The low down on motorbike helmets

A rider's guide to skid lids, brain buckets and crash cups

Wearing motorbike helmets can reduce the chances of death by 42% and the chances of a brain injury by a huge 69%.With figures like that, every motorbike rider should be aware of the helmet standards, new research and proven innovations in helmet design.

LACK OF RESEARCH & OLD STANDARDS

There is surprisingly little research or consistent effort to improve helmet design. The few rigorous research reports that exist can be up to two decades old. Why? Helmet manufacturers generally feel all they need to do is meet the required helmet standards. The helmet standards are mostly set by government departments, so there is little motivation to update and improve the standards they have set.

Smaller helmet manufacturers occasionally put forward new designs for improved safety. However, the question then is whether the designs are tested by qualified independent researchers, how rigorous their methodology was, and whether the results are published in a peer-reviewed journal – the gold standard for quality research.

FIRST, THE GOOD NEWS

If all of this sounds like glum news, it shouldn't be. A comprehensive European study in 1996 called COST 327 found that a wide sample of helmets complying with various safety standards all consistently did a good job.

How good a job? There is room for improvement. The study suggested a possible 20% improvement if standards were revised to include design features for improved helmet safety. Here are some key considerations next time you buy a helmet.

IMPROVING HELMET SAFETY

Dual density liners

The foam in your helmet is the main key to protecting your head. Recently, some manufacturers started using a second softer layer of foam for comfort and a better fit, especially for heads a bit differently shaped to the norm. A lucky spin-off was improved safety. The COST 327 study found that dual density liners could reduce injury in lighter impacts as the softer liner cushioned the head more effectively. A 2001 Australian study showed that these liners, of a specific type, had characteristics that might improve helmet effectiveness, but did not necessarily prove the effectiveness of dual density liners. To date, none of the helmet standards have been updated in this regard.

Rotational injuries

Brain injury research increasingly shows that many brain injuries occur due to the sudden rotation of the brain (or angular acceleration), as well as the direct impact itself. This is relevant to motorbike riders as often the head hits the road surface at an angle. A USA study has confirmed this kind of injury among football players.The COST 327 study concluded that helmet design should insist on a minimum tendency to induce rotational motion by minimising external projections from the helmet shell (e.g. air vents). Mills *et al* speculate that increasing the ability of helmets to to absorb direct impacts should also reduce rotational effects.

Currently there are two developments that claim to protect against rotational injuries. The first uses a gel coating on the helmet that moves when hit at an angle to reduce rotational forces. The second approach incorporates a kind of suspension inside the helmet shell to dissipate rotational forces from an oblique impact on the helmet. In both cases, the helmet manufacturers have contracted independent researchers to run tests, but the full reports are not available for scrutiny, and also have not been published in peer-reviewed journals.

It is interesting to note that many riders are now attaching small video cameras to their helmets to film their ride. There is no research yet to see how much this increases the chances of rotational injuries, but logic suggests it could have a bearing in some impacts.

Flexible outer shell

Only a small number of motor bike accidents result in penetration of the outer shell of the helmet. The COST 327 study found that most helmets are too stiff and only absorb impacts efficiently at levels that are not survivable. Currently the European helmet standard is the only one that requires the helmet shell to be flexible (ECE22).

Wear a full face helmet

Most head injuries are sustained at the front of the head, with more than two thirds of skull fractures involving chin impact. While open face helmets are seen as stylish for scooter riders, and some riders find full face helmets claustrophobic, a full face helmet does reduce the chances of head injury. The chin guard reduces forces transmitted along the jaw that can cause a lethal base-of-skull injury (where your brain stem connects with your spinal cord), and also reduces rotational forces that can lead to a diffuse brain injury.

It is important that the chin guard not be too stiff, and it should also be padded to reduce the chances of brain injury. Currently only Snell and the European standards test the chin guard.

Helmet fit is everything

It is critical for a helmet to fit snugly. Accident statistics reveal that in roughly 10% of motorbike accidents the helmet does not stay on the rider's head. This can be due to a helmet that is too large and/or not doing up the helmet strap sufficiently tight. A good check is to simply push upward with force against your helmet from various directions and see how far it moves – the results can be disturbing!

Never buy a helmet you haven't personally tried on your head to ensure the correct fit, no matter how cheap online shopping may be.

WHICH IS THE BEST HELMET STANDARD?

This is a valid question. Regarded by many as the gold standard, the Snell helmet standard was criticised after claims that Snell-approved helmets were far too stiff in the outer shell and could cause more brain injuries as a result.

Generally, helmet standards do a reasonable job of protecting the head, both in rich and poor nations. But none of the standards are up-to-date with current research, and few have incorporated recommendations that were made more than a decade ago.

In the course of writing this article, we spoke to Guy Stanford, the Australian Motorcycle Council Helmets Committee Chair. He believes the European motorcycle helmet Regulation is definitely a cut above the average – it's motorbike-specific, has higher impact attenuation, a valid chin-bar test and an oblique impact test. The problem in Australia is finding a European-approved helmet from a manufacturer who has bothered to comply with the Australian standard to access such a small market.

While recommending particular brands of helmets is beyond the scope of this article, it hopefully provides pointers in maximising your safety when it's time to buy a new skid lid. If you ride, be sure to share this article with your mates, or email them the link below for the full fact sheet on our website.

FOR MORE INFORMATION

This is a condense version of our fact sheet "Motorbike helmets & Brain Injury Prevention". To read the full version and see full footnotes for the research cited, please visit: http://synapse.org.au/get-the-facts/motorbike-helmets-and-brain-injury-prevention.aspx

BUYING A HELMET IN AUSTRALIA

Helmets from large international companies who make and market their own helmet are generally very reliable, arising from an internal safety culture – no amount of certification can add quality to a helmet if the manufacturer didn't build it in. Large production runs usually ensure the required density of the foam remains at a consistent level to best protect your head.

Any new helmet used on the road must comply with the Australian Standard AS/NZS 1698:2006, but Australia is a very small market so many manufacturers don't bother getting compliance for their helmets here. Some riders may buy a helmet from overseas (e.g. one that complies with the more comprehensive European standard) and but the chance of a fine should the police inspect the helmet.

The largest risk is buying a helmet that has poor quality control in production. Why? Manufacturers usually only do short production runs to service a unique standard, such as the tiny market of Australia. There are definitely problems with reliability of helmet Certification in Australia.

A LEGAL MISH MASH: WHICH HELMETS ARE LEGAL IN WHICH STATES?

Determining which helmets are legal to wear in Australia, and in which States, can be a messy business. A key problem is that many organisations are involved, but there is no overall coordination by one governing body to ensure consistency across Australia.

The Australian Consumer Law 2011, requires that any motorbike helmet supplied to the market must meet the Commonwealth mandatory standard (Consumer Protection Notice No.9) which is based on AS 1698-1988. However, Road Rules around the country now require that when using roads, a rider must wear a helmet in compliance with AS/NZS 1698:2006, a completely revised Standard with different test methods. Road Rules in some areas also include requirements for a "sticker" to aid Police enforcement.

NORTHERN TERRITORY & QUEENSLAND simply require "compliance with AS/NZS 1698:2006" but with no additional "sticker"requirement.

NEW SOUTH WALES Road Rules were changed without warning in February 2010 and now demand that an approved helmet complies with at least one version of AS/NZS 1698 and also "has an identifying mark from a body accredited or approved by the Joint Accreditation System of Australia and New Zealand certifying compliance with an above standard". As a result, the helmets of thousands of NSW riders were made retrospectively illegal on NSW roads on February 2010.

ACT, VICTORIA, TASMANIA, SOUTH AUSTRALIA & WESTERN AUSTRALIA: A helmet that is legal for road use under the new NSW Road Rules is illegal to use in the these States according to their State laws!

Police in the ACT are instructed to look for a helmet that "has applied to it the certification trade mark of which the Standards Association of Australia".

In Victoria, the police are told to look for a helmet that is "marked with an official standards mark certifying compliance with the relevant Standard".

In Tasmania, the helmet must bear "the Australian Standards Mark", in South Australia the helmet must bear "the certification mark of the Standards Association of Australia", and in Western Australia must carry "a sticker issued by Standards Australia".

The problem? None of these exist! Standards Australia was broken up and sold to private buyers in December 2003 and has not issued any stickers or markings since then. Technically, it is impossible to buy any helmet you can legally use on the road in these States. This only touches on some of the inconsistencies with ensuring a helmet is legal. For a more comprehensive list, visit www.roadrider.com.au/special-features/state-of-helmets and read "State of Helmets". Written in 2011, many Road Rules have changed since which have further confused the situation. The ACCC has recently commenced a Review of the mandatory Standard in addition to managing recalls from the Australian marketplace of a number of helmets Certified by JAS-ANZ accredited certifiers.