

The new L-Protection® line designed for increased comfort and safety a new-generation nail-proof textile insole



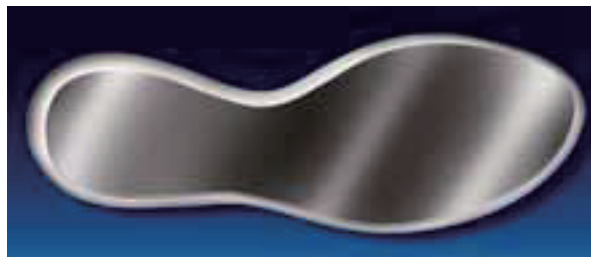
in HT Yarns that offers increased resistance against penetration by nails, even by those of small diameter

Research means safety

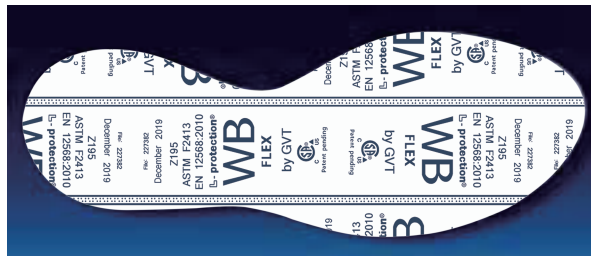
The new-generation L-Protection® nail-proof products are a result of targeted Lenzi research. These materials, made of a multi-layer textile composite, have been certified for use in nail-proof insoles in compliance with EN12568:2010, and with footwear norms S3 ISO EN20344/20345/20346, ANSI Z41, ASTM F-2413 and CSA Z195. The L-Protection® research process was aimed at creating composite textile insoles capable of resisting accidental perforation by nails and other objects, even, even of small diameter.

Technology means safety

Our new nail-proof L-Protection® line has been created using a series of fabrics containing high-tenacity yarns. After plasma treatment, rendering the fibers more porous and hydrophilic, the various layers undergo ceramic treatment. Plasma treatment improves attachment and compactness of the ceramic particles, which provide a higher degree of hardness, and mechanical, physical and chemical resistance.



A traditional steel-plate insole protects approx. 85% of the sole of the foot.



An L-Protection® textile insole protects the entire surface of the sole of the foot.

Ergonomics and comfort mean safety

Safety does not only mean penetration resistance: safety footwear, used throughout long hours every working day, is safer when it is more comfortable and fits the foot ergonomically. Footwear created with L-Protection® non-metallic anti-perforation insoles, being soft and extremely flexible, permits increased contact with ground surfaces, reducing the risk of accidental slippage. Also, as they have isolation properties against heat and cold, they increase foot sensitivity even under extreme atmospheric conditions.

Studies carried out by Satra have analysed the advantages of using footwear with L-Protection® non-metallic insoles. Numerous tests and practical trials were carried out on three pairs of footwear, identical in style, but one pair having a normal non-protective insole, one an insole in steel plate and one a non-metallic L-Protection® insole.

Not only did the third non-metallic pair prove more ergonomic than the pair with steel plate, as was to be expected, but they also proved to be more ergonomically comfortable than the normal non-protective pair.

- Greater foot sensitivity and control
- Reduced fatigue
- Maximum ground surface contact
- Improved adherence

Comfort Factor	Desirability Score		
	No Insert	Textile Insert	Metallic Insert
Fit Comfort	5.33	8.67	6.00
Linings	2.22	5.56	2.22
Heel Cushioning	4.44	5.56	4.44
Forepart Cushioning	0.00	5.56	-1.11
Sole Flexibility	2.22	5.56	0.00
Weight	-1.11	5.56	-2.22
Upper Softness	3.33	5.56	1.11
Warmth	1.11	4.44	0.00

Satra Report, January 2006

Property	No Insert	Textile Insert	Metallic Insert
Heel Hardness	Moderately Soft	Soft	Moderately Soft
Forepart Hardness	Moderately Soft	Soft	Moderately Soft
Sole Flexibility	Moderately Flexible	Moderately Flexible	Moderately Flexible
Weight	Moderately Light	Moderately Light	Slightly Heavy
Upper Softness	Soft	Soft	Moderately Soft
Warmth	Slightly Warm	Moderately Cool	Moderately Cool

Satra Report, January 2006

Alongside 100% protection of the sole of the foot and easy workability, these characteristics of footwear created with L-Protection® insoles provide increased reduction in the risk of slippage and falling, and therefore increased safety in comparison with metal insoles.

Safety in numbers

	Year	Pairs sold	Total accidents	Accidents per million
Steel insert	2001	3,960,000	1085*	273,98
Textile insert	2005	1,800,000	7	3,88

The table (accessible on the Inail website) shows that in 2001, before textile nail-proof insoles entered the market, over 1000 accidents pertaining to perforations of the foot by sharp objects in the workplace were reported, out of total sales of approx. 3,960,000 pairs of safety footwear using steel insoles (Satra data), equal to an incidence of 273.98 cases per million. In 2005, out of 1,800,000 pairs of shoes sold with non-metallic inserts, 7 cases of foot perforation were reported, equal to 3.88 cases per million, a percentage over 7000 times lower. There were also approx. 100 cases of foot "puncture" by small metallic objects, but these did not cause such severe damage as to constitute an official "accident". Nonetheless, these smaller incidents were an incentive for us to improve our product, and led to the creation of our new-generation L-Protection® line, which also inhibits penetration by small pointed objects.

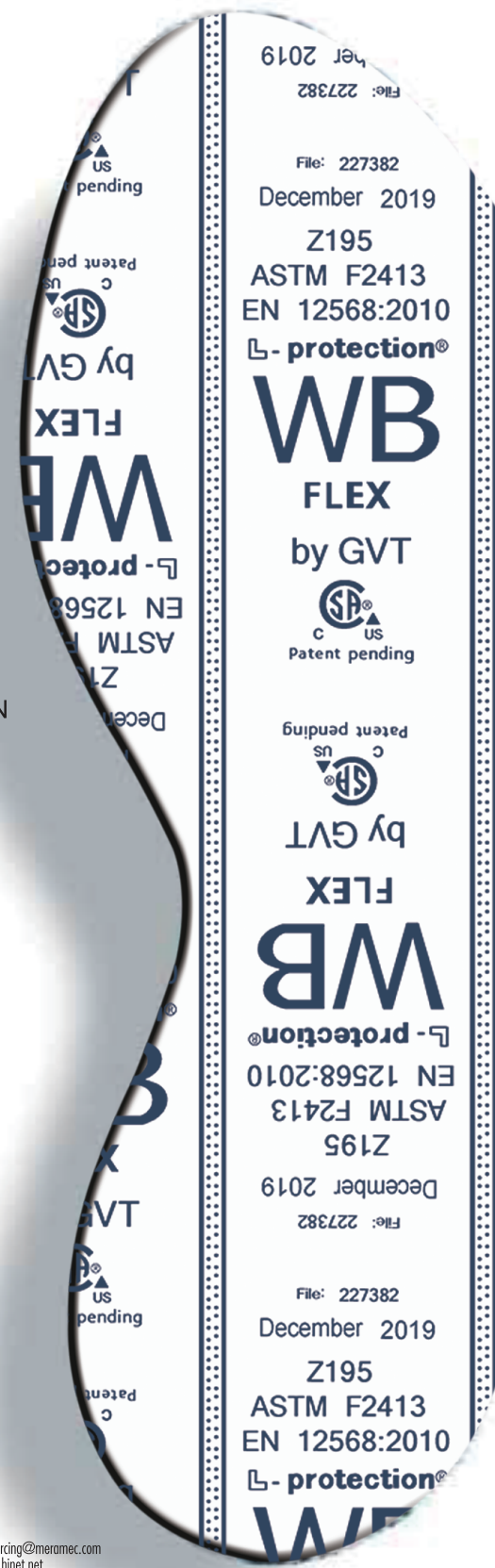
Nail-proof L-protection®

ADVANTAGES

- Safer than steel
- Total protection of foot surface from toe to heel
- Maximum flexibility and comfort
- Minimum weight
- Greater ground adherence
- Ultra-light
- Zero traceability by metal detector
- Thermo- and electro-isolation
Complies with norms EN12568:2010, ISO EN 20344/20345/20346, ANSI Z41, ASTM F-2413 and CSA Z195.
- L-protection® can be used directly as a Strobel insole, offering stable protection over time
- Once you've tried it, you won't want to change



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THE 6 FAQ'S

How can an anti-perforation fabric actually be sewn using needles?

L-protection® materials are a result of our studies on bullet-proof vests. In the ballistics sector, it is absolutely normal for a protective vest to resist heavy-grade bullets such as a 15.6g caliber 44 magnum traveling at a speed of 430m/sec. The same protective vest, however, may be easily penetrated by a small and much lighter 22 l.r. caliber bullet traveling at a speed of 880m/sec. The parallel with insole manufacture is clear. Whereas a normal nail pressing slowly upon the fabric will not penetrate through, a thin sewing-machine needle moving at great speed can penetrate the fabric with relative ease.

There is a general assumption that a textile insole cannot guarantee the same resistance to perforation as a steel plate.

This is false, in fact the reverse is true. Steel plates normally protect from penetration by any sharp object up to approx. 1100N (approx. 100kg). Once the pointed object has penetrated the plate, however, it meets with no further resistance. The L-protection® textile insole provides the same protection against initial penetration by a nail point through to the inside of the shoe up to 1100N, but continues to provide resistance and inhibit further penetration by the point above 1100N up to over 1500N (approx. 140kg).

Why is it said that textile laminates provide a greater protected surface area of the foot than a steel plate?

A steel plate cannot protect 100% of foot surface area for structural reasons. It can protect a maximum of around 85%. It is for this reason that ISO EN20344 norms, and subsequent modifications thereof, permit safety footwear with steel insoles to leave about two centimeters of the foot UNPROTECTED in the heel area, and about half a centimeter UNPROTECTED around the whole foot. It is in these areas, representing about 15% of total foot surface area, that accidents occur in S3-grade footwear with steel plates, until now considered "unavoidable". L-protection® textile insoles, on the other hand, can be sewn directly onto the upper, thus extending protection to the entire surface, and thereby succeeding in protecting 100% of the sole of the foot.

Do textile insoles tend to harden under extremely cold atmospheric conditions?

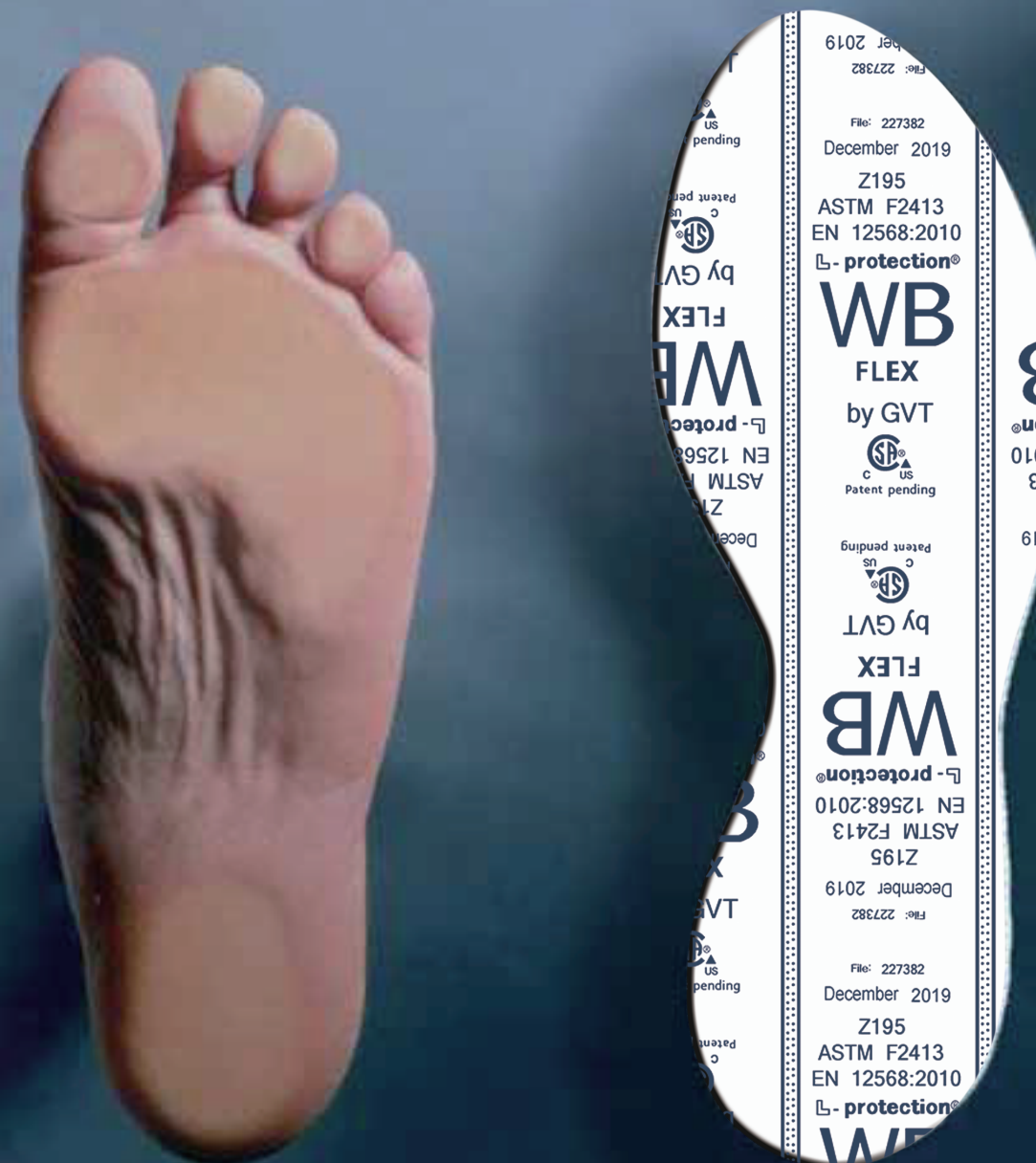
Absolutely not, in fact L-protection® textile insoles provide thermal isolation even at extreme temperatures without hardening, providing greater comfort for the wearer.

Can one jump from a height of 50cm onto a nail, wearing textile insoles?

Aside from this being highly ill-advised, jumping onto nails is expressly forbidden by current norms. If this should occur for accidental reasons, then our laboratory tests (available upon request) have revealed that L-protection® nail-proof insoles provide resistance to impact perforation equal to, and in certain cases greater than, the average resistance provided by steel plate. Once a steel plate has been penetrated, it no longer provides protection and allows further passage of the nail without offering resistance. Moreover, the resultant deformation of the nail tends to inhibit its extraction. An L-protection® insole, on the other hand, due to its elastic, compact and abrasive structure, continues to inhibit the passage of sharp objects, slowing down impact.

Small diameter nails might perforate protective textile inserts, whilst this does not happen with steel plates. Can we say that L-Protection is not as safe as a steel plate?

Being L-Protection® a multilayer textile structure, resistance to penetration may be reduced when reducing diameter of penetrating objects. Nevertheless, small diameter nails and sharp objects either bend or are too short to pass through, and therefore it is very unlikely they reach the foot, and cause small punctures. As far as safety is concerned, it is true the opposite: L-protection® inserts are much more resistant to medium and big diameters nails than steel plate. In case of penetration, medium and big diameter nails are those which hurt and make the serious injuries. Moreover, in case of penetration of a nail through a steel plate, the nail easily remains trapped by the deformation of the steel, making difficult to extract the nail from the foot. In any case, any nail or sharp object, regardless of its diameter, can easily penetrate into a sole protected by a steel plate through the 15% non protected area, and in this case serious injuries are very likely to occur. Therefore, we can state that even in this case, L-Protection® inserts are more safe for the user.



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comfort and safety

New L-Protection® Nail-Proof Insole in HT Yarns