THE FR FABRICS GUIDE

LEARN HOW TO BUILD A STRONG SAFETY CULTURE AND FEEL CONFIDENT IN ALL YOUR PROTECTIVE CLOTHING DECISIONS

GUIDE | 2020

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Make the right protective clothing decisions: start today

MAKE THE RIGHT PROTECTIVE CLOTHING DECISIONS: START TODAY

As a Health & Safety Manager, it is your responsibility to guard the safety of your workers in their day to day jobs and naturally, you want them to feel safe and confident. When you are in the process of improving your worker's protective clothing, you most likely encounter multiple challenges, such as:

1. How do I assess risks in my work environment to determine which rules and regulations to comply with?
2. What is a risk assessment? Are there guidelines available on how to conduct one?
3. How can I best prioritize protective clothing specifications?
4. Apart from safety, why should I be concerned about comfort, durability, sustainability and design?
5. How can a wear trial help me to receive buy-in from workers for their new protective clothing?

This Guide educates you on all relevant aspects of protective clothing and helps you prioritize. After reading this Guide, you will feel confident to take the safety decisions your company needs, and your colleagues love.

1. THE IMPORTANCE OF A RISK ASSESSMENT

Your company has rules and regulations to comply with when it comes to the protection of your workers. Carrying out a risk assessment is an important asset in improving your safety culture.

Needless to say, protective clothing plays a crucial role here. The risk assessment will not only help you to identify possible risks, but will also form guidance on how to take further actions towards your protective clothing and how to prioritize them. A risk assessment is a systematic examination of all aspects of the work undertaken to consider what could cause injury or harm, whether the hazards can be eliminated, and if not, what preventive or protective measures can be made to control the risks.

Boost your knowledge further:

We strongly advise you to read The Directive 89/391/EEC, which provides guidance on risk assessments. It will help and advice safety experts who want to conduct a risk assessment:

READ THIS BLOG

Learn how to conduct a HSE risk assessment:

READ THIS BLOG

How to conduct a risk assessment in 7 steps:

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2. THE PROTECTIVE CLOTHING LANDSCAPE

Different work environments ask for different protective measures. A risk assessment will make clear which kind of protective clothing fits your work environment best. In this Guide, we show you the protective clothing landscape and take a look at all the relevant aspects that need to be prioritized in different work environments. This helps you to feel confident in taking the right safety decisions for your company.

2.1. FLAME RETARDANT CLOTHING

In a wide range of industries, professionals can encounter risks of heat and flames in their daily jobs. Every work environment is different, which adds up to the complexity of selecting the right protective clothing. In this paragraph, we inform you about flame retarding clothing and the corresponding EN ISO 11612 standard.

What is flame retardant clothing?
Flame retardant clothing is protective clothing is meant for workers who are in need of clothing with limited flame spread properties, and where the user can be exposed to radiant or convective or contact heat, or to molten metal splashes. It is either made with FR treated fabrics, or manufactured with FR inherent fabrics.

In order to determine which protective clothing suits your unique work environment best, you have to know the possible risks of your unique work environment. Building and maintaining a strong safety culture is crucial, especially in environments with fire and/or heat hazards.

Boost your knowledge further:

Read more about the difference between FR treated and FR inherent:

READ THIS BLOG

The most commonly used fire retardant clothing standards
In terms of heat and flame protection, two of the relevant standards are EN ISO 11612 and the complementary EN ISO 11611. The latter is specifically needed in work environments where workers are engaged in welding and allied processes, mentioned in 2.2.

Thirdly, NEN EN 469 specifies minimum performance requirements for protective clothing designed to be worn during firefighting activities.

What is EN 11612? Understanding EN ISO 11612 test A, B, C, D,E, F and performance levels
In order for your flame retardant protective clothing to comply with EN ISO 11612, the fabric of choice needs to pass at least two tests: the A test (flames spread) and at least one of the following.

- B test (convective heat)
- C test (radiant heat)
- D test (molten aluminium)
- E test (molten iron)
- F test (contact heat)

Boost your knowledge further:

Learn what ISO 11612 is and what is means for your protective clothing:

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> The level of safety of your workers is strongly affected by the everyday practice of your work environment."

Peter van Barneveld
Product Manager Industrial Safety at TenCate Protective Fabrics

You not only need to know whether a fabric passed the test or not, but also to what degree. For example, the three performance levels in the E test indicate the level of protection the garment offers against different amounts of molten iron splash. Depending on the risk levels of your unique work environment, you need a fabric that meets a certain performance level.

The EN ISO 11612 is the right start to make sure your protective clothing meets basic heat and flame risk requirements. However, the level of safety of your workers is strongly affected by the everyday practice of your work environment. You want to know which level of protection is needed for your workers, but different test results and performance levels can be rather confusing. That's why it is a good idea to ask your partners for test results of protective clothing, for a better understanding of how performance levels are aligned with your work environment.

CREATING PROTECTIVE WORKWEAR THAT IS 'MADE FOR LIFE', THE JOURNEY OF ENGIE

Learn how ENGIE secured workwear that is safe, durable, comfortable and in line with their corporate brand:

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2.2. CLOTHING FOR WELDING AND ALLIED PROCESSES

For many Health and Safety managers, the combination of welding activities and protective clothing is an absolute no-brainer. But are you aware of the differences between class 1 and class 2 of EN ISO 11611? And do you know what the impact is of comfort on safety? In this paragraph, we inform you about protective clothing for the use of welding and allied processes.

Protective clothing for welding: protection and comfort go hand in hand
Protective clothing for welding is designed to protect wearers against molten metal drops, but also protects workers against short contact with flame and radiant heat from an electric arc (plasma) that is used for welding. On top of that, the clothing also minimizes the possibility of electrical shock.

Apart from protection, comfort also plays a highly important role. You will probably recognize that protective clothing that is worn during welding activities is often heavy and uncomfortable.

However, protective clothing for welding that is both safe and comfortable has a truly positive influence on the overall effectiveness and happiness at the workplace. It is advised to take into consideration the weight of the fabric, construction, moisture absorption and the breathability of the suit.

What is EN ISO 11611?
The relevant standard in terms of welding and allied processes, is EN ISO 11611. To meet this standard, you need to past all the 4 tests that simulate the following FR-risks: radiant heat, molten metal drops, flame spread and electrical resistance. However, the EN ISO 11611 standard is divided into two classes.

Boost your knowledge further:

Do you know which situations in practice have an effect on the level of protection? The theory and practice are related and you, as a safety professional, should know about them. Read more about EN ISO 11611:

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Are you aware of which class you need for your specific welding activities? Gas welding, for example, is a class 1 welding activity, while MMA (with basic or cellulose-covered electrode) welding, MAG welding and MIG welding (with high current) are class 2 welding activities.

DAMEN SHIPYARDS GROUP TAKES SAFETY TO A HIGHER LEVEL

Learn how value chain collaboration helped Damen Shipyards to comply with legal frameworks, select protective fabrics with the right price/quality and gain support for health and safety within the organization:

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2.3. ARC FLASH CLOTHING

Professionals who do installation or maintenance work in industries like energy production or network and distribution are often well aware that they are at risk of arc flash. But factories or industrial plants often also contain heavy equipment where electronic switch boxes can cause an arc flash. How do you protect employees in the work environment with the right protective clothing?

What is arc flash clothing and why do you need arc flash protection?
Arc flashes are low impedance connections in an electrical system, which causes unwanted electric discharge via the air. As a result, there is a rapid rise in temperature (up to 19,000 degrees Celsius, which almost four times as hot as the sun) and pressure in the air between electrical conductors. This causes an explosion known as an arc blast. Protective clothing is a crucial part of arc flash protection to prevent arc flashes (the transfer of fire) from causing injuries or life threatening situations. This kind of protective clothing is called arc flash clothing.

What are EN IEC 61482-1-1 and EN IEC 61482-1-2?
There are standards for arc flash clothing, protecting workers against thermal hazards of arc flash. The protection can be tested in two ways:

- The open arc method (IEC 61482-1-1)
- The box test (IEC 61482-1-2)

The open arc method involves three panels that are arranged at an angle of 120 degrees to each other. The test generates, with high voltage, an arc with varying intensity. The outcomes of this test is an ATPV and ELIM value expressed in cal/cm2 that indicates to what blast, measured in cal/cm2, the fabric provides a certain level of protection.

The box test (or arc-in-a-box) is a different test method in which an arc is generated from one direction (the box) by short-circuiting with 4 kA (for class 1: low level of simulated arc exposure) or 7 kA (for class 2: high level of simulated arc exposure).

Often, professionals that are at risk of arc flash work in highly challenging environments. Near traffic, in industrial plants, at high voltage cables, underground... apart from arc flash clothing, chances are that they need protective clothing for other work related hazards as well, such as high visibility clothing.

Boost your knowledge further:

Read more about arc flash clothing and why workers should be protected against arc flash with protective clothing and how to comply with the IEC 61482 standard:

READ THIS BLOG

2.4. LIMITED PERFORMANCE CHEMICAL PROTECTION CLOTHING

If you are active in an industry where your employees work with chemicals, it is extremely important that they are shielded against unexpected (limited) chemical splashes. But how do you determine which protective clothing is appropriate for your unique work environment? And how do you ensure that your protective clothing is not only safe, but also comfortable to wear during a whole shift? In this paragraph, we tell you about protective clothing for chemical splash.

Why do I need protective clothing for chemicals?
Because working with chemicals puts workers at risk of accidental exposure to these chemicals, they are required to wear protective clothing at all times. This clothing should not only shield the body from possible injuries caused by chemical sprays, splashes or liquid aerosols, but should also - regarding the work environment - allow proper flexibility and breathability.. In order for the clothing to be truly protective, it should always be worn in the proper manner no matter the environment, emphasizing the importance of comfort even more.

What is EN 13034?
EN 13034 is the standard for working with chemicals that focuses on limited protection against spray. Protective clothing that complies with the EN 13034 standard offers protection against light spray, liquid aerosols or low volume splashes, against which a complete liquid permeation barrier (at the molecular level) is not required. To comply with the EN 13034 standard for Type 6 protective clothing, a series of tests is conducted on the fabric.

> How do you ensure that your protective clothing is not only safe, but also comfortable to wear during a whole shift?
>
> **Peter van Barneveld**
> Product Manager Industrial Safety at TenCate Protective Fabrics

The meaning of 'limited performance chemical protection clothing'
Terms like 'limited protection' often causes confusion. We are, after all, talking about chemicals! On top of that, Type 6 Protective clothing that complies with the EN 13034 standard is not fully liquid-tight nor does it on the fabric performance after exposure. This might raise some questions as well. It is very important to understand that workers in this industry are being exposed to chemicals by exception (by accident), not by rule! You can look at EN 13034 as an "entry-level" standard for protection against chemical spray, splash or aerosols. But does this type of protective clothing match your unique work environment? A risk assessment makes sure this is assessed properly.

How to maintain the protective properties of the garment
As mentioned before, the Type 6 safety clothing for chemicals is not fully liquid-tight. EN 13034 requires a fluorocarbon finish, allowing it to repel light liquids or aerosols. This example strongly emphasises the importance of a close harmony between all parties involved in the protective clothing value chain.

That is why at TenCate Protective Fabrics, we encourage you to collaborate with fabric suppliers, garment makers and industrial laundries. Together with our partners we are able to develop protective fabrics that are Made for Life.

Boost your knowledge further:

Get inspired by Made for Life and find out how you can activate your role in the protective clothing value chain:

READ THIS BLOG

Learn more about protective clothing for chemicals and how to comply with the EN 13034 standard:

READ THIS BLOG

2.5. ANTI STATIC CLOTHING

You want to provide your workforce with the highest level of safety and comfort possible, no matter the work environment. Industries like chemicals, oil and gas, utilities and transportation (of hazardous substances) are exposed to unique safety risks, of which explosion hazard is just one.

In this page, we explain the importance of protective clothing that is able to prevent electrostatic charging, called anti static clothing.

What is anti static clothing?
Protective clothing that contains electrostatic properties is able to suppress static charge (created by friction or rubbing). Anti static clothing refers to clothing where a carbon fibre is weaved through the fabric. Without it, static discharge can create sparks, which can result in fires or explosions. It is a must for (nearly) all industrial work environments.

Anti static clothing is nearly always worn in explosion-hazard environments. And if there is a risk of explosion, there is also a risk of fire.

What is EN 1149-5 and the ATEX directive?
EN 1149-5 is a anti static clothing standard that sets requirements for the material performance and design requirements of protective clothing with electrostatic properties.

> Anti static clothing is nearly always worn in explosion-hazard environments. And if there is a risk of explosion, there is also a risk of fire."
>
> **Peter van Barneveld**
> Product Manager Industrial Safety at TenCate Protective Fabrics

The scope of the standard does not include footwear or gloves with electrostatic dissipative properties, as they are not part of the garment itself. It is also not applicable for protection against mains voltages. Anti static clothing that complies with the EN 1149-5 standard is often used by companies that have to comply with the ATEX directive 2014/34/EU, which covers equipment and protective systems intended for use in potentially explosive atmospheres.

Boost your knowledge further:

Anti static clothing standards should not be confused with the standard for electrostatic discharge (ESD). Read more about the differences in this blog:

READ THIS BLOG

Read more about anti static clothing and how it helps complying with ISO EN 1149-5:

READ THIS BLOG

2.6. HIGH VISIBILITY CLOTHING

What is high visibility clothing?
High visibility clothing can be defined as 'clothing that is capable of visually signalling the user's presence'. Wearing high visibility clothing is a requirement in a large range of industries where it is crucial to easily notice workers in any light condition: during the day, but also under illumination of headlights in the dark. Think of hazardous work environments with vehicle operation or mechanized equipment, fog/steam, dust/smoke, limited sightlines and more.

Types of reflective clothing material
High visibility workwear typically consists of three types of reflective clothing materials, being fluorescent material, reflective strips and contrast material. Contrast material is darker but is less sensitive to dirt compared to the fluorescent material and reflective bands, which prevents the garment from losing its functionality even when workers are exposed to dust or dirt (which typically builds up around their ankles, knees, sleeves and abdomen).

FR flame resistant and non flame resistant fabrics for high visibility clothing
Depending on the industry you work in, professionals might need protective clothing where the fabric contains FR properties. During your search for protective clothing, bear in mind that work hazards like heat, flames, molten metals, radiant heat and electric arc ask for high visibility clothing with FR properties.

There are multiple other industries, like roadwork or certain activities in construction, where non flame resistant high visibility clothing is sufficient in covering work related risks. A risk assessment should help you discover which possible hazards are present in your work environment, helping you select high visibility clothing that meets all requirements.

What is EN ISO 20471 (class 1, 2 and 3)

EN ISO 20471 is the current standard for high visibility clothing. The standard is designed to make high visibility an indispensable factor in guarding the safety of professionals during work. A garment is allowed to be manufactured in the colors yellow, orange or red. EN ISO 20471 also sets requirements for the specific placement of the fluorescent and reflective materials and for the specific placement of the fluorescent and reflective materials. In addition, the EN ISO 20471 requires the color coordinates and illumination factors to fall between certain limits.

Boost your knowledge further:

Read more about high visibility clothing and how hit helps you keep workers safe while complying with requirements of the EN 20471 standard:

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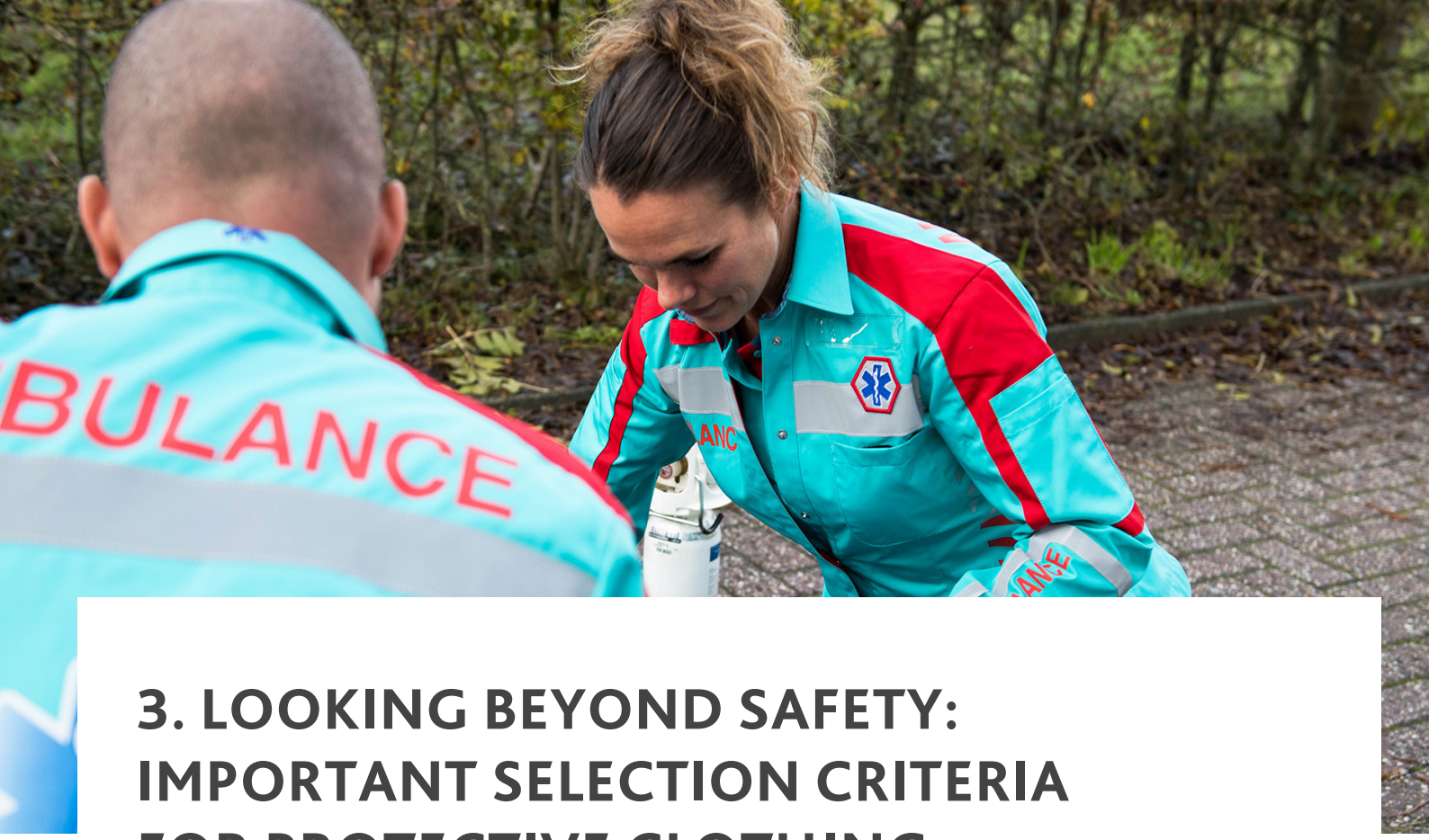

3. LOOKING BEYOND SAFETY: IMPORTANT SELECTION CRITERIA FOR PROTECTIVE CLOTHING

Even when you are able to prioritize the most important safety criteria for your work environment, there are other elements that are worth considering. Comfort was mentioned before as a very important factor, but durability, sustainability and design should also be considered for the best safety culture.

3.1 COMFORT

To contribute to an enjoyable work experience, workwear should hit the right parameters in moisture absorption, flexibility, breathability, weight, and softness on the skin. Protective clothing that is not considered comfortable, might not be worn correctly. Not wearing the garments correctly is just as dangerous as not wearing protective clothing at all. Therefore, comfort has a big impact on safety.

Boost your knowledge further:

Learn why safety and comfort should go hand in hand:

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3.2 DURABILITY

If you want to make sure the garment does not wear down before its intended lifetime, you should take durability into consideration, for example when it comes to washing and repairing. A robust and strong product with good looks not only give you a higher return on investment (ROI), but also makes sure the workers feel protected at all time.

3.3. SUSTAINABILITY

By choosing the right protective clothing, you might have an important impact on the environment. In the process from raw material all the way to the recycled end product, each party in the value chain has environmental responsibilities. So do the end user and your organisation! The first step is to encourage fabric suppliers to look for sustainable fabric solutions.

Boost your knowledge further:

Learn more about sustainability and workwear:

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3.4. DESIGN

In the end, you want to create a garment that matches your corporate identity and employees wear with pride. Garment makers can help you find a protective clothing design that strengthens your brand. Design is an important branding instrument, which should be taken into account when selecting protective clothing.

4. THE WEAR TRIAL

A wear trial is an essential part of the tender process where theory and practice meet. It enables you and your employees to experience the new protective clothing in terms of look and feel. Focusing too much on specs might cause certain red flags from your employees to be ignored, like the aforementioned comfort and design. When garments are over-engineered, it might impact the level of comfort of the fabric.

Therefore, there are different elements to take into account during the wear trial. First, we will sum up from which different angles you, and your employees should ideally look at the new garments.

From a general perspective:

- **Improvement**: are the garments an actual improvement compared to the current protective clothing?
- **Standards**: do these new garments meet the requirements?
- **Design**: does the design represent your company and brand?

From the employees' perspective:

- **Comfort**: is the new protective clothing comfortable to wear?
- **Durability**: are the garments still performing and looking well after several washes?
- **Protection**: do they feel protected by the new protective clothing

> When garments are over-engineered, it might impact the level of comfort of the fabric."

Peter van Barneveld
Product Manager Industrial Safety at TenCate Protective Fabrics

Long story short, look and feel might be on your 'nice to have' list, but our advice is to take comfort just as serious as safety specifications. Not only during the wear trial, but from the very beginning of your new protective clothing journey. This way, you will be able to truly improve and innovate the safety culture of your company.

Boost your knowledge further:

Read more about the importance of a wear trial:

READ THIS BLOG

Read more about PROCLAUD™, a tailor-made protective clothing audit that takes the stress out of your protective clothing decision-making:

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5. IMPLEMENTATION

If your new protective clothing ticks all the boxes regarding safety, comfort and so on, your risk assessment was a success. The order is ready to be finalised and the garment manufacturer can start the production process. For a proper implementation and adaptation of your new protective clothing, we advise you to consider the following:

Review frequently
Assess the risks in your work environment periodically to make sure your protective clothing still meets the requirements. Determine a fixed period for the next assessment, for example once per year. Are new safety measures needed? Is there a product innovation on the market that can help increase safety, comfort or durability of the fabric? Use these reviews to stay up to date on possible innovations, and assess if (and when) your protective clothing should be improved.

Set up a clear washing protocol
Protective clothing that employees wear during work hours gets dirty, and they need to be washed regularly. Some companies wash their protective clothing in an on-premise laundry, others let the workers wash their own garments at home. However, when washings are not executed in a proper manner, it will not only negatively affect the level of protection a garment offers, but the expected lifetime of the garment will also drop drastically.

Boost your knowledge further:

Read this blog and learn how to get the most out of your garments lifetime with a customized washing protocol for your company:

READ THIS BLOG

KEY TAKEAWAYS

1. **Always conduct a risk assessment first.** In order to make the right protective clothing decisions, as a Health & Safety Manager you need to know which protective clothing fits certain work environments. To carefully assess your own work environments and the dangers/hazards your workers can encounter on the job, a risk assessment is a must.

2. **Take safety seriously.** The risk assessment tells you which rules and regulations to comply with, and helps you match your environment with standards for protective clothing to comply with. You will select garments that fit your work environment perfectly.

3. **It's not all about safety.** Even when you are able to prioritize the most important safety criteria for your work environment, there are other elements that are worth considering. Don't forget about comfort, durability, sustainability and design. They are equally important factors when selecting the right protective clothing.

4. **Always conduct a wear trial.** Performing a wear trial allows you to experience the new protective clothing in terms of look and feel. In this phase, you make sure that all factors are all incorporated in the product just right. Now you are ready to improve your safety culture with new protective clothing!

LEARN HOW TO IMPROVE AND INNOVATE YOUR PROTECTIVE CLOTHING AS A PART OF THE VALUE CHAIN

As a safety professional or protective clothing manufacturer, you are always wondering how you can bring your protective clothing to new heights of quality. That is why we encourage you through this Guide to collaborate with fabric suppliers, garment makers and industrial laundries. Together with your partners, you are able to develop protective fabrics that are Made for Life.

Take the next step in your safety culture by talking to one of our protective clothing specialist, who will give you objective and customized advice:

TALK TO OUR SPECIALISTS TODAY