padding, leg padding and with a variety of 3M Fall Protection for Tools accessories. All models are equipped with low-profile suspension trauma relief straps.

3M™ DBI-SALA® ExoFit™ XE50 Safety Harness

3M™ DBI-SALA® ExoFit™ XE50 Positioning Safety Harness

3M™ Protecta® Vest-Style Harness

Features a fixed back D-ring to minimise workday readjustment and offers a modern design that gives the harness a fresh, sleek look.

C Connecting devices



For work in MEWPs, restraint lanyards that limit travel to a minimum required to perform the work task should be considered as a best practice.

For general elevating work platform use:

3M™ Protecta® Work Positioning Trigger Lanyard

3M™ Protecta® Work Positioning Trigger Lanyards feature an adjustment system giving the user the option to easily adjust the length of the lanyard during use. These lanyards have a triple action carabiner with a zinc-plated steel snap hook and are available in different lengths.



D Descent device

3M™ DBI-SALA® Rollgliss™ R550 Rescue and Descent Device

This compact and versatile unit can be used in a number of configurations to effectively rescue or evacuate a person from height or below ground level. The unit incorporates a geared handwheel to lift the casualty (can also be used with a cordless drill) and a constant rate descent system to lower a casualty to safety.

F Fall protection for tools

3M™ DBI-SALA® Parts Pouch

Innovative self-closure system traps objects inside, making it nearly impossible for objects to fall out once placed in the bag. It makes it easy to retrieve objects while you work at heights since no opening or closing is necessary. Compatible with most tool belts.

3M™ DBI-SALA® Hard Hat Coil Tether 1500178

The 3M™ DBI-SALA® Hard Hat Coil Tether allows for fast and easy tethering of hard hats. The compact coil tether stays out of the way of the user, while an industrial steel clip with simple snap provides easy one-handed tethering.

3M™ DBI-SALA® Comfort Accessory Padding for XE50 Safety Harness

Comfortable, lightweight and compact padding provides the opportunity to add extra comfort to your 3M™ DBI-SALA® ExoFit™ XE50 Safety harness. Convenient features including a hook-and loop attachment and non-slip design makes the padding easy to use, fit, and remove by the user. Heavy-duty construction is suitable for tough work environments.

Shoulder/Back Padding

Leg Padding



Head, eye and face protection



For aerial bridge and high-rise concrete formwork from a MEWP: **3M™ SecureFit™ X5000 Series Safety Helmets**

Safety helmets are designed to help protect workers from small falling objects with the security of a chinstrap. This climbing-style helmet delivers all-day comfort without sacrificing security. Its suspension system incorporates exclusive patented Pressure Diffusion Technology to deliver comfort without compromise.



For general elevating work platform use: **3M™ Safety Helmet with Uvicator™**

Designed to help protect a worker's head from impact, these adjustable safety helmets feature a four-point ratchet or pinlock suspension system to deliver a comfortable, secure fit that helps reduce slippage. A Uvicator™ sensor lets the wearer know when to replace hard hat due to UV exposure and integrated vents help release heat buildup and allow air circulation for enhanced comfort.



3M™ Faceshield Holder for Safety Helmets

Designed to be compatible with 3M™ Hard Hats, the 3M™ Hard Hat Faceshield Holders help securely mount a faceshield to your hard hat. Compatible with a variety of 3M™ W-Series Faceshields that help protect against impact, splash and/or radiant heat. Consider pairing with the 3M™ WP Series Clear Visors.



3M™ SecureFit™ Safety Glasses 200 Series

3M™ SecureFit™ 200 Series are lightweight safety glasses with 3M™ Pressure Diffusion Temple Technology. Our glasses feature a wraparound design that's secure and comfortable. They are available in various lens tints.



3M™ Solus™ CCS Safety Glasses

3M™ Solus™ CCS Safety Glasses are our rimless safety glasses that feature lime green temples with a Corded Control System (CCS) for attaching corded earplugs. The polycarbonate lens features a Scotchgard™ Anti-Fog and Anti-Scratch Coating on both sides for increased durability and improved vision. Available in a range of lens options.

*Always ensure that your PPE and fall protection equipment are compatible.

Welding safety



3M™ Speedglas™ 100 Welding Helmet

The 3M™ Speedglas™ 100 Black Helmet with Auto-Darkening Filter 100V is good for Stick, MIG and most TIG welding processes. User selectable dark shades 8 through 12 and viewing area of 39 sq. cm. (6.05 sq. in.).



3M™ Adflo™ Powered Air Purifying Respirator HE System with 3M™ Speedglas™ Welding Helmet 9100 MP

This system includes respiratory protection, a hard hat, optional hearing protection and flip-up weld shield. The system can help protect the face from sparks and splatter, and the eyes from intense light during MIG, TIG and stick welding.



3M™ Protecta® Pro™ Welders Harness

Stay safe and protected when working at height with 3M™ Protecta® Pro™ Welders Harness. Our welders harness is specifically designed to resist potential heat damage experienced in welding applications.



3M™ Protecta® Pro™ Welders Shock Absorbing Lanyard

Our 3M™ Protecta® Pro™ Welders lanyard is constructed from reinforced webbing with Nomex®/Kevlar® fibre and has been especially designed for high temperature applications.



Hearing protection

3M™ E-A-R™ Flexible Fit Earplug

Features a soft foam tip and a flexible fitting stem that allows easy insertion into the ear using one or two hands. These are well-suited for activities that require gloves or cause dirty hands, or situations when only one hand is free to fit the earplugs.



3M™ PELTOR™ Electronic Earplug

Helps protect workers' hearing and can help promote auditory situational awareness and communications in challenging dynamic noisy environments.



3M™ PELTOR™ WS™ LiteCom Plus Headsets

3M™ PELTOR™ WS™ LiteCom Plus Headset features integrated pre-programmed PMR two-way radios, Bluetooth® Multipoint connectivity, noise-cancelling microphones, and a level-dependent function for ambient listening. They're available with a headband, neckband or as helmet attachments.



3M™ PELTOR™ WS™ ALERT™ X Headsets

3M™ PELTOR™ WS™ ALERT™ X Headset is a Bluetooth® headset with noise-cancelling boom microphone that connects to your mobile phone for hands free calls and streaming in noisy environments. The headset has a level-dependent function for ambient listening and it synchs to a mobile app so users can easily set-up and adjust the headset.



Coveralls

3M™ Disposable Protective Coverall, 4520

Built for protection and designed for comfort, it features breathable back panels and an anatomical fit for enhanced wear, coverage and comfort while working.

*Always ensure that your PPE and fall protection equipment are compatible.



Hazards of scaffolding work at heights

Scaffolding gives construction teams access to work areas that would otherwise be difficult to reach. These structures are convenient and cost-effective, but their temporary nature exposes them to a different set of hazards than permanent structures.

Whether completing structural maintenance, renovations or other types of construction work, safety remains a key consideration for anyone working on scaffolding systems.

Scaffolds are designed to support both people and materials, so it's important to account for both when assessing worksite hazards and risks. Additionally, the structural integrity of the scaffold itself impacts safety for workers and surrounding environments. From assembly to dismantling, meticulous care should be taken to follow your scaffold manufacturer's instructions, local regulations and jurisdictional requirements. Scaffolds should adhere to the manufacturer's recommended inspection guidelines or other inspection frequencies imposed by the employer, contractor, engineer or local authorities to ensure safety is maintained prior to use.

There are four main scaffolding hazards for construction work at heights.⁹ These hazards can affect workers during the assembly, use and disassembly phases of a project.

Common hazards:

1 Falls

Scaffolding without guardrails, and improperly installed guardrails, increase the risk of fall hazards for workers. The hazard becomes more dangerous when workers do not use an appropriate personal fall arrest system (PFAS) where required. The method workers use to access the scaffold work platform may also impact their protection from falls. This applies to the construction or alteration of a scaffold.

2 Scaffold collapse

Erecting a scaffold correctly is critical for the safety of workers at heights. Proper construction methods can help prevent a collapse, so care should be taken to design the scaffold according to the project requirements and localisation hazards. Many scaffold collapses are as a result of high winds and recent requirements to sheet scaffolds to reduce noise, dust and visual impact. Account for the weight that the scaffold will have to support before anyone uses a scaffold. This should include the weights of materials, workers and the structure itself. Some jurisdictions require scaffolds to be designed by qualified individuals and inspected by competent persons before use.¹⁰

Other important hazard considerations include:

- Foundation stability
- Scaffold plank placements
- Tie-in requirements
- Position of the scaffold in relation to work area¹¹

From the time scaffolding construction begins, worker safety depends on the plans you have in place. Account for collapse risks before anyone steps foot on the structure.

38 

fatalities between 2015 and 2018, due to falls from height in the construction sector in the UK¹³

11,000+ 

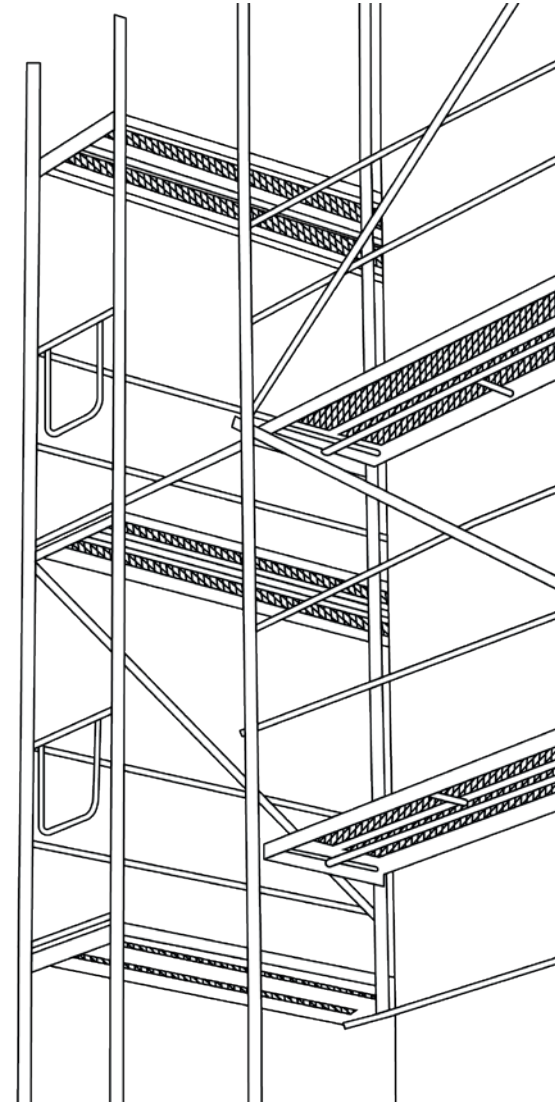
non-fatal accidents involving fall from height in the UK construction from 2015/2016 – 2017/2018¹³

2nd

leading cause of death in the workplace in France is falls from height, and the third leading cause of permanent disability and work stoppages¹⁴

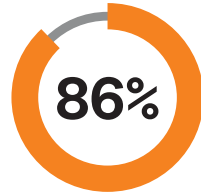


of all workplace deaths in the UK were caused by falls in 2019¹⁵



7,000+

non-fatal injuries in the United Kingdom were caused by falling objects¹⁵



of fatalities from scaffolds in the U.S. occurred in the Construction industry in 2018¹⁶

20%



of fatal accidents in construction in Europe are caused by struck objects in motion¹⁷

16

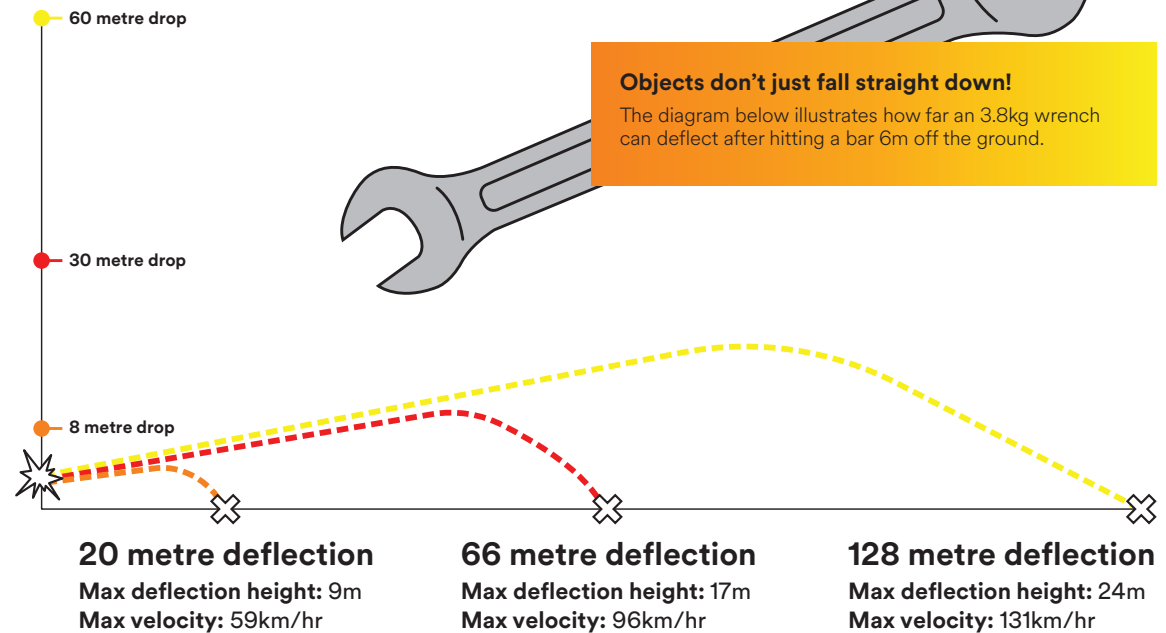


falling object recordables per day in the U.S. Construction industry in 2019¹⁸

3 Struck by falling material

Objects such as tools and structural debris can easily fall towards construction site workers. Depending on the weight and shape of the tool or object that is dropped, the forces of a direct impact can reach fatal levels – even when a hard hat is worn.

Falling object deflections



Leading by example is an effective way to help a construction crew prioritise safety during construction work. Before enacting new safety practices, provide background information that illustrates their importance. Educate your team on the hazards associated with scaffold work, and the measures they can take to protect themselves. Ensure that every construction worker is trained on the proper use of engineering controls such as guardrails and toe boards, any work practice controls such as properly accessing or carrying loads on the scaffold. Ensure that every construction worker understands the PPE they need and how to use it correctly. Mobility plays an important role in scaffold work, so help your team to add safety to every step they take.

During the scaffold assembly and disassembly phases of a construction project, closely follow the scaffold manufacturer's guidelines.

Makeshift solutions can lead to unforeseen safety hazards, and nobody knows the safest processes better than the manufacturer themselves. In addition, it's important to understand and follow local regulations that will help prevent a scaffold accident at a worksite.

- Assign a competent person to complete a scaffold inspection before beginning work
- Wait until necessary repairs are complete before working on scaffolding
- Develop a rescue plan in case a fall occurs
- To protect workers from falling debris, utilise¹⁰:
 - Toeboards
 - Guardrail systems
 - Debris nets
 - Screens
 - Barricades
 - Canopy structures
 - Catch platforms
 - Hard hats
- Use a personal fall arrest system when there are no scaffolding guardrails
- As a best practice utilise 100% tie-off personal fall arrest systems



Another essential safety practice is planning and implementing personal fall arrest systems for scaffold workers at heights. Every construction team member should be aware of the PPE that will help protect from fall hazards and how to properly use it. What's more, workers should understand the situations that call for personal fall arrest systems.

The types of scaffolds that require PFAS typically include:

- Aerial lifts
- Boatswains' chair
- Catenary scaffold
- Crawling board
- Float scaffold
- Ladder jack scaffold
- Needle beam scaffold
- Self-contained adjustable scaffold supported by ropes
- Single-point and two-point suspension scaffolds¹⁹

A successful scaffold construction project is the result of careful planning. Some regulations require qualified individuals or competent persons to properly assess the worksite before each workday, as environmental factors will affect worker safety. From weather to ground conditions, every detail should affect how you approach scaffolding work at heights. Also take interference with other jobs or workers into account. There should be open communication between crew members about who will be working where every day.

While scaffolding at heights presents many safety challenges, approaching projects with a comprehensive plan can improve protection for workers. Safety should be the top priority at every phase of a project, so be sure to demonstrate your commitment to safety protocols on a continuous basis. Construction workers are sure to appreciate an improved commitment to their safety, and every project will be more likely to come with fewer safety setbacks.

Consult your local regulations on scaffolding for additional information.



A study of 114 workplace fall from height case in the U.K. showed 98% missed critical risk management measures, such as:

- Proper risk assessment and mitigation
- Work platform and scaffolding guardrails or other engineering controls
- Training
- PPE²⁰



600+

667 total deaths in construction sector across EU-27 in 2018 (from 3,332 across all industries)²¹



Every construction team member should be aware of the PPE that will help protect them from fall hazards and how to properly use it.

There are many solutions available for scaffolds; here are some commonly used options to consider for use of personal fall arrest systems for work at height. Contact your 3M Fall Protection representative for additional assistance.

A Anchor



3M™ Protecta® Anchor Sling

Made of durable polyester construction and compact and lightweight design, this is an ideal anchorage device for scaffolding or piping.

B Body support

There are many body support options for scaffolding work at heights. Please contact 3M for more.



3M™ DBI-SALA® ExoFit™ XE50 Safety Harness

Specially developed for enhanced safety and fit whilst working at heights. The back D-ring plate design with Personal Self-retracting Lifeline (PSRL) tunnel allows quick and easy connection of personal SRLs. This harness is compatible with optional accessories for back/shoulder padding, leg padding and with a variety of 3M Fall Protection for Tools accessories. All models are equipped with low-profile suspension trauma relief straps.



For scaffolding assembly/disassembly:

3M™ Protecta® E200 Comfort Belt Style Fall Arrest Harness

Features a fixed back D-ring to minimise workday readjustment and breathable shoulder/hip padding for added comfort during long periods of wear. Includes a durable and sturdy belt, a choice of pass-through or quick connect buckles, back and side D-rings.



For general scaffolding use:

3M™ Protecta® E200 Standard Vest Style Harness

Features a fixed back D-ring to minimise workday readjustment and offers a modern design that gives the harness a fresh, sleek look. A choice of pass-through or quick connect buckles are available.

C Connecting device



3M™ DBI-SALA® Nano-Lok™ Personal Self Retracting Lifeline

Made from 19 mm (3/4") Dyneema® fibre and polyester web, our 1.8m single-leg lifeline has a comfort-grip hook end, a quick connector for harness mounting and a smart-activating brake system.

D Descent device



3M™ DBI-SALA® Rollgliss™ R550 Rescue and Descent Device

This compact and versatile unit can be used in a number of configurations to effectively rescue or evacuate a person from height or below ground level. The unit incorporates a geared handwheel to lift the casualty (can also be used with a cordless drill) and a constant rate descent system to lower a casualty to safety.

F Fall protection for tools

For scaffolding assembly/disassembly work:

3M™ DBI-SALA® Scaffold Wrench Holster with Retractor, Belt

Quickly holster scaffold wrenches while working at height. Rear feed system allows retractor to tie off a scaffold wrench while staying out of the way.



3M™ DBI-SALA® Hard Hat Tether

Allows for easy, one-handed tethering of hard hats. The compact coil tether stays out of the way of the user, while a heavy-duty clip holds strong with a 1.8kg load rating.



For general scaffolding use:

3M™ DBI-SALA® Dual Tool Holster, Belt

Equipped with D-rings that are load rated for 2.3kg, this holster features a bottom drain vent that allows it to perform even in wet conditions.

Head, eye and face protection

For scaffolding assembly/disassembly work: 3M™ Safety Helmets with Uvicator™



Designed to help protect a worker's head from impact, these adjustable hard hats feature a four-point ratchet or pinlock suspension system to deliver a comfortable, secure fit that helps reduce slippage. A Uvicator™ sensor lets the wearer know when to replace hard hat due to UV exposure and integrated vents help release heat buildup and allow air circulation for enhanced comfort. Pair with a 3M™ DBI-SALA® Hard Hat Coil Tether or a 3M™ Chin Strap for G3000.

3M™ Faceshield Holder for Safety Helmets



Designed to be compatible with a variety of 3M™ Safety Helmets, the 3M safety helmet faceshield holders help securely mount a faceshield to your hard hat. The 3M™ faceshields can help protect against impact, splash and/or radiant heat. Ensure the faceshield holder is compatible with the faceshield and safety helmet.

For general scaffolding use:

3M™ SecureFit™ X5000 Series Safety Helmets



Safety helmets are designed to help protect workers from small falling objects with the security of a chinstrap. This climbing-style helmet delivers all-day comfort without sacrificing security. Its suspension system incorporates exclusive patented Pressure Diffusion Technology to deliver comfort without compromise. The 3M™ SecureFit™ X5000 safety helmet can be configured as an industrial safety helmet or a climbing helmet meeting the requirements of both EN 397 and EN 12492.

3M™ SecureFit™ Safety Glasses 200 Series



3M™ SecureFit™ 200 Series are lightweight safety glasses with 3M™ Pressure Diffusion Temple Technology. Our glasses feature a wraparound design that's secure and comfortable. They are available in various lens tints.

Welding safety

3M™ Speedglas™ 100 Welding Helmet



The 3M™ Speedglas™ 100 Black Helmet with Auto-Darkening Filter 100V is good for Stick, MIG and most TIG welding processes. User selectable dark shades 8 through 12 and viewing area of 6.05 sq. in.

3M™ Adflo™ Powered Air Purifying Respirator HE System with 3M™ Speedglas™ Welding Helmet 9100 MP



This system includes respiratory protection, a hard hat, optional hearing protection and flip-up weld shield. The system can help protect the face from sparks and splatter, and the eyes from intense light during MIG, TIG and stick welding.

Hearing protection

3M™ E-A-R™ Flexible Fit Earplug



Features a soft foam tip and a flexible fitting stem that allows easy insertion into the ear using one or two hands. These are well-suited for activities that require gloves or cause dirty hands, or situations when only one hand is free to fit the earplugs.

3M™ PELTOR™ Electronic Earplug



Helps protect workers' hearing and can help promote auditory situational awareness and communications in challenging dynamic noisy environments.

3M™ PELTOR™ WS™ LiteCom Plus Headsets



3M™ PELTOR™ WS™ LiteCom Plus Headset features integrated pre-programmed PMR two-way radios, Bluetooth® Multipoint connectivity, noise-cancelling microphones, and a level-dependent function for ambient listening. They're available with a headband, neckband or as helmet attachments.

3M™ PELTOR™ WS™ ALERT™ X Headsets



3M™ PELTOR™ WS™ ALERT™ X Headset is a Bluetooth® headset with noise-cancelling boom microphone that connects to your mobile phone for hands free calls and streaming in noisy environments. The headset has a level-dependent function for ambient listening and it synchs to a mobile app so users can easily set-up and adjust the headset.

*Always ensure that your PPE and fall protection equipment are compatible.

References

1. World Statistic. International Labour Organization.
https://www.ilo.org/moscow/areas-of-work/occupational-safety-and-health/WCMS_249278/lang--en/index.htm
2. Science of Safety | Worker Health & Safety | 3M US.
https://www.3m.com/3M/en_US/worker-health-safety-us/safety-resources-training-news/science-of-safety/
3. Eurostat. Accidents at work – statistics by economic activity, 2018.
https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Accidents_at_work_-_statistics_by_economic_activity
4. Eurostat, Accidents at work – Statistics by economic activity, published July 2018.
<https://ec.europa.eu/eurostat/statisticsexplained>
5. Workplace fatal injuries in Great Britain, 2021. Health and Safety Executive, 2021. <https://www.hse.gov.uk/statistics/pdf/fatalinjuries.pdf>
6. Global MEWP Safety Report – Reported incident statistics 2016-2018.
www.lpaf.org
7. Smith, S. S. (2016, April 8). Number of Fatal Injuries for Mobile Elevating Work Platforms Remains Constant. EHS Today.
8. Skyjack SJ6826 RT Operating Manual.
9. Common Hazards Associated with All Scaffolds. OSHA.
<https://www.osha.gov/etools/scaffolding>
10. US OSHA 29 CFR 1926.451(h)(1) & (2) and (3).
<https://www.osha.gov/laws-regs/regulations/standardnumber/1926/1926.451>
11. A Guide to Scaffold Use in the Construction Industry. OSHA, 2002.
<https://www.osha.gov/sites/default/files/publications/osh3150.pdf>
12. U.S. Bureau of Labor Statistics. Census of Fatal Occupational Injuries (CFOI) - Current and Revised Data. <https://www.bls.gov/iif/oshcfoi1.htm>. Accessed March 16, 2018. The data is for the private sector construction industry.
13. Source: www.hse.gov.uk/statistics/industry/construction.pdf
14. ALSOLU. (2014, March 14). Regulation. ALSOLU.
<http://www.alsolu.com/en/regulation/>
15. RIDDOR Data: RIDKIND: RIDDOR reported Injuries by kind of accident and broad industry group. <https://www.hse.gov.uk/statistics/tables/ridkind.xlsx>
16. Occupational Injuries/Illnesses and Fatal Injuries Profiles. U.S. Bureau of Labor Statistics. <https://data.bls.gov/gqt/ProfileData>, Accessed 2021, July 22. Profiles Type : Fatal Injuries Numbers; Year 2018; Area Name: All U.S.; Characteristic: Industry; Subcharacteristic: Construction; Ownership: All Ownerships
17. Accidents at work - statistics on causes and circumstances – Statistics Explained (europa.eu) https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Accidents_at_work_-_statistics_on_causes_and_circumstances
18. BLS Data 2019, TABLE R64. Number of nonfatal occupational injuries and illnesses involving days away from work by event or exposure leading to injury or illness and industry sector, private industry, 2019.
https://www.bls.gov/iif/oshwc/osh/case/cd_r64_2019.htm
19. Fatality and Catastrophe Investigation Summaries.
<https://www.osha.gov/pls/imis/accidentsearch.html>
20. Zlatar, T., Lago, E. M. G., Soares, W. A., Baptista, J. S., & Barkokébas Junior, B. (2019). Falls from height: analysis of 114 cases. Production, 29, 20180091.
<https://doi.org/10.1590/0103-6513.20180091>
21. Fatal and non-fatal accidents at work by NACE Section, EU-27, 2018 (% of fatal and non-fatal accidents) AAW2020.png – Statistics Explained (europa.eu)

Hearing and PELTOR

▲ WARNING

These hearing protectors help reduce exposure to hazardous noise and other loud sounds. Misuse or failure to wear hearing protectors at all times that you are exposed to noise may result in hearing loss or injury. For correct use, consult supervisor and User Instructions or contact your local 3M Personal Safety Division.

▲ WARNING

Research suggests that users may receive less noise reduction than indicated by the attenuation value(s) on the packaging, due to variation in fit, fitting skill, and motivation of the user. Refer to your applicable regulations for guidance on how to adjust label values and estimate attenuation. In addition, 3M strongly recommends fit testing of hearing protectors.

Eye protection

▲ WARNING

These eye or face protection products help provide limited eye and face protection. Misuse or failure to follow warning and instruction may result in serious potential injury, including blindness or death. For proper use, selection and applications against flying particles, optical radiation and/or splash see supervisor, read User Instructions and warning on the package or contact your local 3M Personal Safety Division. These 3M PSD products are for occupational use only.

Head protection

▲ WARNING

3M Head and Face Products provide limited protection only. Misuse or failure to follow warnings and User Instructions may result in serious personal injury or death. For proper use, see supervisor, User Instructions, or contact your local 3M Personal Safety Division.

Fall protection

▲ WARNING

Compliant fall protection and emergency rescue systems help prevent serious injuries associated with fall events. Users must read and understand the User Instructions provided with the product, and must be properly trained by their employers in the safe use of these systems before using them, always follow applicable local standards. Misuse or failure to follow warnings and instructions may result in serious personal injury or death. For proper use, see supervisor, User Instructions, phone +44 (0)1344 858000 or email informationfallprotection@mmm.com

Respiratory protection

 **▲ WARNING**

These respirators help to protect against certain airborne contaminants. Proper selection, training, use and appropriate maintenance are essential in order for the product to help protect the wearer from certain airborne contaminants. Failure to follow all instructions on the use of these respiratory protection product and/or failure to properly wear the complete product during all periods of exposure may adversely affect the wearer's health lead to severe or life threatening illness or permanent disability. For suitability and proper use follow local regulations, refer to all information supplied or contact a safety professional or your local 3M Personal Safety Division.

Welding safety

▲ WARNING

This product is designed to help protect the wearer's eyes and face from harmful radiation including visible light, ultra-violet radiation (UV), infra-red radiation (IR), sparks and spatter resulting from welding processes. These products must be used only by qualified persons who are properly trained in their use and maintenance. Misuse may result in permanent eye injury and vision loss. Always wear an EN 166 compliant safety spectacles in addition to any welding helmet. For correct use, see supervisor and User Instructions, or contact your local 3M Personal Safety Division.

Coveralls

Proper selection, training, use and appropriate maintenance are essential in order for the product to help protect the wearer. Failure to follow all instructions on the use of these personal protection products and/or failure to properly wear the complete product during all periods of exposure may adversely affect the wearer's health, lead to severe or life threatening illness or permanent disability.

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