

## Safety Standards Explained

### Riding Hats

#### How Protective Headwear works

Modern technology has enabled manufacturers to reproduce hats that are very strong, lightweight and extremely comfortable to wear. The bit of the hat that does the work of protecting your head is the protective liner, made of high grade polystyrene (like microscopic bubble wrap) which is in turn protected by a hard (fibre glass or plastic) shell. On impact, i.e. when you fall and land, the helmet does two things. Firstly the shell diffuses the impact over a large area, then the liner reduces bruising to the brain by increasing the length of time it takes for the shock to meet your head and you to stop. The bigger the impact the more layers of bubbles will burst so it is basically the hat liner that collapses, not your head. It is for this reason that if the hat suffers a severe impact – even dropping onto a hard surface, it should be thrown away and a new one purchased. It is easy to replace a hat, but impossible to replace a head!

### Standards

Hat standards continue to evolve as a result of improvements in technology and developments in methods of testing together with an increased understanding how riders fall and the injuries that they sustain in accidents. All hats and skulls to current standards must be fitted with an integral adjustable 3-point harness and if there is a peak it must be flexible. Chin cups are no longer allowed in any current standards.

#### **Obsolete Standards:**

BS3686; BS6473:1984; BS4472:1988

All these standards preceded the first European standard and were all withdrawn in 1997. They are no longer viewed as suitable by the Health & Safety Executive (HSE) although some organizations continue to allow the latter of the standards, e.g. Dressage.

#### **Current Standards:**

Standards are usually composed by a committee, in Europe each country sending their own representative to the European technical committee. European standards are reviewed every five years or following a complaint about its efficacy and although a review does not necessarily lead to a new standard, history has shown that a new standard emerges every ten years or so. PAS standards are managed by BSI staff and are reviewed every two years.

EN1384 1996 / BSEN 1384 1997

This standard may be found prefixed by other initials belonging to the country testing the helmet, e.g. DIN EN1384 indicating testing in Germany. The BS prefix symbolizes that the hat has been tested in Britain and though in theory

there should be no difference, some European countries have approved helmets that may have failed if tested in Britain.

The two standards are identical in content and were a major leap forward over the previous British standards, offering bottom edge protection for the first time. The helmet is impact tested almost right on the bottom edge (as opposed to 75mm up from the bottom edge on BS4472 hats) so the protective liner has to extend all the way down to the rim. This change came about because it was found that in 25% of falls the rider did not land on the top of their heads, but on the sides, front or back. It does include a penetration test. This is the basic minimum standard for almost all forms of riding.

#### PAS 015:1994 / PAS015 1998

This stands for Product Approval Specification and was developed by the British Standards Institute (BSI) in response to concerns about the time it was taking to develop what would become the EN1384. The first version was formulated by looking at drafts for the European standard and taking the highest option in each case.

After the official publication of the EN1384 in 1997 certain differences occurred between it and PAS015, leading to the 1998 revision of the PAS015 to remove those differences and address new areas of protection such as crush resistance and protection against injury when landing on an edged surface. As the test line is lower at the front it tends to lead to slightly bulkier helmets. A stability test is also included to limit excessive movement during wearing or a fall.

#### ASTM F1163 : 1998

This is the American standard for riding hats and is similar to PAS015:1998 although it does not include a lateral rigidity (crushing) test nor a penetration test, meaning these hats often have quite large ventilation holes or slots. There is much debate about the ventilation holes and whether they do help to cool the head or put the rider at more risk of penetration type injuries. There are many helmets on the market however with ventilation holes that do pass the PAS and EN1385 penetration tests as well as the ASTM standard.

#### Snell E2001

This is the newest standard, developed in America by the Snell Institute. It is a higher performance standard which includes all aspects of ASTM and PAS 015 but with a sharper horseshoe anvil (to replicate a horse kick or impact with a sharp surface), higher impacts and an additional hemispherical anvil to represent an uneven but not sharp surface such as a tree, fence or cobbled surface.

#### EN 14572

This is a high performance hat standard in development by a Committee of the European Hat Standard Committee. This standard is designed to complement, not replace the existing standards and will include a radical new lateral crush test. It is likely to take at least another year before this is introduced.

#### AS/NZS 3838: 1998 or 2003

This Australasian standard is comparable to the EN1384 but testing includes the hazard anvil from PAS 015 but does not include a penetration test.

### Quality Symbols

#### **The Kitemark**

The Kitemark is the registered trademark of the British Standards Institute and can only be affixed to products certified by them. As well as complying with the requirements of the relevant standard, e.g EN1384 or PAS 015, the mark indicates that the company complies with a rigorous system of regulation and testing. Companies are required to provide the BSI with unrestricted access to their offices and factories and allow regular testing of randomly chosen samples through batch and audit testing. Hats are only released for sale once batch testing is completed, thus avoiding product recall.



Kitemark certification is voluntary and can be withdrawn at any time.

#### **SEI – Safety Equipment Institute**

The SEI quality mark is the American equivalent of the Kitemark for ASTM standard hats. The SEI is an organization similar to the BSI, set up to test the claims of manufacturers that their product meets the claimed standard. Its system of regulation includes design approval and audit testing of product. Hats must be tested a minimum of annually, however the company must also show an internal auditing and quality control system of regular testing that may include batch testing.

#### **SAI Global**

The “five ticks” Standards Mark for the Quality Assurance Scheme of Australia shows certification to their version of the Kitemark, requiring batch testing and company auditing.

### CE Mark

The CE Mark is neither a quality mark nor a standard in itself but is a mandatory declaration under EU law by a manufacturer to show compliance with essential requirements of all relevant EU Directives. It was introduced to allow government officials a way of ensuring that products entering a European Country met the basic safety requirements of Europe. Under the Personal Protective Equipment Directive all safety equipment must bear the CE mark showing compliance with the appropriate European safety standard.

### Which is the safest hat?

It is important to understand that no hat can prevent serious injury in certain circumstances. Equally the safest hat in the world will be useless if it is not fitted correctly. The safest hat is one that is tested to the appropriate standard, is most suitable for the intended riding activity and possibly most importantly of all is fitted correctly. The British Equestrian Trade Association (BETA) runs regular safety courses instructing retailers on the correct

procedures for fitting hats and body protectors. Attendees on the courses receive certificates of attendance and a full list of retailers who have completed the course are available from the BETA office.

### **Testing**

It is very difficult if not impossible to directly compare standards from around the world due to the number of variables within each of the tests. A hat is tested by being fastened to a number of different sized and weighted metal "heads" which are then dropped from a given height onto a number of differently shaped anvils to replicate different types of riding falls and surfaces. Other objects (e.g. a spike) can be dropped on the head form to replicate penetrating injuries and the restraining straps (harness) are tested to ensure the helmet straps do not allow the helmet to be pulled or rolled off. The variables between standards will include the height from which the head form is dropped onto the anvils with increased height creating higher impacts. Equally some standards test different sized hats, others test under different climatic conditions.

If you were to rank the standards by the demands placed on the hats in testing the standards both in terms of the types of tests (i.e. anvils) used and the drop heights used the standards could be rated, from the lowest to the highest demands as:

EN 1384 & A/NZS 3838

PAS 015 & ASTM F1163

Snell E2001

Any hat with a quality mark as shown above can be viewed as safer than a hat to the same standard without the quality mark as without it no further testing is carried out after the hat passes the initial test to the standard.

Each discipline or organisation has its own requirements or recommendations so it is important to check each year in case of rule changes.

### **Legal Requirements**

By law children aged 14 years or younger must wear a riding hat to at least EN1384 when riding on the road.