3M Science. Applied to Life.™

On-the-Job Head Protection

What you need to know about bump caps, hard hats and safety helmets

No matter your industry, protecting your head at work is essential.

Bumps to the head, falls and impact from falling debris are regular occurrences that can leave you with a serious head injury, preventing you from working and, in the worst cases, causing permanent damage.

The best defense is to engineer out the hazard. PPE is the last defense that helps protect the user. Wearing the right head protection- bump caps, hard hats, or safety helmets - can help reduce the potential for injury . This short Ebook explains your choices for head protection by industry and job, features and benefits, longevity and care requirements, as well as compliance information. For proper use, remember to always follow the manufacturer's *USER INSTRUCTIONS*.

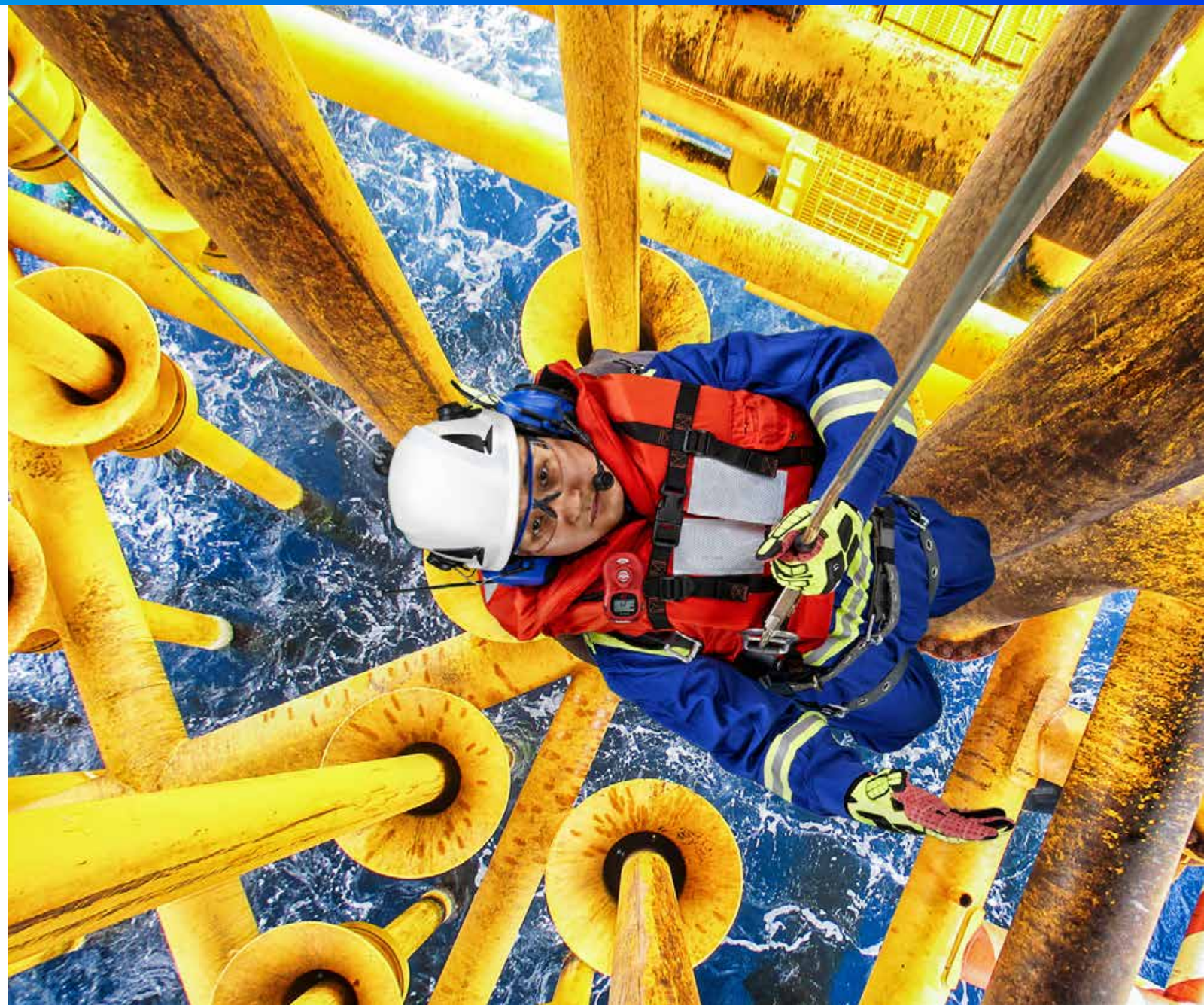
Part 1

The basics of head protection

The basics of head protection

Head protection isn't just a nice-to-have on a job site; it's often a requirement. The Occupational Safety and Health Administration (OSHA) recognizes that protecting workers from potential head injuries is a key element of many safety program. OSHA states that employers must conduct a hazard assessments and ensure that their employees wear head protection if there is potential for injury to the head from impact, falling or flying objects, or from electrical shock and burns.

Hard hats and safety helmets are all designed for specific applications, and there are important differences to be aware of when you are selecting which one is right for your job and the tasks you perform.



Bump caps

Bump caps are designed to protect from user generated situations, like bumping your head on stationary objects. They are becoming a popular part of workers uniforms because they come in many styles and materials, and people in many types of industries find them to be a comfortable option. There are currently no applicable standards in the U.S., but standards exist elsewhere in Europe. Please note, bump caps are not a substitute for hard hats and do not provide the same protection.

Hard hats

Hard hats are designed to help protect your head from impact and are required in areas where impacts from falling or flying objects exists. They are among the most commonly used forms of personal protective equipment (PPE) because they are meant to protect your most valuable body part, your head. Some models of hard hats also help protect from contact with low and higher voltage conductors and electrical shock or burn hazards. Hard hats are required to comply with ANSI Z89.1 in the US.

Safety helmets

Safety helmets are designed to help protect you from small falling objects with the security of a chinstrap. They have been popular throughout Europe and other parts of the world and are now being adopted by workers in the U.S. Workers like them because traditionally they have no brim, which help with upward visibility, and they are a comfortable choice.

Part 2

Bump caps

Bump caps

If you are looking for head bump protection but it is not formally required by OSHA, the bump cap may be a great choice. Typically, a bump cap is a light-duty option that can help shield your head if it comes into contact with a stationary object or structure. This can include low ceilings or fixed objects such as piping.

Bump caps are only allowed where hazard assessments have been conducted and it is determined that ANSI approved head protection is not required.

It should be noted that bump caps are only appropriate for work situations which do not require ANSI compliant head protection. So, if you don't need to reduce the risk of impacts such as a dropped screwdriver but would benefit from reducing the risk of "worker-generated impacts" such as bumping your head on an object you are working near or under, a bump cap may be the right article of head covering for you.

Bump caps
A quick look

A comfortable, versatile option employers can choose to provide to workers in environments without any hazard of falling objects.

Protection Level: Bump

Regulation: None in U.S.; Europe EN 812

Safety: Protects against bumping into a stationary object or structure

Styles: Baseball cap or plastic shell with headband

Used at: Factories, stock rooms, airports

Popular for: Aircraft maintenance, baggage handlers, assembly line workers, painters

Only appropriate for work situations which ***do not*** require ANSI compliant head protection.

Industries and jobs

Bump caps can provide bump protection in a variety of working environments. There are all types of workers who may benefit from using bump caps, such as:

Airport baggage handlers and ground staff

Food hygiene plants

Beverage bottling plants

Warehouse operatives

Automotive manufacturing

Aerospace manufacturing

Maintenance operatives

Features and benefits

Bump caps come in a wide array of styles, colors, and features to accommodate a variety of situations and uses. When selecting the type of bump cap that will work for you, remember to base your selection on comfort, temperature management, visibility and compatibility with other personal protective equipment (PPE).

Bump caps typically come in two design variations:

- **Option 1 – Hard-plastic shell with inside headband**
  - The outer shell is often made of polyethylene and may have vents
- **Option 2 – Baseball cap style**
  - Comes in a variety of fabric options

There are several features available to make bump caps more suitable for specific applications or environments:

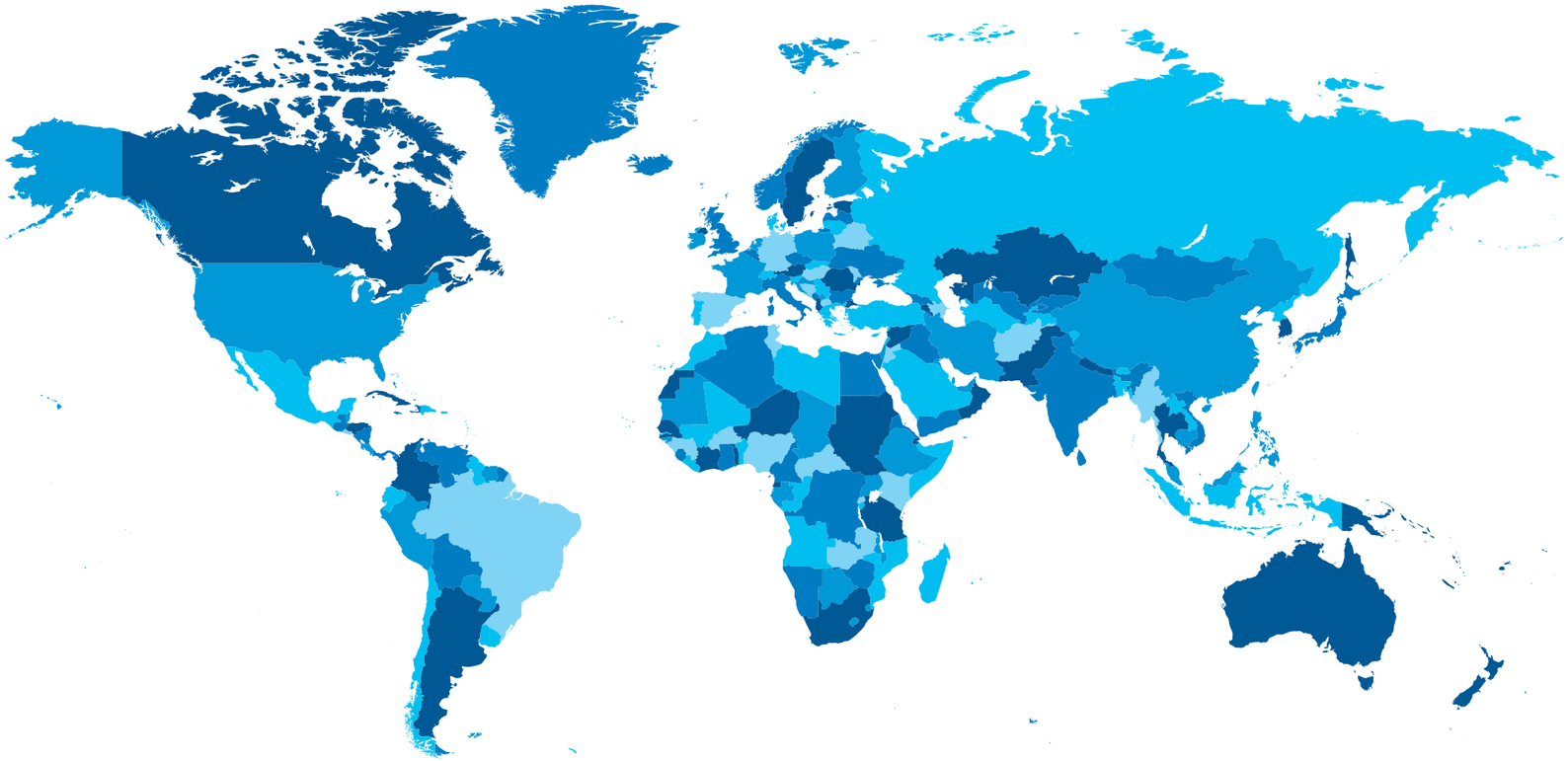
- Adjustable band for a variety of head sizes
- Vents designed to increase airflow
- Sweatbands for comfort and moisture management
- Brim in different lengths for shade from weather or to improve upward visibility
- Reflective material
- Options for water repellency
- Additional coverage for cold environments
- Flame resistant materials
- Customization for brand logos or symbols

Global standards

The guiding standard for bump caps comes from Europe; EN 812 specifies physical and performance requirements, methods of testing, and marking requirements for industrial bump caps. It's important to note that bump caps are also used in other regions but there are currently no standards in Australia, New Zealand, USA or Canada.

PPE compatibility

Bump caps will work with some eyewear and hearing protection, but usually do not contain any mounting system or means of integration with other PPE as a connected system.



Part 3

Hard hats

Hard hats

Hard hats, sometimes called helmets, are designed to help protect workers from head trauma due to small objects falling from overhead. Hard hats also help reduce force from transmitting down the spine if an impact does occur. Hard Hats also provide a hard physical barrier when in contact with fixed objects (exposed beams, pipes, etc.) and electrically insulated models help protect from electrical shock.

Yet, despite national and private safety standards for hard hat use, occupational head injuries are more common than you might expect. In 2014 in the U.S., there were a total of 84,750 non-fatal head injuries requiring time off from work reported to the Bureau of Labor Statistics.[1]

There are different shapes of hard hats ranging from traditional to cowboy hat shapes. The most common shapes are cap style and full brim (also called wide brim). They all must meet the same performance requirements regardless of the shape or style, and the standards generally test for:

- Impact
- Penetration
- Electrical insulation
- Temperature

So what hard hat is right for you?

There are different types that you should know about before making this important head protection decision.

Type I

These are the most common type of hard hats in most markets and come in many shapes and styles. They are designed to help protect from objects falling and hitting the top of the hard hat; they are tested against impacts and penetration. To meet Type I requirements, a hard hat must absorb the specific energy during impact testing and must prevent test objects from penetrating the shell and hitting the wearer's head, in accordance with ANSI Z89.1. Type I hard hats hats are not rated for side protection from blunt force.

Type II

Type II hard hats must meet additional requirements. They are tested against vertical impacts and penetration like Type I hard hats and are also tested against front, back, and side impacts and penetration. For this reason, many Type II hard hats contain a foam insert or other material to help absorb the force of impacts from the side.

Check your local requirements

Regulations and Standards

OSHA Regulates the Customers
29 CFR 1910.135 - Head Protection

- Required in areas where there is a possible danger of head injury from impact, or from falling or flying objects or electrical shocks and burns.

ANSI pertains to the manufacturer
ANSI Z89.1-2014 - Industrial Head Protection

- General minimum performance and label requirements
- Hazards: Impact type, penetration, electrical, and high visibility in occupational & educational environments.

Impact Types

- Type 1 - Top Impact
- Type 2 - Top and Side Impact

Electrical Classes

- C - Not rated
- G - 2,200 V
- E - 20,000 V

Marking

- Reverse donning
LT - Lower temperature
HT - Higher temperature
HV - High visibility

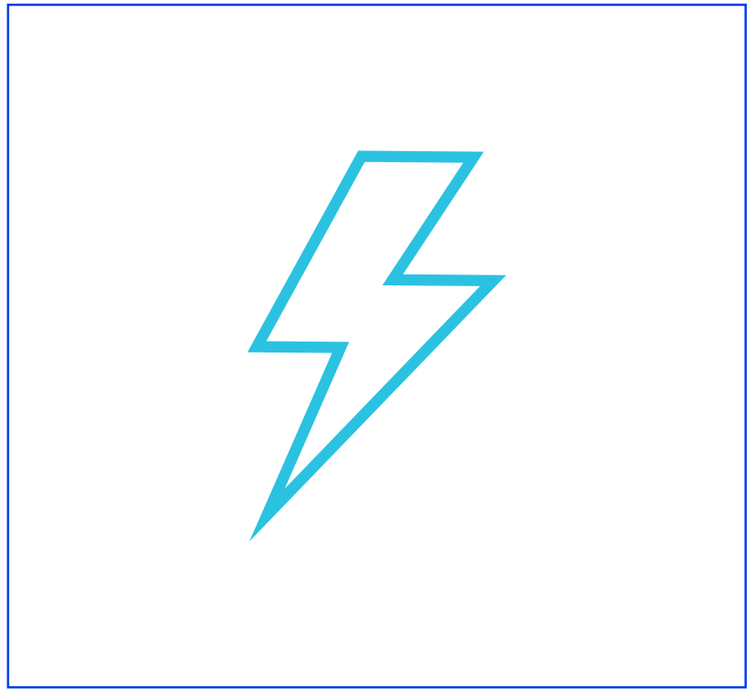
Type I and Type II definitions, classifications and requirements differ from country to country. Remember to check the requirements in your location against the certification or rating of the hard hat you plan to use.

Electrical shock protection

Hard hats can also help protect from accidental electrical shock when the wearer's hard hat comes in contact with live electrical conductors. Different countries have varying electrical classes and ratings. Here in the U.S., ANSI Z89.1 recognizes three different classes for hard hats:

- **Class G:** Protect against impact, penetration and low-voltage electrical conductors
  - For certification, sample shells are proof-tested at 2,200 volts of electrical charge
- **Class E:** Protect against impact, penetration and high-voltage electrical conductors
  - Sample shells are proof-tested at 20,000 volts of electrical charge
- **Class C:** Protect against impact and penetration only

Designations for the type, class, and other optional ratings are marked on the hard hat.



Hard hats

A quick look

A comprehensive head protection option required for all workers in environments with hazard of falling objects.

Protection Level: Type I or Type II

Regulation: Various, including ANSI/ISEA Z89.1

Safety: Overhead impact; additional protection may include side impact, penetration and electric shock

Styles: Range from traditional to cowboy hat shape

Used at: Building sites, oil platforms and rigs, chemical plants, manufacturing plants, forest sites, utility stations

Worn by: Construction workers, oil drillers, industrial workers, miners, loggers, utility professionals

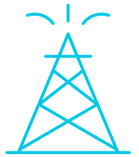
Available in Type I and Type II for varying levels of protection.

Industries and jobs

Hard hats can provide heavy-duty protection in a variety of working environments. Many industries commonly use hard hats on the job, including:

Construction

Manufacturing



Oil and gas

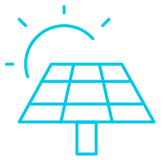
Heavy and light industrial

Petrochemical

Mining

Road construction

Forestry



Utilities

Features and benefits

Hard hats are required in many applications and job sites. The good thing is that there are many options for hard hats that address comfort, fit and style.

Adjustable fit systems

Hard hat suspensions usually can be adjusted so the helmet can be worn securely without pain points and hot spots. This can be accomplished by push-button, pinlock or ratchet suspension systems that you can turn or click into place so that the hard hat fits properly.

Some helmets offer innovations such as pressure-diffusion technology that allows the suspension to better adjust to the contours of the wearer's head. Brow pads and sweatbands can often be added or adjusted to improve the comfort and fit of hard hats. Check with your hard hat manufacturer for their recommended options.

Ventilation and UV indicator

Hard hats usually consist of a shell, often made of plastic, and a suspension, sometimes called a harness. This rigid design should be able to protect from impact hazards as defined in the ANSI standard. The shell might have ventilation holes or other features built into it that will allow for PPE integration, but also help it hold up to weather and other conditions.

A UV indicator may help you know when it is time to replace your hard hat helmet because of over exposure to the sun.

Customizations and reverse donning

In addition to a variety of styles, hard hats also come in many colors, including high visibility hues and reflective PPE integration options to help increase worker safety. Organizations can also add their brand logos or other symbols.

Some workers prefer to wear a hard hat backwards and want to know if that is compliant. If the hard hat was tested to the standard with the suspension in the reverse position and the hard hat is marked with the "reverse donning" symbol, then it is compliant.

Safety smarts

How to inspect your hard hat

It's important to inspect your hard hat before you put it on each time, looking for:

Physical damage

- Inspect for cracks, frayed straps and any sign of damage
- Replace the hard hat immediately if you notice any wear, abuse or degradation

Brittleness

- Look for cracking and deformities
- Your hard hat should be firm but flexible

If you're unsure of your hard hat's status, replace it. Your safety is always worth it.

Longevity

When assessing whether it is time to replace your helmet, you should always follow the manufacturer recommendations. It is important to note that there are differences between "shelf life" and "service life" so look for guidance from the manufacturer.

Most manufacturers recommend that when a hard hat has sustained an impact to dispose of it immediately, even if there is no visible damage. To protect the hard hat shell, many manufacturers also recommend that you do not use paints, solvents, chemicals, adhesives, gasoline or similar substances on a hard hat. These materials can deteriorate the shell, minimizing its ability to withstand impact and penetration.

Prolonged exposure to direct sunlight can degrade the plastic material many hard hats are made of, so do not store it in direct sunlight.

Do not store objects between the suspension and the shell. The space between the suspension straps and the top of the hard hat is usually part of the shock-absorbing design. Affixing stickers or other decorations can make it difficult to properly inspect a hard hat for damage and in some cases might harm the plastic shell.

Maintenance, care and washing

Check the *USER INSTRUCTIONS* for the specifics regarding your make and model. In most cases, it is as easy as cleaning with mild soap and water, rinsing and wiping dry. You should always store your hard hat away from direct sunlight.

PPE integration

Depending on the hard hat and the manufacturer, there are several methods for connecting PPE directly to hard hats.

Hard hat/safety helmets are commonly integrated with:

- Hearing protection (earmuffs)
- Integrated eyewear
- Face shields
- Neck covers
- Respiratory protection
- Headlamps
- Reflective materials
- Welding accessories

Many hard hats have “accessory slots” designed to make attaching PPE (such as face shields and hearing protection) easier. There are other attachment methods, though, and you should always check to make sure the PPE integration is compliant.

previous next

Part 4

Safety helmets

Safety helmets

Safety helmets borrow design and style cues from recreational climbing products. Since many of them are certified to occupational head protection standards, they are becoming popular on jobsites. The current generation of line workers, utilities and other industries are looking for the stylish, comfortable head protection offered by climbing helmets. This option is already quite popular in Europe.

Workers often prefer climbing-style helmets for their comfort and brimless design which can make it easier to wear when climbing or working in tight spaces. Like hard hats, many climbing-style helmets offer venting options designed to allow air to circulate, keeping people more comfortable in warm environments or during high-intensity work.

Climbing helmets may also offer adjustments to give the wearer a comfortable and secure fit. Helmet suspensions adjust to alleviate pain points and hot spots while staying in place. This security can be provided by push-button, pinlock or ratchet suspension systems that you can turn or click into place so that the helmet fits properly.

Some climbing helmets offer innovations such as pressure-diffusion technology for optimal conformity to the contours of the wearer's head. Brow pads and sweatbands are another option for added comfort and improved fit. Check with your hard hat manufacturer for their recommended options.

Requirements and certifications

Climbing-style safety helmets may have different requirements depending on the country that they are used in. In Europe for instance, climbing-style helmets meet a different requirement for impact protection than standard hard hats and have different requirements for chin straps.

In the U.S. and other countries that use ANSI Z89.1 as the standard for head protection, there is no difference in the requirements for traditional Type I hard hats and climbing-style helmets that are rated as Type 1/Type I.

In the U.S. market, climbing-style helmets must meet the same minimum requirements as denoted in the type and class. Climbing-style helmets must be specifically rated as Type I or Type II for ANSI standards.

Type I

These are the most common type of safety helmets in most markets and come in many shapes and styles. They are designed to protect from objects falling and hitting the top of the safety helmet; they are tested against impacts and penetration. To meet Type I requirements, a safety helmet must absorb the energy during impact and must prevent objects from penetrating the shell and hitting the wearer's head, in accordance with ANSI Z89.1. Type I safety helmets do not have any side protection from blunt force.

Type II

Type II safety helmets must meet additional requirements. They are tested against vertical impacts and penetration like Type I safety helmets and are also tested against horizontal or side impacts and penetration. For this reason, many Type II safety helmets contain a foam insert or other material to help absorb the force of impacts from the side.

Safety smarts

Check for a rating

Some people assume that because many Type II hard hats contain foam inside of them, and many climbing-style helmets also contain foam, they must be similar. This is not necessarily true. Climbing-style helmets must be specifically rated as Type I or Type II for ANSI standards. Most climbing style hard hats on the market today do not meet Type II requirements.

Electric shock protection

Climbing-style helmets can also help protect from accidental electrical shock when the wearer's hard hat comes in contact with live electrical conductors. Different countries have varying electrical classes and ratings. Here in the U.S., ANSI Z89.1 recognizes three different classes for climbing helmets:

- **Class G:** Protect against impact, penetration and low-voltage electrical conductors
  - For certification, sample shells are proof-tested at 2,200 volts of electrical charge
- **Class E:** Protect against impact, penetration and high-voltage electrical conductors
  - Sample shells are proof-tested at 20,000 volts of electrical charge
- **Class C:** Protect against impact and penetration only, with no protection from electrical shock.

What is EN 12492?

The EN 12492:2012 *Mountaineering equipment – Helmets for mountaineers – Safety requirements and test methods* is a European Standard approved by European Committee for Standards (CEN).

Clause 4.2.1.1, 4.2.1.2, 4.2.1.3, and 4.2.1.4 refer to the vertical, front, side, and rear impact shock absorption, respectively. The force transmitted to the headform shall not exceed 10 kN, when striker is dropped approx. 500 mm following clause 5.5.3.4.

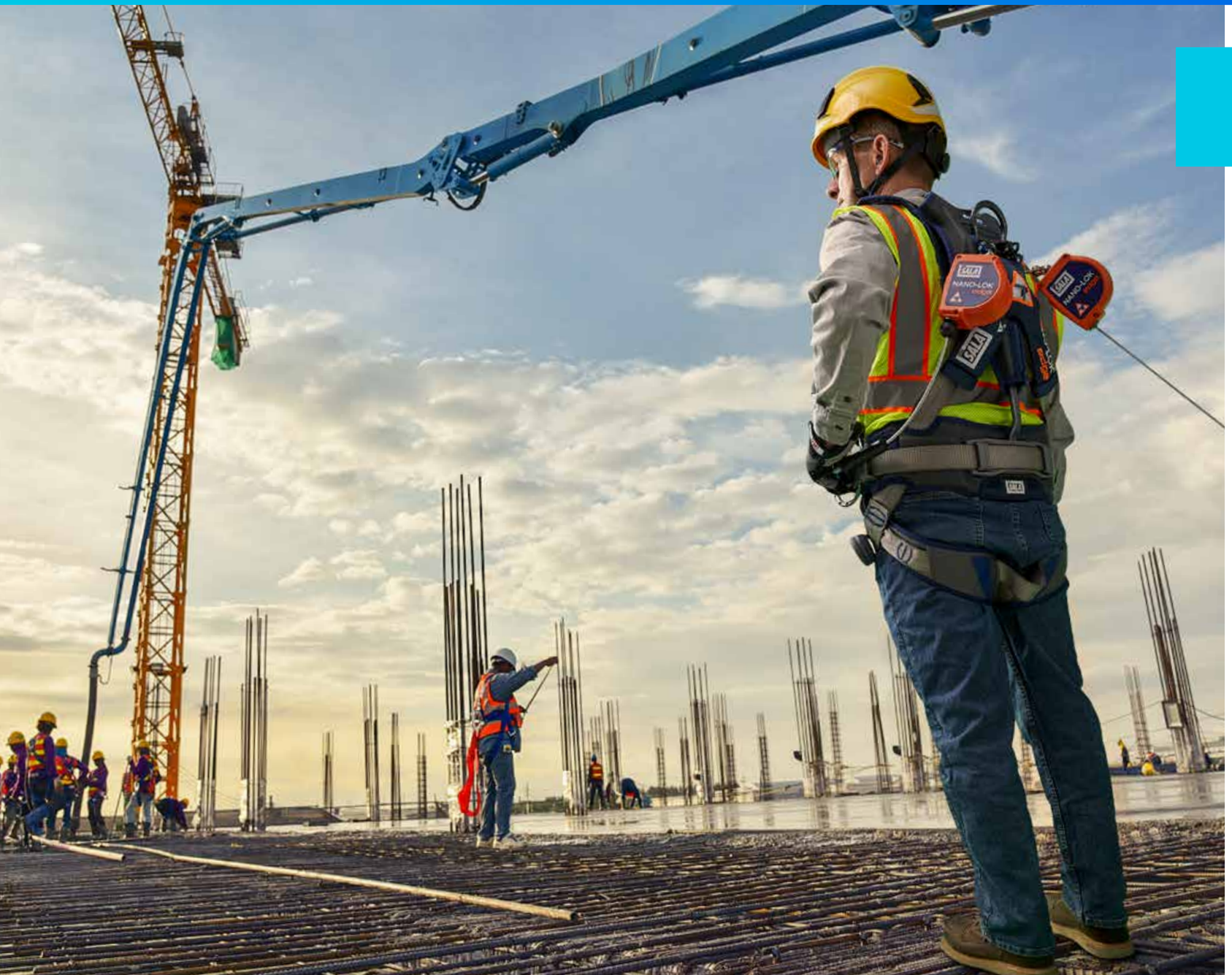
Clause 4.2.2 refers to the penetration requirements which is impacted at two points at least 50 mm apart at a striker drop height of approx. 1000 mm following clause 5.6.3.4.

Why test to EN 12492?

How does this compare to ANSI Z89.1?
ANSI Z89.1 Type I hard hats are only tested to top impact. ANSI Z89.1 Type II is impacted front, back and side; however, it is more direct and requires reinforcement, adding additional weight and cost to the user.

Is this required by OSHA?
No. The EN 12492 is not applicable in the U.S.

Why should I care?
Bumps and other points of contact can be common in some jobs, such as telecom or confined space. Testing demonstrates additional performance capabilities to these types of impact.



Climbing helmets

A quick look

A stylish and comfortable head protection option that is good for tight spaces and can be used in environments with hazard of falling objects.

Protection Level: Type I or Type II

Regulation: Various, including U.S. ANSI Z89.1-2014 Type I, Class G and E; Europe EN 12492 mountaineering standard

Safety: All types protect from overhead impact; additional protection includes side impact, penetration and electrical shock

Styles: Climbing style helmet with chinstrap

Used at: Building sites, oil platforms and rigs, chemical plants, manufacturing plants, forest sites, utility stations

Worn by: Construction workers, oil drillers, industrial workers, miners, loggers, utility professionals

Available in Type I and Type II for varying levels of protection.

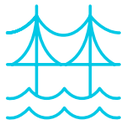
Industries and jobs

Like hard hats, climbing-style helmets offer heavy-duty protection and are widely used across various industries and jobsites, including:

Construction

Heavy manufacturing

Utilities



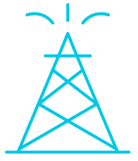
Bridge workers

Emergency rescue crews

Oil, mining and gas

Forestry

Petrochemical



Oil and gas

Features and benefits

People like climbing helmets because they have a distinct style compared to traditional hard hats, they often have a lower profile brimless design, which helps upward vision and have chin straps to help keep them in place.

Safety smarts

How to inspect your climbing helmet

It's important to inspect your climbing helmet **before you put it on each time**, looking for:

Physical damage

- Inspect for cracks, frayed straps and any sign of damage
- Replace the hard hat immediately if you notice any wear, abuse or degradation

Brittleness

- Look for cracking and deformities
- Your hard hat should be firm but flexible

If you're unsure of your climbing helmet's status, replace it. Your safety is always worth it.

Longevity

When assessing whether it is time to replace your helmet, you should always follow the manufacturer recommendations. It is important to note that there are differences between "shelf life" and "service life" so look for guidance from the manufacturer.

Most manufacturers recommend that when a helmet has sustained an impact to dispose of it immediately, even if there is no visible damage. To protect the helmet shell, many manufacturers also recommend that you do not use paints, solvents, chemicals, adhesives, gasoline or similar substances on a hard hat. These materials can deteriorate the shell, minimizing its ability to withstand impact and penetration.

Prolonged exposure to direct sunlight can degrade the plastic material many helmets are made of, so do not store it in direct sunlight.

Do not store objects between the suspension and the shell. The space between the suspension straps and the top of the helmet is usually part of the shock-absorbing design. Affixing stickers or other decorations can make it difficult to properly inspect a helmet for damage and in some cases might harm the plastic shell.

Maintenance, care and washing

Like other types of head protection, make sure to closely follow the *USER INSTRUCTIONS* for proper care and maintenance for your safety climbing helmet. Typically, washing with soap and water, followed by rinsing and drying is all that's needed to keep the climbing helmet clean and sanitary. You should always store your helmet away from direct sunlight.

PPE integration

Depending on the climbing-style helmet and the manufacturer, there are several methods for connecting PPE directly to helmets.

Climbing-style helmets are commonly integrated with:

- Hearing protection (earmuffs)
- Integrated eyewear
- Face shields
- Neck covers
- Respiratory protection
- Headlamps
- Reflective materials
- Welding accessories

Many helmets have “accessory slots” designed to make attaching PPE (such as face shields and hearing protection) easier. There are other attachment methods, though, and you should always check to make sure the PPE integration is compliant.

ANSI, CSA and NOM standards

Just like bump caps and hard hats, climbing-style helmet requirements are different depending on the country. Some countries have regulations and standards that recognize climbing-style helmets as a separate category from hard hats, while other countries merely require them to meet the same requirements. Check the manufacturer safety standards against the standards on your work site.

Part 5

Head protection FAQ

Head protection FAQ

Is one type of head protection better than the others, or is each type better suited for different types of applications?

In general, each type of head protection is designed for a range of activities and environments. Always conduct a hazard assessment prior to selection. Hard hats and climbing helmets help protect the head from objects falling from above and offer the highest levels of protection — with options for side impact protection and electric shock insulation up to 20,000 volts.

Bump caps offer bump protection from stationary/fixed objects or low ceilings.

Do all three types last as long as each other?

The lifespan of each product varies by manufacturer and is determined by the environment it is used in, plus there are many variables that affect the life of a product. See the manufacturer's *USER INSTRUCTIONS* for your specific product.

What kind of environments and industries are each usually used in?

All three varieties of head protection could be used in the same industries, and the worker's particular role determines which option they need. For example, people bottling beverages in a plant may be wearing bump caps, while a repairman working on the plant's equipment could be wearing a hard hat and someone working in a confined space such as a storage tank could be wearing a climbing style helmet.

What other kinds of PPE is each compatible with?

Bump caps will work with some eyewear and hearing protection, but usually do not contain any mounting system or means of integration with other PPE as a connected system.

Hard hats and climbing helmets are commonly integrated with various PPE including earmuffs, eyewear, face and neck shields, headlamps, respirators, reflective materials and welding helmets.

References

1 Bureau of Labor Statistics, Type of injury or illness and body parts affected by nonfatal injuries and illnesses in 2014, https://www.bls.gov/opub/ted/2015/type-of-injury-or-illness-and-body-parts-affected-by-nonfatal-injuries-and-illnesses-in-2014.htm.

3M

Personal Safety Division
3M Center, Building 235-2W-70
St. Paul, MN 55144-1000
U.S.A.