

# BOLTS:

»» a climbers' guide

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NEIL KERSHAW IS CRUISING FOR A BRUISIN' AT YEW COGAR, F7b+. PHOTO: LAURA SMITTON.



 **BMC**

BOLTS

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# INTRODUCTION

Climbers first started using bolt anchors long ago when aid climbing was popular. Some crags still sport the rusty relics left over from this bygone age. In the 1980s free climbing standards increased dramatically, and those at the cutting edge started using bolts on hard climbs which otherwise would have been very difficult, if not impossible to protect. The term sport climbing was adopted to highlight the focus on the physical and gymnastic aspects of climbing.

Sport climbing has become extremely popular, enabling climbers to push levels of physical and technical difficulty while eliminating some of the risks associated with traditional rock climbing. Many climbers learn to lead climb at an indoor wall, and may be tempted to assume that sport climbing outside is pretty much the same thing.

This guide aims to help dispel this myth, and aid those making the transition from climbing indoors to sport climbing outside. It should also provide useful guidance for more experienced sport climbers. Whilst not attempting to be an instructional manual, after reading it you should know a bit more about the bolts and belays which you rely on to stay safe when sport climbing.





BOLTS

# RISK AND RESPONSIBILITY

PHOTO: NIAL GRIMES.

Devil's Gorge,  
Clwyd, N.Wales



# RISK AND RESPONSIBILITY

## SECTION 02

Climbing is often viewed by the uninitiated as an extreme sport. It therefore may come as some surprise that the injury and death rate is extremely low compared to many other sports. Most injuries that do occur are relatively minor, but there should be no room for complacency. All climbers should understand and accept the **BMC Participation Statement**:

***The British Mountaineering Council recognises that climbing and mountaineering are activities with a danger of personal injury or death. Participants in these activities should be aware of and accept these risks and be responsible for their own actions and involvement.***

Although sport climbing and lead climbing indoors both involve clipping bolts for protection and using a belay to descend safely, they take place in two very different environments. Before taking the skills learnt indoors to the outdoor arena, it is important to be aware of these differences and consider how these might affect you.

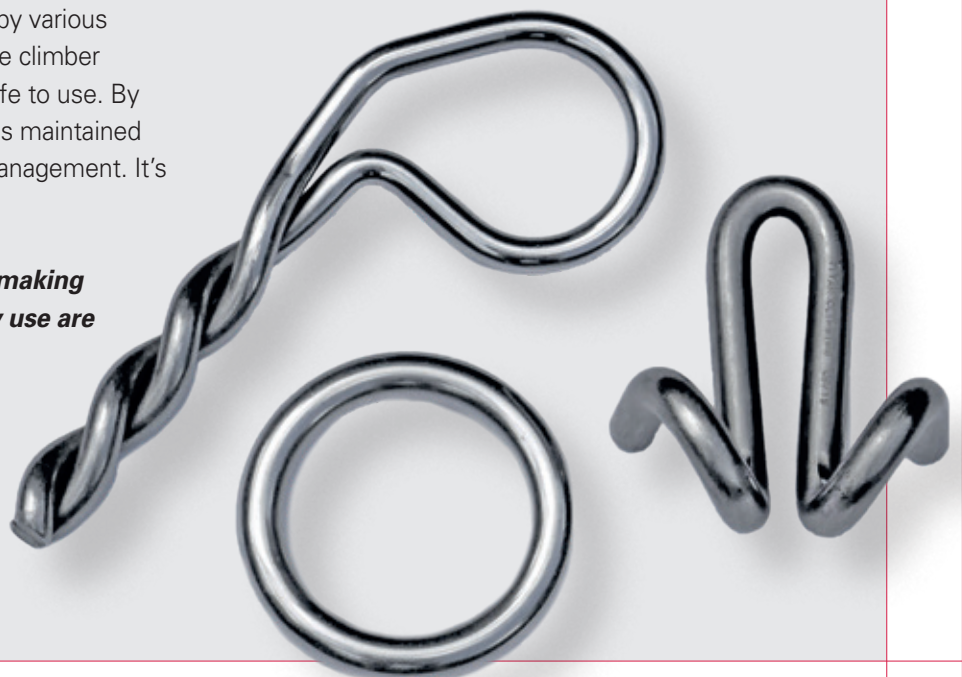
The key difference is that sport climbing is an unregulated activity. Bolts are placed by various individuals or groups, but it is up to the climber using them to ensure that they are safe to use. By contrast, at an indoor wall the facility is maintained and regularly inspected by the wall management. It's important to emphasise this point:

***Sport climbers are responsible for making sure that any bolts and belays they use are safe before relying on them.***

This may seem like a lot to take on board, but before you sell your harness, rope and quickdraws, take comfort from the fact that sport climbing is a very safe activity when the risks are appropriately managed.

Most serious sport climbing accidents occur as a result of user error or distraction, for example, failing to correctly tie into the rope, or being lowered off the end of the rope. Both are avoidable if good practice is followed, such as performing buddy checks and tying a knot in the end of the rope.

Much rarer is the failure of a bolt or belay. The BMC offers advice and guidance through our accompanying guide for those installing bolts, to assist them in doing this to a good standard. Climbers must remember that for the most part, routes outdoors are not maintained or inspected. The bolts, and even the crags themselves, are subject to environmental degradation. The result is that the climber must assess for themselves whether a route is safe or not, and take responsibility for their own safety.





BOLTS

# BOLTS AND BELAYS

PHOTO: GUY VAN GREUNING

Little Plum F8a,  
Stoney Middleton



# BOLTS AND BELAYS

## SECTION 03

When climbing a sport route, bolts and belays of various types may be encountered. It's worth knowing about the different types you might come across. Bolts manufactured to the EN959 standard are designed specifically for rock climbing. Those equipping a route sometimes may use industrial fixings, or even parts they have manufactured

themselves. In these circumstances, you are reliant on them having been diligent in choosing and installing equipment of an adequate standard.

Whatever their provenance, bolts come in two basic types - expansion bolts and resin bolts.



A range of expansion bolts



An expansion bolt in place

ALL PHOTOS: BMC

### > EXPANSION BOLTS

Expansion bolts are the most commonly used bolts for climbing. Quick and easy to place, they are the most popular choice for equipping new routes. The two main components are the bolt itself with its expansion mechanism, and the hanger which acts as an attachment point for a quickdraw or karabiner.

Most expansion bolts use a mechanism in which a free-moving collar sits against an angled cone. Tightening the nut against the hanger causes the main

part of the bolt to be pulled out of the hole, forcing the cone against the collar and expanding it. This pushes against the rock and prevents the bolt from being pulled out during a fall. Once tightened, this type of bolt is in place permanently.

Their main disadvantage is that most types can only be used in fairly hard rock, and they require a straight and true hole of exactly the right diameter to achieve their design strength.





A single-leg resin anchor, eye recessed

## RESIN BOLTS

Resin bolts are the strongest and longest lasting rock anchors available. With the correct choice of materials, they can be extremely corrosion resistant even in hostile environments such as sea cliffs. Because they do not apply any expansion forces on the rock, they can be placed closer to cracks, edges or any existing bolts. They can be used on very soft rock, by using a longer bolt.

Resin bolts consist of two components, the resin and the bolt itself. There are a number of different kinds of resin system available, but all work in a similar manner – once the two parts are mixed, they react chemically to change from liquids into a strong, hard polymer.

One downside is that they require more time and equipment to place, and the resin needs to harden and cure before they can be used. Resin bolts are used in preference to expansion bolts on sea cliffs, crags with softer or more broken rock, and for re-equipping popular venues.

Single-leg resin bolts are by far the most popular type and with appropriate design and choice of materials, they can be used on pretty much any climbable rock and in any environment. Material choice reflects the use environment – stainless steel for most areas with titanium or special steel grades for highly corrosive, tropical sea cliff locations.

Some of the earliest and most extensively used resin bolts were a simple U-shape with two legs, known as staples, and many are still in place on the south coast of England and other areas. Commercial versions exist, but the majority were home-made and are a legacy from when suitable commercial anchors were not available or were too expensive. The earliest versions in particular are prone to failure, and are a focus for replacement initiatives by local bolt funds.



A range of resin anchors with a single leg



Double-leg resin anchors, also called staples

ALL PHOTOS: BMC



## BOLTS AND BELAYS 03

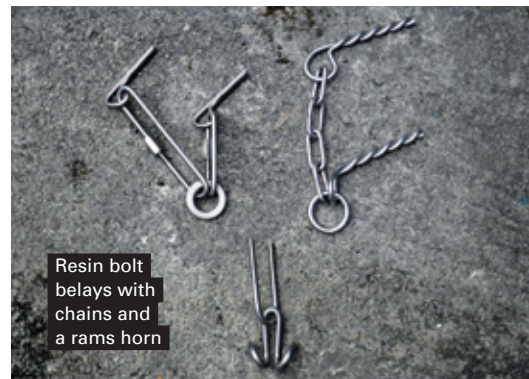


Belay with rings, rethreaded with the rope

## > BELAYS

Most sport climbs in the UK are single pitch, and are equipped with a belay for lowering off. You may be used to the user-friendly belays at the climbing wall, where you simply clip your rope into a karabiner and lower off. Outside things are usually more complicated, with the most popular belays consisting of metal rings which you'll need to thread your rope through. Don't wait until you are at the top of a cliff to learn how to do this safely. You can practice on the ground using a lower-off simulator at a climbing wall and by watching our video. Alternatively, seek expert instruction or the guidance of an experienced mentor.

Rarely found in the UK, but more commonly overseas, are multi-pitch sport routes. Before embarking on such routes, familiarise yourself with the appropriate methods needed to safely belay and descend.



Resin bolt belays with chains and a rams horn



A range of belay bolts with rings

ALL PHOTOS: BMC



BOLTS

# POTENTIAL PROBLEMS



PHOTO: BMC

Gus Hudgins taking things very seriously at Seynes, France



# POTENTIAL PROBLEMS

## SECTION

# 04

Some problems can be avoided by doing some research before you climb. The guidebook and online resources will sometimes have details on the age of the bolts and highlight any poorly bolted routes. Inspect the route from the ground, and only

set off if you are happy with what you see. Have a plan for what to do if you find a bolt or belay to be in a dangerous condition. You may be better off downclimbing or jumping off onto a good bolt below you than risk falling onto a poor one higher up.



PHOTO: BMC

### ► BOLT SPACING

On some sport routes bolts cannot be placed optimally for safety. This may be because of the rock, or there may not be good enough holds to clip from. This may lead to dangerous run-outs between bolts or awkward clipping where you may risk a bad fall. Inspect the route carefully, and don't be afraid to use a clipstick to pre-clip the first or even higher bolts if necessary to protect against ground falls. Most climbers will also extend a clip using a sling or by combining quickdraws when redpointing if a clip is awkwardly placed.

For high first bolts, using a clipstick can be a very good idea





## ➤ ROCK QUALITY

Any anchor is only as good as the rock it is placed in. Bolts placed too close to edges, cracks or other discontinuities may cause the rock to fail when loaded. The softer the rock, the greater the separation required from any edges. Consider 15cm as a minimum distance for hard rock. Consider the quality of the

rock that the bolt is in. In particular look out for cracks or crumbling around the bolt, and whether the bolt has been placed in a loose block. It may have been fine originally, but never forget that the outdoor environment is a changeable one where one hard winter can change a route dramatically.



## POTENTIAL PROBLEMS

04

**> CORROSION**

Corrosion can weaken a once good bolt and make it fail. Corrosion comes in a number of different forms, most of which can be seen with the naked eye, but some kinds are difficult if not impossible to spot.

In the damp and rainy British climate, stainless steel bolts are the accepted minimum standard for bolts and lower-off components. Use of this material gives good resistance to corrosion in most situations, but problems can occur both due to poor manufacturing methods and environmental factors. If you do see any evidence of rusting, either on a bolt or lower-off, be very cautious regarding its security.

If you come across a shiny hanger and rusty bolt, don't trust it. This is the hallmark of galvanic corrosion, where mixed materials have been used which leads to dramatic weakening of the rusted part.



In recent years, stainless steel bolt failures have been reported in warm coastal areas. This has been blamed on stress corrosion cracking (SCC). There is no evidence yet of this being a problem in Britain, but you might need to be careful when climbing abroad. One solution is to use bolts made from titanium or special grades of steel, and some areas have programmes in place to re-equip routes with bolts made from more suitable materials.

**> LOOSE BOLTS**

A loose bolt, whether it is an expansion bolt or a resin bolt, is very likely to fail well below the design load. An expansion bolt with a loose hanger can be tightened using a spanner on the nut. If this can be successfully hand-tightened without the bolt spinning or shearing off, the bolt will almost certainly be safe to use. If not, don't trust it.

You can test a suspect resin bolt by clipping in a quickdraw and levering it to twist and pull on the bolt. If the bolt doesn't move you can expect it to be strong enough to hold most normal falls.

ALL PHOTOS: BMC





Checking a resin bolt

## UNSET RESIN

Several accidents have occurred where the installer has failed to check that the resin has properly cured. Incorrectly mixed resin, resin that was out of date, or installation when it was too cold can all cause problems. The equipper should always check that the resin has set correctly, but just in case be cautious of any newly equipped routes. You can check the integrity of the bolts by using a quickdraw in the same way as checking for a loose bolt.

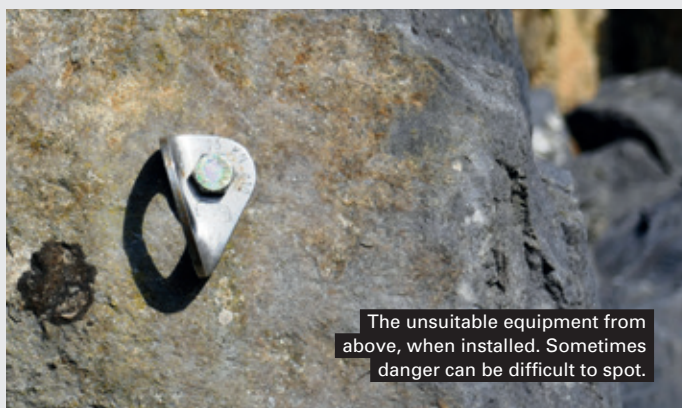
## OLD OR POOR BOLTS

Despite renewal programmes, there are still many old bolts out there. Knowledge, materials and expertise have all greatly improved since bolts first appeared in large numbers, so take extra care on any routes where you know that the bolts are getting on a bit. What was state-of-the-art back in the day may be found wanting today, especially when also considering the effects of exposure to the elements.

Despite the range of high quality bolts and belay components available, sometimes equipment of insufficient quality is installed. Look out for anything unusual, such as non-stainless steel bolts or home-made hangers. Beware of cheap chain links used to equalise belays which are not load rated.



Unsuitable equipment which failed in use.

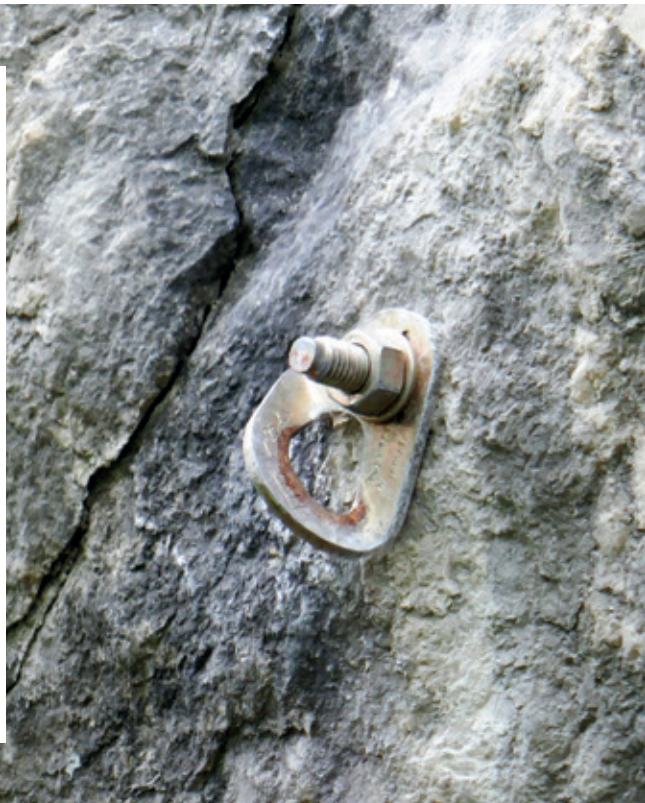


The unsuitable equipment from above, when installed. Sometimes danger can be difficult to spot.



## ➤ OVER-EXPOSED BOLT STUDS

A specific issue with expansion bolts is when the stud or threaded shaft of the bolt extends too far outwards. This can make it more likely for the top quickdraw karabiner to catch at an awkward angle, which can lead to the karabiner breaking if fallen on. It may also mean that the bolt is not placed deep enough to reach its full strength, but this depends on the length of the bolt used and the strength of the rock. As an example, Petzl recommends that the length of exposed thread lies between 3mm and 6mm for its bolts.

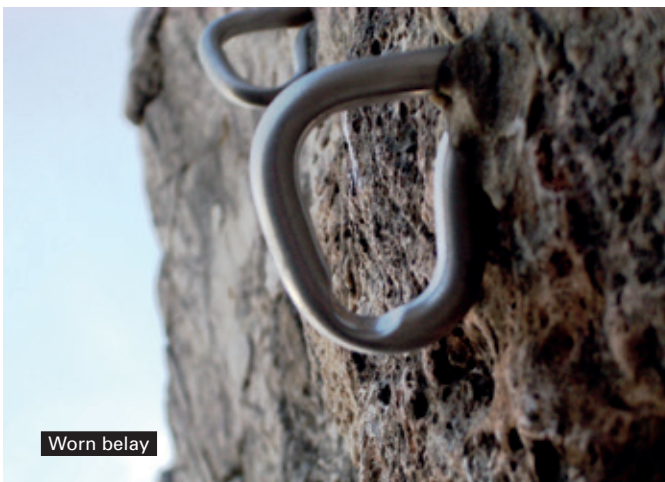


Preventing worn belays

## ➤ WORN BOLTS AND BELAYS

On popular routes, heavy use can lead to worn out belays and to a lesser extent bolts. Lowering off and in particular top roping directly through the belay bolts causes wear which will significantly weaken the equipment over time. If the bolts cannot be replaced, this effectively consigns the route to history. In many areas belays are fitted with rings or ram's horns which are harder wearing and can be replaced when worn out – make sure you use them.

Good practice if top roping or climbing a route as a team, is to use your own equipment to attach the rope to the belay, and have the last person to climb remove it. Two quickdraws or a sling and screw-gate karabiners are ideal for this purpose.



Worn belay



## BOLTS

# BOLT FUNDS AND INSTALLERS

Chris Parkin of the North Wales Bolt Fund, at work at Upper Pen Trwyn, Llandudno.

Ever had a fantastic day climbing at Malham, Lower Pen Trwyn or another great sport climbing venue? Spare a thought for all the bolts you clipped that day. Each one not only has a material cost, but it also took time, skill and effort to install. Bolting is tiring, messy and can be dangerous. The person doing it is typically a volunteer, giving up time when they could be climbing so that we can all enjoy the routes they have equipped.

Supporting this work helps ensure that good bolts are installed and that dangerous ones are replaced. You can do this by supporting bolt funds, which are groups of climbers who bolt and maintain sport crags, generally organised fairly informally and on a local basis. Any money which you donate can help buy bolts, resin, drill bits and all the other equipment required to maintain bolted routes in good order.





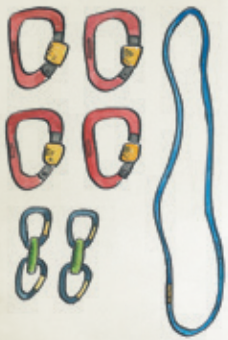
CHECK CONDITIONS, PARKING AND ACCESS/BIRD RESTRICTIONS



ESSENTIALS - DUVET JACKET, FIRST AID KIT, FLASK OF TEA, FOOD



USE A CLIPSTICK FOR TRICKY BOLTS AND ASSESS BOLT SPACING



KNOW HOW TO USE YOUR OWN GEAR FOR TOP ROPING AND HOW TO SAFELY SET THIS UP



ASSESS BOLT QUALITY - OLD, WORN, RUSTY, LOOSE OR DAMAGED, BOLTS IN SUSPECT ROCK - CHECK IN SITU QUICK DRAWS TOO

# #CLIMBINGOUTSIDE

## HOW TO SPORT CLIMB SAFELY



EVALUATE THE POTENTIAL FOR LOOSE ROCK

CONSIDER WEARING A HELMET OUTSIDE

"Phew"



KNOW HOW TO SAFELY RETHREAD THE BELAY TO LOWER OFF





BOLTS

# FURTHER INFORMATION

PHOTO: BMC

Tessa Sylvestre le Lyon  
getting some winter  
sun at Seynes, France



SECTION  
07**> FURTHER INFORMATION****NEW ROCK CLIMBERS GUIDE:**[www.thebmc.co.uk/new-rock-climbers](http://www.thebmc.co.uk/new-rock-climbers)**SKILLS VIDEOS:**[www.youtube.com/teambmc](http://www.youtube.com/teambmc)<http://tv.thebmc.co.uk/videos/?channel=sport-climbing>**INSTALLERS' GUIDE:**[www.thebmc.co.uk/bolting-guide-for-installers](http://www.thebmc.co.uk/bolting-guide-for-installers)**> MANUFACTURERS****BOLT PRODUCTS**[www.bolt-products.com](http://www.bolt-products.com)**PETZL**[www.petzl.com](http://www.petzl.com)**TITAN CLIMBING**[www.titanclimbing.com](http://www.titanclimbing.com)**> OTHER USEFUL SITES****AMERICAN SAFE CLIMBING ASSOCIATION**

US-based anchor replacement and education initiative.

Practical advice on removing old bolts, and placing new ones. Some destructive test data.

[www.safeclimbing.org](http://www.safeclimbing.org)**UIAA**

International Climbing and Mountaineering Federation.

Technical information on UIAA and EN standards for rock anchors.

[www.theuiaa.org](http://www.theuiaa.org)**UKBOLTFUND.ORG**

A website set up by UKClimbing.com to help people donate to bolt funds.

Covers all the current active bolt funds in the UK.

[www.ukboltfund.org](http://www.ukboltfund.org)



# WE WORK TO PROTECT YOU

Over 70 years old and 85,000+ members strong, the British Mountaineering Council (BMC) exists to promote and protect the interests of climbers, hill walkers and mountaineers in England and Wales. And that's not all; there are huge benefits from being a BMC member:

## GUARDIANS OF THE COUNTRYSIDE

Our members consistently tell us our most important role is maintaining access to hills, mountains and cliffs – and their conservation – which we do through our Access Management Group. We've noticed that our members value the natural world tremendously. And so we promote a wider concern for the environmental and economic interests of the rural communities our members visit. Meanwhile our charity – the Access & Conservation Trust (ACT) – funds footpath restoration and conservation events and information.

**ACT NOW:** [www.thebmc.co.uk/act](http://www.thebmc.co.uk/act)

## PROTECTORS OF OUR MEMBERS

We want to make sure our members are as safe as houses. That's why all our Club and Individual Members automatically receive £15 million Combined Liability insurance cover, all Individual Members get £10,000 Personal Accident Disability Insurance, and all members get access to our specialist travel insurance.

And to make sure you stay as safe as possible, the BMC tries to develop the skills of our members by providing subsidised and discounted courses, helps oversee the work of the UK's various training boards, offers knowledge and advice on safety equipment, and contributes to international standards work.

**FIND OUT MORE:** [www.thebmc.co.uk/membership](http://www.thebmc.co.uk/membership)

## INCLUSIVITY AND EQUITY

We believe the outdoors is for everyone and that the activities our members enjoy should be accessible. It's incredibly important that people of all ages, abilities and backgrounds can enjoy these activities, and disability needn't be seen as a barrier to participation.

Initiatives like This Girl Can Climbing, competitions and events for people to participate in paraclimbing, and many other projects aim to help overcome these barriers, and the BMC works with partners to provide support to clubs, climbing walls, activity providers and coaches to ensure the activities they run are accessible.

**READ:** [www.thebmc.co.uk/supporting-you-to-provide-inclusive-activities](http://www.thebmc.co.uk/supporting-you-to-provide-inclusive-activities)

## OTHER VITAL WORK

### CLIMBING WALLS:

supporting the management and sustainable development of climbing walls

### CLUBS:

facilitating the sharing of information and advice between BMC affiliated clubs

### COMPETITIONS:

developing competition climbing in Britain and managing the GB Climbing Team

### EQUIPMENT:

providing an informed source of technical advice on safety equipment

### GUIDEBOOKS:

publishing climbing guidebooks to the Peak District and surrounding Pennine areas

### HERITAGE:

preserving mountaineering's rich heritage of artefacts, history and traditions

### HUTS:

offering advice and guidance on the management and use of club huts

### INTERNATIONAL:

supporting British mountaineers travelling overseas with information and grants

### MOUNTAIN MEDICINE:

providing expert medical advice on keeping fit and healthy in the mountains

### YOUTH:

providing advice and support for young people and their parents



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