

Honeywell

SAFETY FOOTWEAR RISK REPORT

An assessment of the impact of inappropriate protective footwear on worker health, safety and productivity



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Introduction

According to the International Labour Organization, more than 2.7 million people die every year due to occupational injuries and diseases. This is in addition to the 374 million people who experience non-fatal work-related injuries and illnesses¹. These statistics represent a substantial human cost in terms of impact on families and livelihoods as well as a significant financial cost in terms of medical care and loss of productivity. Nevertheless, they also offer an opportunity to evaluate the causes of these injuries and illnesses and take concrete steps to reduce the number of incidents and improve the quality of life of workers.

Prevention is the key to avoid injuries and save on the associated costs. These costs can be quantified in terms of medical expenses, loss of productivity due to absences from work and in some cases interruption of production due to the incident on site. In light of this, selecting the right safety footwear lowers the risk of two of the largest influences on occupational injuries and health - slips, trips and falls as well as musculoskeletal diseases.

However, choosing a safety footwear product is not as simple as picking something from a catalogue. Safety shoes are certified against regulatory standards that provide peace of mind about the protection the shoe offers. EN ISO 20345 lists basic requirements for all safety footwear and also optional requirements for specific applications. It is important to understand the safety regulations and how to identify whether a safety shoe is suitable for your application and environment.

After selecting the right safety footwear product in terms of safety features and ISO standard requirements, there is still the question of fitting and size. Poorly fitting shoes have the potential to cause long-term musculoskeletal problems by putting unnecessary pressure on the feet, knees and hips of workers. Long-term work-related diseases like musculoskeletal disorders can have an even greater impact on worker productivity than an immediate injury.

This report evaluates the impact of inappropriate safety footwear on worker safety, health and productivity, providing recommendations for reducing the risks of foot-related workplace injuries and diseases.

Quantifying the impact of work injuries and illnesses



The World Congress on Safety and Health at Work offers a platform for the exchange of information and views on a three-year cycle. A new report presented at the 2017 congress in Singapore revealed the staggering costs associated with work place injuries and illnesses. The International Labour Organization, the EU Occupational Safety and Health Association and others all collaborated in this joint effort to quantify their impact on business productivity. Their calculations show that the worldwide cost of work-related injuries, diseases and deaths amounted to \$2.99 trillion (€2.65 trillion) or 3.94 % of the global GDP².

These figures have been broken down into regional statistics. Dr. Christa Sedlatschek, head of EU-OSHA, was quoted as saying: “Safe and healthy work is a fundamental human right but these new estimates of the costs of poor or non-existent OSH measures show that the economic case for OSH has never been stronger. Work-related ill-health and injury is costing the European Union 3.3 % of its GDP. That’s €476 billion every year which could be saved with the right occupational safety and health strategies, policies and practices.”³

The impact of footwear on workplace accidents

Safety analysts break down injury statistics into different types of injury to help practitioners understand where the major risks are. Some common categories include:

- Slips, trips and falls
- Struck by or caught in moving objects
- Vehicle-related accidents
- Fires, explosions or electrocutions

From this information, plans can be developed to reduce the injuries through changes to procedures and improved safety equipment. This includes prioritising where to invest in occupational safety and health to gain the biggest improvement in results.

EU-OSHA lists slips, trips and falls as the largest cause of accidents in all sectors. They are the main cause of accidents in the workplace that result in an absence of 3 days or more⁴. Of course, there are many contributors to injuries in this category from basic housekeeping to the use of safety harnesses. However, the right safety footwear plays a major role in preventing slips due to the anti-slip features designed for this purpose. Safety footwear also protects feet from being struck by falling objects or being crushed by heavy equipment. This highlights the importance of a safety footwear strategy and approach to minimise the potential for these incidents and the resulting loss in business productivity.



The impact of footwear on occupational health

In terms of business productivity impacts due to workplaces injuries and illnesses, by far the highest contributor is from occupational diseases. According to the World Congress Report referenced above, 86% of work-related deaths actually stem from occupational diseases and only 14% from accidents and injuries at work⁵. Data visualisation tools show that musculoskeletal diseases (MSDs) make up 15% of DALY (years of life lost and years lived with disability) in Europe, which is second only to cancer. The figure for Germany is in line with the 15% average for Europe, while France performs slightly better at 11%⁶.



The Federal Institute for Occupational Safety and Health in Germany has identified MSDs as a significant cause of incapacity to work. It reports that almost 23% of all sick days in a year are attributable to MSDs and that MSDs also cause more than 22,000 workers to retire early due to their impaired ability to work. This results in €17 billion of lost production annually.⁷

Most research for MSDs focuses on the upper body due to the impact of lifting heavy loads and repetitive movements. But there is a growing awareness of the impact of standing and walking as well as the impact of poor-quality footwear. Workers in industry spend large amounts of time on their feet and approximately walk up to three times as far as other workers

in a typical day⁸. An article in *Lower Extremity Review* highlights the importance of footwear in the fight against MSDs: "Footwear plays an integral role in force distribution on the lower extremities, and choosing appropriate footwear is one of many strategies people can use to manage knee pain caused by joint disorders.

When footwear is properly fitted, force and stress can be shifted away from weaker parts of the knee, and the leg stabilized."⁹

Musculoskeletal diseases are a major cause of loss of business productivity. Safety footwear has the potential to exacerbate those problems or alleviate them depending on the fit and the support they offer to the arch and heel.

European regulations for safety footwear

An overview of ISO 20345

European regulations for safety footwear centre around Standard EN ISO 20345:2011, known as 'Personal Protective Equipment - Safety Footwear'. This standard specifies both basic and additional requirements for safety footwear used for general purposes. It is supplemented by other job-related standards that have particular requirements for the industry concerned. For example, EN ISO 20349:2010 lays out the requirements for protection against thermal risks and molten metal splashes. This job-related standard covers the welding industry, the risks of molten metal splinters, and foundries where workers need protection from aluminium and iron splashes.

According to ISO 20345, all safety footwear must pass an impact resistance test and a compression resistance test. The minimum acceptable impact resistance is 200 joules. Shoes are tested by dropping a 20 kg weight onto the toe cap from 1.02 metres. Compression resistance is measured by applying an increasing force up to the value of 15 kN to the toe cap. This test is equivalent to a 1.5 tonne load resting on the shoe. Deflection in the toe cap is measured by placing a modelling clay cylinder inside the toe cap during the test and then examining it after the test is complete¹⁰.

One thing to note is that ISO 20345 is currently under revision and will be replaced. The new standard is currently being developed.

Categories of safety footwear

Safety footwear is certified according to safety categories defined in the ISO standard. Each category adds to the safety features already present in the previous category. These can be summarised as displayed in the table below:

SAFETY CATEGORY	DESCRIPTION
SB	Safety footwear having protective toe caps and non-slip soles.
SBP	Complies to SB with additional midsole penetration resistance.
S1	Complies to SB with additional anti-static features, oil resistance and energy absorbent heels.
S1P	Complies to S1 with additional midsole penetration resistance.
S2	Complies to S1 with additional waterproof upper.
S3	Complies to S2 with additional midsole penetration resistance and cleated outsoles.
S4	Same features as S1, but upper is made from rubber or moulded polymer making them waterproof and leakproof.
S5	Complies with S4 with additional midsole penetration resistance and cleated outsoles.

Safety footwear and slip resistance

Slip resistance is an important feature of safety footwear given the number of injuries caused by slips, trips and falls. The ISO standard classifies slip resistance in terms of a rating depending on the type of slippery material workers may be exposed to. Passing a slip resistance test is dependent on the measured coefficient of friction for both a forward heel slip and a forward flat slip:

- An SRA rating means the footwear has been tested on ceramic tile floors wet with a sodium lauryl solution.
- An SRB rating involves passing a slip test on metal floors wet with glycerol solution.
- An SRC rating is given to safety footwear that meet both the SRA and SRB slip resistance rating.

Optional features for safety footwear

Besides the safety category that a safety shoe complies with, there are additional safety features specified under ISO 20345, which are optional. Each feature has its own code and should be stamped on the safety shoe to indicate its compliance.

The following list highlights these optional safety footwear features:

- | | | | |
|-----------|--|------------|---|
| A | Antistatic protection, which dissipates static from the body and prevents sparking. | P | Midssole penetration protection, which resists a penetration force of at least 1,100 N. |
| C | Conductive protection, which is even more effective at dissipating static than antistatic shoes. They should not be used where there is a potential for electric shock as the full force of electric current will pass through the body. | E | Energy absorption in the heel region of at least 20 J to aid comfort and relieve pain. |
| AN | Ankle protection, meaning that the shoe upper extends above the ankle region providing extra protection. | WRU | Water resistant upper |
| CR | Cut resistant upper, which provides protection from sharp objects. | HRO | Heat resistant outsole, which resists 300 C for up to one minute. |
| | | CI | Insulation against cold of -17 C for up to 30 minutes. |
| | | HI | Insulation against heat of 150 C for 30 minutes. |
| | | M | Additional metatarsal protection with a minimum resistance of 200 J |



Other ISO standards to be aware of

While ISO 20345 is the most common standard referred to in terms of safety footwear, it is not the only standard in circulation.

ISO 20346 : 2011 - This standard describes the requirements for protective footwear, which are lower than the standards for safety footwear. Impact resistance of 100J and compression resistance of 10 kN is sufficient to meet the requirements of ISO 20346.

ISO 20347: 2012 - This standard describes the requirements for occupational footwear. No impact or compression requirements are specified for this footwear. However, features like penetration resistance, fuel oil resistance and anti-static properties are required.

Choosing the right safety footwear can reduce risk

Selecting safety footwear for any organisation starts with making sure that it meets the ISO standard.

Choosing the right shoe for the right environment

ISO 20345 specifies general requirements for all safety footwear, but there are a number of optional specifications within the standard too. These features are needed for different work environments and must be considered depending on the application. For example, workers in the oil industry should have safety footwear with an SRB slip rating to limit the risk of slipping on an oil spill. Workers in the explosives industry should have antistatic or conductive protection to avoid sparking while on the work site. A basic safety shoe does not provide additional metatarsal protection, but this is essential in some workshops and construction sites where the risk of being struck by a falling object is high. A good safety footwear management program will consider the site-specific risks and issue workers with safety shoes that cater for those risks.

The importance of sizing

When any shoe is too small it puts pressure on the toes forcing them into an unnatural position. But, with safety footwear, this consequence is even more pronounced. Steel or composite toe caps do not flex at all, increasing the pressure on a worker's toes. Blisters, bunions, walking pain, knee or back pain and hip problems can all be attributed to wearing safety footwear that doesn't fit. These factors contribute to the development of MSDs, confirming that the right fit of safety footwear is important to prevent lost work days due to occupational illness.

An article by the Harvard Medical School describes the way our feet change as we age. An average 50-year-old has walked over 75,000 miles or even more depending on job requirements and lifestyle. Over time the foot padding reduces, and ligaments and tendons stretch. It is not uncommon to require a larger shoe size in your fifties than you did in your twenties¹¹. Correct sizing of safety footwear is an essential component to preventing MSDs and the associated loss in productivity. Some tips for sizing are as follows:

- Try on safety shoes with the same type of socks as you will use daily.
- Check the size of both feet and choose a safety shoe for the larger size.
- Sizing should also be done near the end of the day, when the foot is slightly swollen so that there is enough room in the shoe to accommodate this.



Conclusion

Each year large numbers of people lose their lives or face serious health consequences as a result of occupational accidents or diseases. Researchers have converted these consequences into money terms in order to show the productivity impact for business. The results of this research help to quantify the risks of workplace injuries and illnesses. They also help to identify the opportunities available to improve the statistics and the quality of life of workers.

Making an improvement in workplace injuries and occupational diseases is possible with investment in safety. Studies have shown that an investment in occupational safety and health generates a positive economic return for companies. The EU-OSHA quotes a German research report, which estimates a return of 2.2 Euros for every 1 Euro spent on OSH¹².

Safety footwear is a category of PPE that influences several of the major injury categories as well as occupational health. The right safety shoes prevent slip incidents, protect workers from heavy objects and equipment and help prevent musculoskeletal diseases. The risks of workplace injury and illness can be overcome by making an investment in a safety footwear management program.



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