SELECTING APPROPRIATE HAND PROTECTION FOR ELECTRIC DISCHARGE

SAFETY BRIEFING

THE LAWS OF ATTRACTION

Electrostatic is an unwelcome yet ubiquitous feature of many workplaces. The result of contact between two materials — one positively and the other negatively charged — transfer of static charge is all but unavoidable and responsible for a range of reactions from low-level irritation through to catastrophic outcomes.

> **"Minimising the impact of static in the workplace"**

Most people are familiar with minor shocks experienced when touching something metallic like a door handle. The likelihood of this increases in low humidity conditions and when the individual is wearing, walking on or otherwise exposed to conductive materials. Though not necessarily pleasant, minor static shocks are generally benign.

The stakes are higher in environments that incorporate sensitive electronic components or explosion hazards, where electrostatic build up and discharge can cause considerable harm to both workers and sensitive electronic equipment and components.

There are two key spheres in which operations and safety managers aim to mitigate the adverse effects of static in the workplace;

1) electrostatic discharge (ESD) in and around sensitive electronic components and equipment and;
2) prevention of explosion from static discharge in volatile environments or applications, generally referred to as ATEX

ESD is the sudden flow of electricity between two electrically charged objects. It is caused by contact, an electrical short or dielectric breakdown (current flowing through an insulator). It is an issue in workplaces that incorporate sensitive electronic equipment and parts — this includes environments such as cleanrooms used in the production of electronics, nanotechnology and semiconductors. Transfer of electrostatic charge to sensitive components damages the electrical characteristics and can cause equipment malfunction and failure.

Uncontrolled electrical discharge in ATEX zones is even more problematic. ATEX environments feature risk of explosion due to the presence of flammable or otherwise volatile materials. Because ESD often manifests as a spark, it holds potential for extensive harm in these conditions. Applications defined under ATEX call for equipment, footwear and clothing that will not give rise to ESD which could lead to explosion.

ELECTROSTATIC DISCHARGE (ESD)

Static poses significant problems in many or industries or workplaces but is especially detrimental in environments where delicate electronics are found.

ESD damage is facilitated by transfer of electrostatic charge between an ESD-sensitive device and a human body or other ESD-sensitive device. For example, when a person walks on the floor, their body can become charged and that charge is released when they touch a device. Equally, an ESD-sensitive device can become charged while on a conveyor belt or other processing surface and subsequently release this charge when it contacts another device or a human body.

When processing or handling articles like film, circuit boards and components including semiconductors, or working with sensitive electronic instruments, uncontrolled ESD has multiple negative impacts. Transfer of electrostatic charge not only directly damages the electrical characteristics of electronic parts, but can also cause equipment malfunctions and failures, interfering with normal operations.

An electrostatically charged surface also facilitates particle collection through electrostatic attraction (ESA), meaning it attracts and holds on to contaminants which are likely to cause defects in a device's electrical circuitry. ESD can also pose a significant fire risk when workers are required to handle solvents or other flammable materials.

Beyond the immediate effects, failing to adequately control ESD can be expensive, especially in cleanroom environments used in the production of electronics, nanotechnology and semiconductors. Damage to electronics caused by static charge can quickly increase manufacturing costs and lower production yields, potentially decreasing overall profitability.

From a safety and operations perspective, employers will generally utilise personal protective equipment (PPE) designed to minimise any charge transfer between staff and ESD-sensitive equipment or components. In most cases, this will incorporate a hand protection solution. Utilising the correct glove will not only eliminate or minimise static, but also prevent contamination caused by particle attraction to the natural oils from a workers' hands.

Static charge management in cleanroom environments generally incorporates the use of static dissipative materials, which fall somewhere on the spectrum in between insulative and conductive. Gloves designed specifically for use in particle sensitive and low contaminant applications that offer antistatic or ESD prevention qualities will therefore be manufactured from a material that exhibits static dissipative properties. Some generally used gloves (such as single use natural rubber latex alternatives) are not suitable as they are inherently static insulative — they hold on to a charge and release it in an uncontrolled manner, generally leading to damage as outlined above.

Dissipative materials allow electrons to flow over or through the material — but only in a controlled fashion, thanks to its inherent surface or volume resistance. This allows the charge to dissipate or transfer to ground at a slow rate, meaning damage to components or instruments is avoided.

ATEX

Potentially explosive environments are governed by the ATEX Directive, which comprises two European Union directives; one of which focuses on equipment manufacturers and the other on equipment users. ATEX derives its name from the French title of the 94/9/EC directive and is the generally accepted term encompassing requirements for the safe design and use of products utilised in potentially explosive environments.

Solvent or dust concentration in an area may contribute to or create the risk of an explosion. Areas where such risks are present are therefore classified as an 'ATEX zone'. Examples of actions that present explosive risks may include the following;

- Handling over compounding tanks in fine chemistry or pharmaceutical applications
- Sampling from solvent tanks
- Transferring flammable substances from a tanker lorry
- Cleaning with solvents
- Packing, filling hoppers or weighing powders
- Manufacturing explosive products

In an ATEX zone, objects that charge and discharge static electricity may produce a spark and can therefore cause an explosion. Under the directive, any object that enters an ATEX zone must be designed, constructed and utilised in a manner that will not accumulate static electricity. This is referred to as 'static dissipative' or 'conductive' and often incorrectly as 'antistatic'.

Workers in ATEX zones must wear clothing and footwear that ensures they are permanently earthed and therefore not able to discharge static electricity through movement. Both the ATEX and PPE Directives stipulate the use of hand protection solutions designed and constructed so that they will not give rise to electrostatic discharge. This requirement means opting for protective gloves that meet with the EN16350 standard and are designed specifically for ATEX applications, incorporating conductive yarns in the textile liner and conductive fillers in the elastomer compound. General or chemical protective gloves constructed from neoprene or nitrile are not a suitable alternative for this type of application.

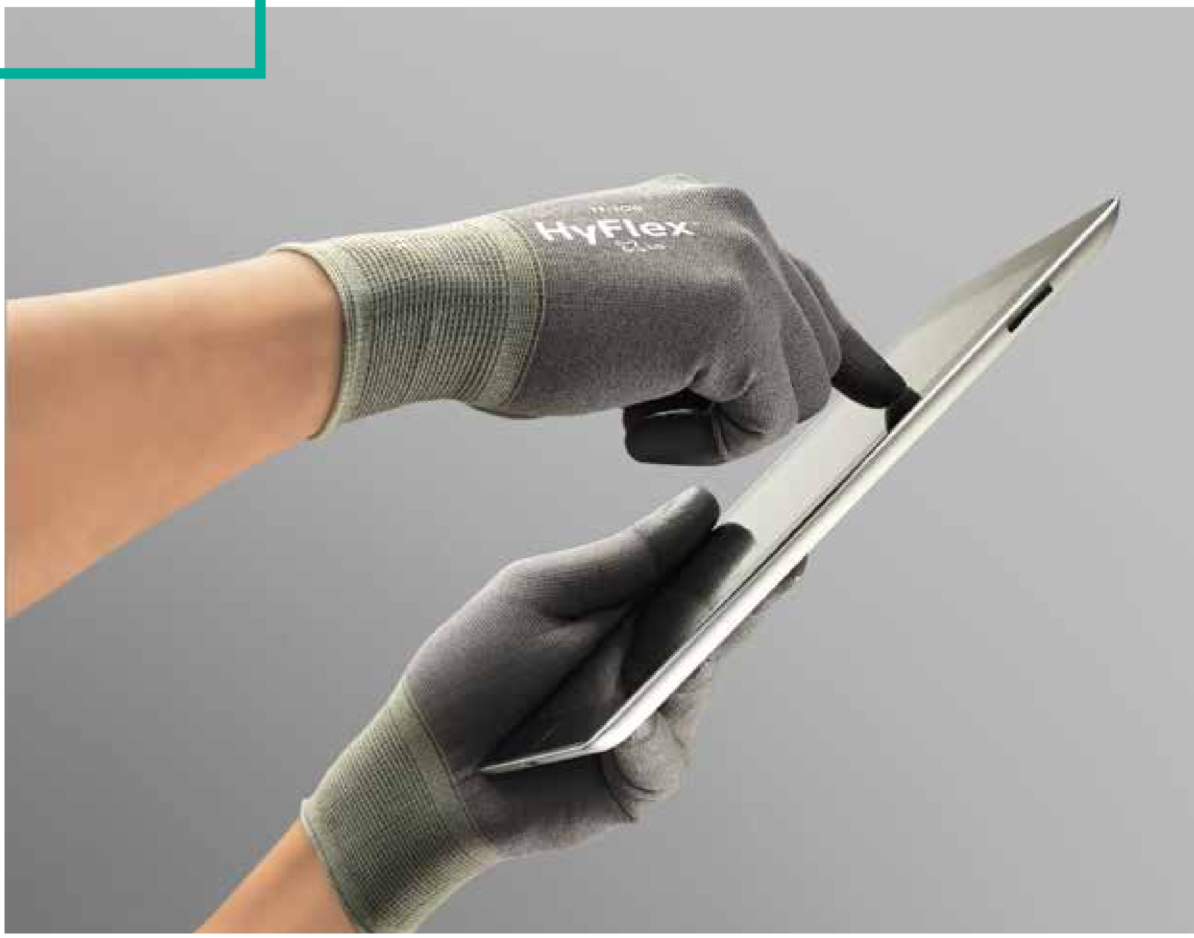
GENERAL CONSIDERATIONS

As with any PPE selection process, there are additional factors that influence identification of the ultimate protective glove choice. These factors may include the presence of secondary hazards, such as risk of cut injury or chemical exposure.

The specific working environment (incorporating present ambient conditions and the typical range of tasks being performed) will proffer additional practical parameters to be considered. The levels of dexterity, flexibility and grip required for workers to perform efficiently and effectively will vary from job to job and therefore make some choices more (or less) suitable.

To overcome the confusion consider using a service like Ansell's Guardian, a personalised assessment that matches glove materials and choices to your specific application and environment, removing the guesswork and ensuring optimum worker safety.

> **"Removing the guesswork and ensuring optimum worker safety"**



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