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UIAA STANDARDS 106 / HELMETS
Recommendations for Inspection and Retirement

Foreword

The UIAA equipment standard provides a baseline for equipment performance in a test lab under controlled conditions on new equipment. Although these test conditions are relevant to the conditions encountered climbing, conditions encountered at the crags and the condition of the equipment are equally important. This recommendation from the UIAA member federation The British Mountaineering Council (BMC) provides vital equipment information that is NOT explicitly addressed in the standard, particularly failure modes of the equipment and recommendations for the use, inspection, maintenance, and retirement of equipment.

These recommendations are of necessity general. For any specific piece of equipment, the primary source for all equipment information is the manufacturer. Always read and heed the manufacturer's warnings and instructions for use, inspection, maintenance, and retirement of equipment. Taken together, the UIAA standard, the BMC recommendations, and the manufacturer's instructions provide a sound basis for understanding climbing equipment and its limitations. This understanding, in conjunction with best practices, is the basis for managing the risk associated with climbing and the use of climbing equipment.

THE FOLLOWING INFORMATION ON USE, CARE AND MAINTENANCE COMES FROM THE BMC BOOKLET: ***CARE and MAINTENANCE***

Cf. http://www.thebmc.co.uk/Feature.aspx?id=1170

Helmets

by Dave Brook

*Video stills from the film **Equilibrium** courtesy Mark Turnbull, **Intrepid Film**.*

Introduction

The helmet is a very important (and vastly underused) piece of safety equipment in the world of mountaineering and climbing.There are many instances of accident reports containing phrases like 'serious injury/death could have been avoided had the climber been wearing a helmet'. Obviously it is a matter of personal judgement and choice whether to wear a helmet or not, but prudence and common sense would suggest the former.

The first helmet designed specifically for mountaineering appeared in the 1960s, but industrial helmets or cycle caps had been pressed into use well before this. Alternatively, climbers improvised with whatever was to hand – Don Whillans famously using (and losing) his flat cap stuffed with money and cigarettes! Nowadays, helmets come in three basic types, each more suited to a slightly different end use.

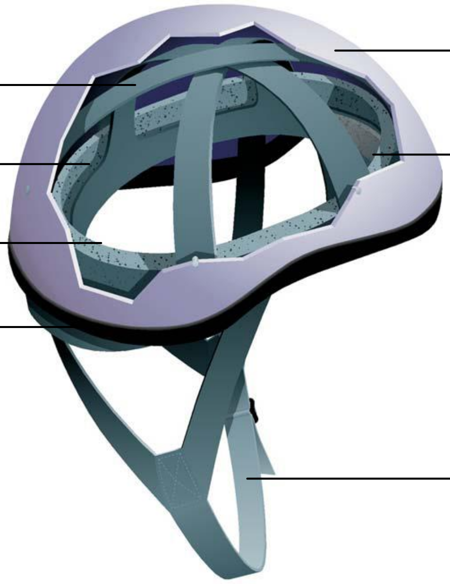

Figure 9.2 Shell/cradle helmet

Fibreglass/resin composite shell

This was the material first used to manufacture helmets, and offers longevity and durability at the expense of being generally heavy (though there are exceptions), and poorly ventilated and therefore can be hot to wear (good in winter!). Many outdoor centres and group users choose
this type of helmet.

Plastic shell

(Injection-moulded or vacuum-formed)
Advances in material technology allowed the production of these lighter and better ventilated helmets but this type of helmet will almost certainly not maintain an acceptable level of protection for as long as a fibreglass/resin shell. Both the above types can be categorised as the more usual style of mountaineering helmet consisting of a hard outer shell and an interior cradle to secure it on the head in conjunction with a chinstrap. For many years these were the only types of mountaineering helmet available, primarily designed to protect the wearer's head against stonefall from above. Recent years have seen the rise of a third type, more geared to pure rock climbing, ie. protecting against impact with the rock rather than falling rocks themselves.

Figure 9.3 Expanded polymer foam helmet

Expanded polymer foam helmets

Akin to a cycling helmet, this type uses a thickness of foam in conjunction with a thin plastic skin as the energy absorber, rather than the traditional shell and cradle system. This allows the helmet to be lighter and more comfortable (thus making the user more likely to wear it) at the penalty of a higher peak transmitted force. Helmets of this type with a fairly uniform thickness of foam have been shown to give good protection to the front, side and rear of the head and are thus well-suited to protecting against head injuries during rock-climbing falls.

Relevant standards

When considering helmet design, manufacturers must give thought to two main criteria – the peak force transferred via the helmet to the climber's neck (this must not exceed 10kN), and the penetration of the helmet (and head!) by sharp objects. These form the basis of the tests that a helmet must pass to gain the standard specified by EN 12492. In addition, the retention system (ie. cradle and chinstrap) and front, side and rear impact forces are subject to testing. The UIAA standard 106 is similar but more stringent; for example, the peak force transmitted must not exceed 8kN rather than the 10kN allowed in the EN standard.

Observed faults and failures

In the last ten years, six incidents involving helmets have been reported to the EIP *(*1 UIAA comment, see below)* – in five of the six cases, the helmet did its job and prevented injury or death. The sixth case involved use of a helmet, manufactured to the industrial standard but used in a climbing situation, where the chinstrap released itself on impact (as industrial helmets are designed to do), leaving the wearer helmetless and exposed to further impacts, from which he died.

UIAA Comments on this part
EIP means Equipment Investigation Panel

How to prevent failure in use

There is a clear message from the case of the industrial helmet incident noted above –
Ensure that the helmet is a good secure fit on your head and check that your chinstrap is secure and holds the helmet tightly on your head!
It is worth spending some time adjusting the retention straps, side buckles, and chinstrap, preferably in front of a mirror, to ensure that:
· the helmet cannot be pushed up in front and over the back of the head;
· the helmet cannot be pushed up at the back, over the face, and off the head.
Such adjustments are crucial to ensuring head protection in a sliding fall.

Routine care and maintenance

In addition to checking the chinstrap and overall fit frequently, the following actions are recommended:

· Do not expose your helmet to high temperatures (eg. on a car parcel shelf) or unnecessary UV light.This will accelerate degradation of the shell material.
· Don't sit on your helmet – sideways loads in particular are undesirable.
· Paint and stickers may degrade some types of plastic helmets. Always check before applying, or better still don't bother!
· Frequently inspect your helmet for any signs of damage, not just to the shell, but also the cradle, chinstrap and attachment points.
· Do not store wet, and always rinse thoroughly after exposure to salt water – any rivets can quickly corrode.
· Helmets are best stored in a cool dark place – as usual keep away from corrosives and solvents if stored in a garage or similar.

Degradation and discard criteria

In a similar manner to the way that the bonnet of a car crumples in a head-on crash in order to reduce injuries to the passengers, a helmet crumples, or suffers internal damage in protecting the wearer's head. Every impact degrades the helmet to some extent. A severe impact reduces a helmet's protection capability to such an extent that it should be discarded and replaced as quickly as reasonably possible.

The problem is that helmets do not necessarily show outward signs of serious damage. GRP or other composite shells do show obvious damage after severe impacts, but injection-moulded or vacuum-formed plastic shells may not. Some foam polymer helmets may not show any outward signs, but if cut in two it would become obvious where a severe impact had occurred. Hence the owner must take note of all impacts in use, and use judgement in deciding when to discard – contact the manufacturer for further guidance.

Even without major impacts, helmets deteriorate in performance over time due to degradation of the shell material. Again, composite and injection moulded models are different – the former can still perform well after 20 years of light use, but plastic helmets have been found to degrade to the point where they will no longer pass the standard tests after only 5 years. This should be considered as grounds for retirement. As a general rule, the larger the original energy absorption capacity of the helmet (in other words, the lower the stated value for transmitted force), the longer the usable lifetime of the helmet. Check the information supplied when purchasing a helmet, and follow the manufacturer's advice on lifetime.

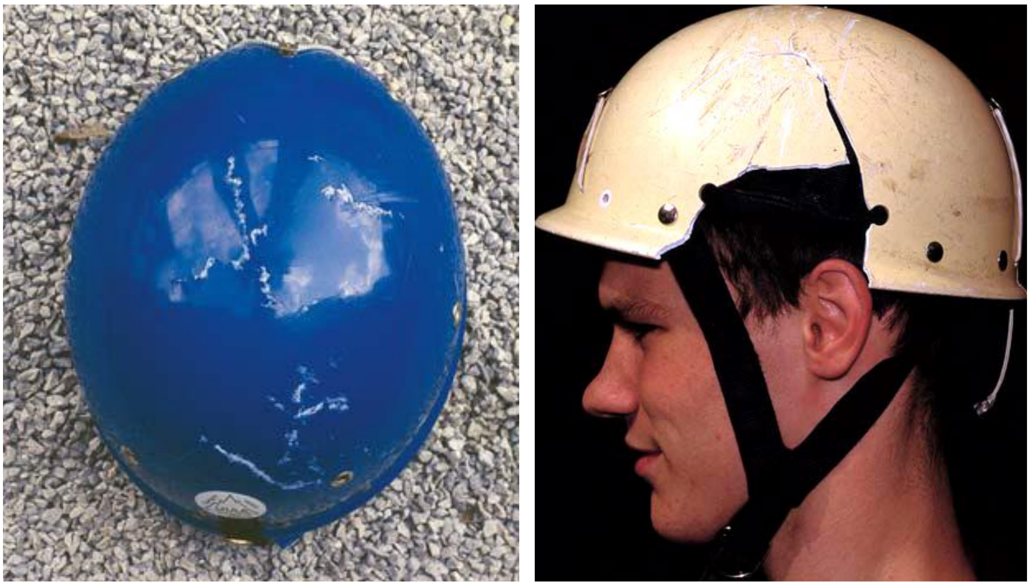

Figure 9.4 Damaged helmets ***Photos:*** *BMC Collection*