



ELTEN

WHITEPAPER

FIREFIGHTER BOOTS FOR THE HARDEST DEPLOYMENT

WHY THE RIGHT FOOTWEAR SAVES TWICE THE LIVES

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1. THE PURPOSE OF THIS WHITE PAPER

Whether a large fire in an apartment building, a car accident with leaking fluids or a cat stuck in a tree – for special applications and the people who risk everything for others, reliable foot protection is essential. High-quality and durable materials, qualitative workmanship and the highest standards – firefighters should expect nothing less from their firefighting boots. The scenarios are diverse: Heavy rain and flooding, clearing and cleaning operations, working with heavy equipment, extinguishing fires with water and foam. The profession of firefighter is highly exciting and varied, but also places high demands on people and safety equipment. After all, things can get really rough on the job. To prevent firefighters from in-

juring themselves during operations, they have to wear protective equipment. Because when they walk through fires, crawl down narrow shafts or climb treetops, their feet in particular are at increased risk of injury. Footwear manufacturers such as ELTEN have therefore developed models that are suitable for use in extreme conditions. Their special sole technologies and fire-resistant materials ensure greater safety during use. But what materials should one look for, when purchasing a firefighting boot? What else does it have to offer besides heat resistance? What solutions does ELTEN’s FIRE series offer? This white paper clarifies these and further questions about firefighting boots and their special features.

2. TYPES OF FIREFIGHTING BOOT

DIN EN 15090:2012 defines the characteristics of firefighting boots. It classifies the boots into three groups. Class I is defined by boots made of leather or other material, but not rubber. Class II includes solid rubber and entirely polymer shoes. In addition, boots are further subdivided by type. Type I is suitable for general technical assistance (Type I HI 1) and firefighting outdoors (Type I HI 2, Type 2 HI 3). Type 2 is suitable for indoor use (Type 2 HI 2, Type 2 HI 3). Type 3, the „classic“ firefighting boot, is used for exceptional risks and hazardous materials. It is also suitable for any type of firefighting. All types and classifications offer basic protection against chemicals and micro-organisms. In addition, they are subjected to a sand bath test. For this purpose, type 3 boots are exposed to a contact heat of 250 degrees Celsius for 40 minutes. The boots also have to withstand a radiant heat test. After five minutes of glowing time and a heat flux density

of 20 kW/m², the upper material of the firefighter boot must not break. In addition to typing, the standard tests the thermal insulation of the boots and takes into account additional requirements such as electrically insulating footwear. This property is identified by the abbreviation „I“. Other additional requirements include antistatic shoes (A), chemical resistance (CH) and cold insulation (CI). These requirements must meet certain minimum values, depending on the classification and type. For example, a type 2 firefighting boot must withstand a higher thermal load than type 1, as this may only be used for outdoor firefighting. The HI value indicates the thermal insulation of the sole: A distinction is made between HI1 (30 minutes at 150 degrees Celsius), HI2 (20 minutes at 250 degrees Celsius) and HI3 (40 minutes at 250 degrees Celsius).

CLASSIFICATION OF THE ELTEN FIRE SERIES

All firefighting boots from the ELTEN FIRE series are of type 3 (HI 3) and can withstand temperatures of 250 degrees Celsius for at least 40 minutes. They also have the suffix F2A. The „F“ stands for the fulfilment of all basic requirements for firefighting boots. The „2“ indicates that the boot is a safety boot with an integrated toe cap and shock protection up to 200 joules. The „A“ guarantees the anti-static requirements.²

¹ German statutory accident insurance e.V (DGUV): DGUV Information 205-014 – Selection of personal protective equipment for fire department operations based on a risk assessment (DGUV Information 205-014).

² FUK Mitte, HFUK Nord, FUK BB: Stichpunkt Sicherheit.

URL: <https://www.hfuknord.de/hfuk-wAssets/docs/service-und-downloads/download-praevention/stichpunkt-sicherheit/SiSi-PSA-Feuerwehrtiefel.pdf> [12.05.2022]

3. FEATURES OF THE ELTEN FIRE SERIES

In addition to the types, firefighting boots have additional features that meet the requirements of the respective deployment location. In addition to the typifications, firefighter boots have further features that adapt to the requirements of the respective place of operation. ELTEN uses high-quality high-tech materials for its firefighting boots. The seams and laces of the ELTEN FIRE boots are made of NOMEX® from DuPont™. This material is a high-performance fibre made from a patented mixture of 95% NOMEX® and 5% KEVLAR®, high-strength aramid. NOMEX® offers optimum flame resistance, heat protection and chemical resistance. It is self-extinguishing, does not melt and does not drip. If the boots are sooty and dirty after a long period of use, they can be cleaned easily. Fire

resistance is not affected by this.³ In addition, the firefighting boots of the ELTEN FIRE series are equipped with a breathable GORE-TEX membrane. This regulates the foot climate even under very hot conditions and guarantees water resistance for a time – even in extinguishing water.

Another basic feature of the boots is a steel toe cap that protects the toes from falling objects – because heavy equipment can hit the feet during rescue or fire-fighting operations. The steel midsole used provides the necessary penetration resistance in accordance with EN ISO 20345 S3, warding off dangers from below. The wide, abrasion-resistant overcap also prevents premature wear of the boot due to abrasion.

REFLECTIVE MATERIALS FOR PROTECTION IN THE DARK

In the rain, in the shade, at dusk and in the dark, people with dark clothes are only noticeable at a distance of about 30 metres. Therefore, safety reflectors increase visibility in poorly accessible environments. Equipping with reflective materials provides additional protection through good visibility, even in adverse weather and light conditions.

The CRAIG GTX F2A lace-up boot also has cut-resistant fibres that provide special protection for the foot. 100% protection against cuts by hand-held chainsaws cannot be ensured by PPE. But the degree of protection increases many times over thanks to these fibres. The protective effect can, among other things, be achieved

by the following functional principle: The chain is slowed down by using fibres with high cut resistance, as these reduce the chain speed by absorbing kinetic energy. It is important to note that shoes and trousers must overlap. An anti-cut protective shoe of protection class 2 withstands chain speeds of 24 m/s.

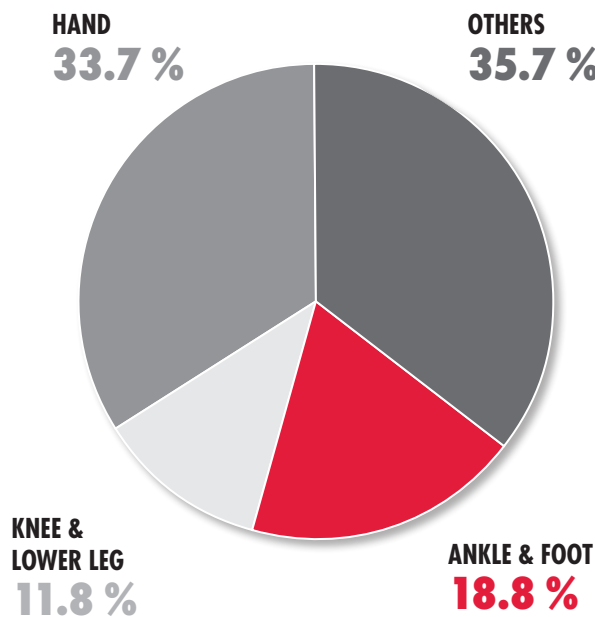
³ Norms & regulations for heat & flame protection: <https://www.dupont.de/knowledge/norms-regulations-heat-flame.html> [12.05.2022 16.46]

4. PREVENT SLIPPING!

The workplace of firefighters constantly changes, as does the terrain on which they move. While rescuing a person on a slope or removing an oil slick on the road, it can be very slippery. The weather can also drastically complicate conditions when working in the field. For example, in stormy conditions, heavy rainfall or when black ice turns the ground into a slippery slope. In these cases, the persons concerned need safety shoes that provide them with good grip. A major risk of injury on uneven floors is to losing one's footing, slipping and falling down or twisting your ankle.

According to statistics from the DGUV (German Social Accident Insurance), ankle and foot injuries ranked second in 2020, with 18.8 percent (129,731 cases) of the most frequently injured parts of the body in the case of reportable work-related accidents. Of this, injuries to the upper ankle joint accounted for 59 percent – the area that is particularly frequently affected by twisted ankle accidents. This alone corresponds to 11.1 percent of all reportable work-related accidents. In this context, only the hand was more frequently affected than the foot and ankle area (33.7 percent, 232,462 cases).⁴

DISTRIBUTION – REPORTABLE WORK-RELATED ACCIDENTS



⁴ <https://publikationen.dguv.de/widgets/pdf/download/article/4271>

In 2019, members of the volunteer fire brigade suffered 4,507 reportable work-related accidents 384 commuting accidents. This resulted in a total of 6 fatalities. In 2,454 cases, new pensions were paid to insured persons or their bereaved, which is an indication of a particularly serious accident history. The accident rate, as reported by the fire service accident insurance funds in some German counties is well above the average in the German statutory accident insurance (DGUV) of 21.0 reportable work-related accidents per thousand full-time workers, with 45.0 reportable work-related accidents per thousand full-time workers.⁵

The accident figures show that the fire brigade service is associated with risks. This makes it all the more important to ensure the prevention of accidents in the fire service. Our ELTEN FIRE models prevent slips with their slip-resistant rubber/PU sole. The coarse outsole is extremely heat-resistant (HI3) and, with tread depths of up to six millimeters, always ensures a secure footing. In addition, it is not glued, but injection-moulded, which makes it even more resistant. For extra grip, some models are also equipped with a steep-front heel.

5. WEARING COMFORT THROUGH OPTIMAL FIT

Alongside safety and protection, comfort is an important criteria. Some deployments last several hours sometimes the boots are worn all day. Therefore, the boots must fit comfortably, even when worn for long periods of time, instead of rubbing or pressing on the foot. In order to achieve this, the ELTEN FIRE models have been developed on a new last – for a comfortable and ergonomic fit. This gives the wearer extra space in the forefoot area. This is a plus in terms of wearing comfort for all emergency personnel with particularly wide feet. Ultimately, it also helps to increase safety.

If the protective footwear is comfortable, the wearer will gladly wear it for long periods.

Pain in the musculoskeletal system can quickly lead to inattentiveness in the field. Wearers tire more quickly, which reduces their orientation performance and means they are no longer fully operational. For this reason, an ergonomic shoe construction is important, because it aims to minimize risk factors, increases efficiency and increases comfort.

OUR LACE-ZIP COMBINATION

The lace-up zipper combination of our ELTEN FIRE models enhances the wearing experience by optimally adapting to the foot and lower leg. The combination zipper is replaceable, allows quick entry and exit.

⁵ https://www.dguv.de/de/mediencenter/pm/pressemitteilung_402783.jsp

6. BOA® AND PULL-ON – THE SPECIAL ONES

The ELTEN FIRE models are not only available laced, but also as slip boots or with BOA® closure. The CRUZ GTX F2A and CLAY F2A slip-on boots perform when speed is of the essence, without sacrificing a single bit of comfort or support. For this reason, the GTZ CRUZ F2A is also equipped with a TPU shin protector.

The BOA® Fit System is installed in the COLIN GTX BOA® F2A and delivers high-performance fit solutions perfectly tailored to the respective area of use. It consists of a finely adjustable rotary closure, a light but nevertheless extremely heavy-duty cable and low-friction cable guides. Each individual configuration not only optimises the fit of the product, it is safe, fast, adaptable, robust and comes with the BOA® warranty. This states that the system lasts as long as the shoe into which it

is integrated. The fastener repels dirt and oil and works so reliably that no readjustment is necessary. To avoid pressure points during hazardous operations and to ensure a high level of wearing comfort all the time, the edge of the shaft and the ankles, lugs and collar are softly padded. The soft ankle padding increases the wearing comfort as well as a special Gore-Tex stretch laminate that can be integrated into the shoe tongue. This stretch area on the back of the shaft and a pull-off aid at the heel allow the boot to be put on and taken off particularly quickly. With the exception of the CLAY F2A, the firefighting boots of the ELTEN FIRE series are available from shoe size 35 and up to shoe size 50 – and are therefore also suitable for smaller women's feet. The CLAY F2A is available from size 38.

SEMI-ORTHOPAEDIC INSOLE

The boots of the ELTEN FIRE series can also be easily adapted to the shape of the foot with the FIREFIGHTERS semi-orthopaedic insole. The insole is available in three different thicknesses: Level 1 is slightly thinner, level 3 is the thickest. The particularly skin-friendly soft foam material enhances the pleasant walking feeling. Due to the well-functioning moisture absorption and release, no sweating fluid can accumulate. The anatomically shaped footbed allows a natural rolling motion from the heel to the toe, while the foot is always well supported. Abrasion-resistant and well suited for continuous use – the FIREFIGHTERS insole is provided for optimal adaptation of the feet.

7. AND AFTER DEPLOYMENT?

After deployment, the firefighting boots are changed for service or safety shoes to avoid contamination of the fire station. ELTEN also provides appropriate footwear for this point. Safety shoes of class S2 or S3 are suitable for working in the fire station, depending on the safety inspection. Working with heavy equipment and maintenance of the fire service vehicle require a protective toe cap and, depending on the risk

level, a penetration protector for the toes. In addition, it is important that the safety shoes are quickly fastened during daytime duty and can be opened again just as quickly when the next assignment calls. For this purpose, models such as the REACTION XXT Pro BOA® Mid ESD S3 are suitable. For this purpose, models such as the REACTION XXT Pro BOA® Mid ESD S3 are suitable.

8. CONCLUSION

Firefighting boots have to withstand a lot. They have to meet high demands with details such as fire-resistant seams, heat-resistant soles and anti-cutting protection – be it extinguishing a fire or rescuing people from a vehicle. ELTEN took up this challenge a few years ago and since then has been continuously developing its materials and technologies to protect those who risk their lives for others. Anyone who works under extreme conditions cannot make any compromises when it comes to safety. The ELTEN fire service boots are designed for particularly tough operations and are ba-

sed on the needs of the wearer. Robust, fire- and tear-resistant upper materials with innovative technology, full safety equipment and adjustable lace-up systems or pull-on boots: These boots leave nothing to chance, they must be reliable in use. Safety for those who make the world a little safer.