EN 14052: 2012
High performance industrial helmets

Impact / Shock Absorption

EN 14052 covers helmets with higher performance than standard industrial helmets, and the impact tests are intended to reflect this. Tests are carried out using similar apparatus to that used by EN 397 - a free-falling striker dropped onto the helmet mounted on a fixed headform - but with a significantly higher impact energy, as well as with impacts carried out on both crown and front, sides & rear of the helmet. Specifically, crown impacts are carried out with an energy of 100 J (5 kg mass dropped approximately 2.04 metres), and off-crown impacts are carried out with an energy level of 50 J (5 kg mass dropped approximately 1.02 metres) with the headform inclined at angles of 15°, 30°, 45° and 60°. For the off-crown impacts, assessment is made not by the use of a load cell mounted below the headform, but by a uni-axial accelerometer mounted on the striker carriage itself - the acceleration in this accelerometer cannot exceed 300 g (2943 m/s²) for a helmet to be considered acceptable. This test is carried out on several helmet samples, following pre-conditioning to high temperature, low temperature, water immersion and UV ageing. There is also the option to expand the temperature range for the pre-conditioning if claimed by the manufacturer.

Penetration

For high performance helmets, the conical striker penetration test used in EN 397 is replaced with the flat blade striker test used in EN 443 (firefighter helmets). A blade striker (of total mass 1 kg) is dropped onto the helmet from a height of 2.5 metres (crown impacts) or 2 metres (off-crown impacts), with no contact between the striker and headform allowed. As with the impact testing, this is carried out on helmets pre-conditioned to high temperature, low temperature, water immersion and UV ageing.

Design Requirements

Most specifications for protective helmets include a number of requirements for the design of a helmet in addition to the specific performance requirements. These typically encompass the area of coverage provided by the helmet, as well as the field of vision afforded to the user when worn. They can also cover a number of ergonomics and safety-based requirements, such as clearance between the head and the shell of the helmet (particularly in the case of industrial helmets).

Retention System

Helmets can only protect the head when they are being worn and therefore the means for retaining the helmet on the user’s head requires as much attention as the rest of the head protection, and so is subject to a series of tests. The specific test carried out is dependent on the type of helmet, but two main tests are carried out:

Retention system strength
The retention system (in particular, the chin strap) is subjected to a force, applied either statically or dynamically, to ensure the strap is unlikely to fail at the point where it is most necessary. In the case of industrial helmets, it is however desirable that the chin strap will not cause a strangulation hazard, and so cannot be too strong, and therefore straps need to include a break-away element at the anchorages, intended to fail within a specific load range. Typically, the helmet, including chin strap, is fitted to a suitably-sized headform, with the chin strap either fitted to an artificial chin (consisting of two rollers mounted on a frame), where the headform remains static, or to the chin of the headform itself, where the headform is used to dynamically apply the force. The chin strap is then subjected to either a static force (where the artificial chin is slowly loaded until failure) or a
dynamic (shock) load, applied using a falling mass, and the amount of stretch in the chin strap is measured.

Retention system effectiveness
Helmets are subjected to a shock load, applied to the rear or front of the helmet in an attempt to pull the helmet off the headform. This is intended to consider the risk of the helmet catching on an obstacle and being unintentionally pulled off the user’s head. The test load (applied using a 10 kg falling mass) is applied, via a system of pulleys, to the rear of the helmet when mounted on a suitable headform, with the direction of loading following a direction approximately 45° from the horizontal towards the front of the headform (this is occasionally repeated on the front of the helmet). In order to meet the requirements of most protective helmet standards, the helmet must remain on the headform.

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