

No compromise on footwear

While impressive developments in rescue coveralls and specialist protective clothing for firefighters, police and other responders are well documented, footwear rarely has the same prominence says **Dave Frodsham**



IN ANY TOP TO TOE PROTECTIVE

clothing solution for emergency responders the focus of most attention is understandably on the structural garments that protect the body – trousers and jackets. Every organisation applies the lifetime cost benefit model to clothing; however this is often not the case when it comes to footwear. Protective footwear that is properly designed and tested for emergency responders is as essential as any other part of their equipment. Shoes and boots must be built to perform in the extreme situations that emergency personnel operate in. Any organisation that is compromising on the quality of footwear to save money in the short term is living in a false economy.

According to the Bureau of Labor Statistics in the US, more than 60,000 foot injuries every year result in lost work days. In 75 per cent of those cases, the injuries occurred when workers were not in compliance. The National Council of Compensation Insurance, US, cites the average cost of a lost work day foot injury as US \$9,600 (£6,210.38).

During the rescue work in the aftermath of 9/11 at both the Pentagon and the World Trade Centre, firefighters' boots became soaked because the seams failed in hot water, or water came in over the sides. In addition, the rubble at the World Trade Centre was so hot in places that it melted the boot soles of those working on site. Work shoes with steel reinforcements in the soles and toes protected feet against



Gore boots being tested for waterproofing, taking 300,000 steps through water and flexing in the Gore laboratory

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punctures by sharp objects, but often could not be worn because they conducted and retained heat, causing blistered and scorched feet.

So what is the best solution for emergency responders? As is so often the case there is no single solution but there are some guiding principles that should be applied to footwear design that will significantly mitigate the

risks for the wearer and improve protection.

One of the most important performance requirements is the need to keep feet dry from the inside and outside and in so doing maintain the optimum thermal balance that will allow the wearer to perform at their best for longer.

The GORE-TEX membrane is waterproof from the outside and breathable, allowing sweat to evaporate, so that when it is incorporated into the construction of a boot, the foot stays as dry as possible. The CROSSTECH membrane offers additional protection from biological pathogens.

Feet have more sweat glands per square centimetre than any other part of the body and, other than hands, produce the most perspiration. Each foot produces around quarter of a cup of water a day at rest and as much as a full cup when active. Temperature

inside the boot is equally important for maintaining comfort and performance at an optimal temperature between 28°C and 32°C.

Every piece of footwear made with one of Gore's waterproof, breathable membranes uses technology in its construction that is designed to stop feet from getting wet. This is to avoid injuries such as blistering, which limits the ability to walk and work; cold feet, which have a negative impact on important organs and can lead to illness; and heat and swelling.

WATERPROOF TESTING

Gore works closely with a number of footwear manufacturers to ensure that footwear produced with one of their specialist membranes is fit for purpose and meets the company's stringent quality assurance programme. The company regularly audits its partners' manufacturing process and runs its own exhaustive testing process on all components of prototypes, from the laces to the sole to ensure compliance. Manufacturers that incorporate GORE-TEX fabrics in PPE and CROSSTECH fabrics in their footwear must conduct continuous waterproof testing during production.

Gore operates specialised footwear testing laboratories across all of its operations around the world to ensure ultimate protection that meets the required safety and performance standards for end use. As well as abrasion and testing for every component, boots are subjected to a flex test – simulating taking 300,000 steps through water – to ensure waterproofing.

This robust system of audit and testing ensures that boots and shoes that incorporate a Gore membrane consistently deliver a combination of comfort and protection beyond the levels achieved by most footwear. The durability of the products means that they will also last much longer in everyday use, delivering a real cost benefit over the lifetime of the product.

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