

How Much Have You Been

The Possible Accumulation of Static Electricity on People

Charged?

Previous articles in Ear To The Ground have focused on the dangers of charge accumulation on isolated metal objects and on plastic containers. Another area for consideration is the often neglected topic of static electricity building up on a person. In everyday life, the accumulation and discharge of static electricity on a person can be a nuisance; we have all experienced static 'shocks' when approaching door handles, filing cabinets and when getting out of cars. In an industrial situation, where a flammable atmosphere may be present, **it could be potentially lethal.**

If a person is isolated from earth, either by wearing shoes with insulating soles or by being on a floor surface with little or no conductivity, then static electricity can accumulate on their body or clothing as they move around. It is surprising to learn that a person can become charged to a level as high as 30,000 volts, and this energy can be discharged in a spark when they come in close contact with an earthed object, or one at a lower electrical potential. Storing this voltage does not cause the person harm, in the same way that coming into contact with a high voltage power line would, because there is no continuous current flowing through the body.

The energy given up in the spark is likely to be of several milli-joules (mJ) and in fact, needs to be at least a few milli-joules in order for the shock to be felt. It is interesting to note, therefore, that most solvent vapours can be ignited with a spark containing less than one milli-joule of energy! Even some dust clouds can be ignited by a static discharge from a person. Hence, it is vital that static charge build-up is prevented on people entering Potentially Explosive Atmospheres. This is most usually achieved by ensuring that, firstly, the floor has a suitable level of conductivity and secondly, that the person is wearing static-dissipative / anti-static footwear.



Internationally recognised standards and reports on static control in flammable areas give upper and lower limits of conductivity for footwear and flooring. The lower limits are there to help with the prevention of electric shock from mains voltage and ensure that there is not TOO much conductivity. The upper limits are set to ensure that there is sufficient conductivity to allow static electricity to dissipate. The European EN345 Standard and U.S.A. Code NFPA77 both quote an upper resistance of 1×10^9 ohms (1000 meg ohm) and the British Standard 5958 and European Cenelec Report R044-001 give an upper resistance of 1×10^8 ohms (100 meg ohm). It is possible to obtain footwear testing devices to ensure that the shoes conform to the limits shown, but it is important to

remember that the tester must have a test range which matches the footwear resistance level chosen by the user.

The above mentioned standards are widely used in the Chemical, Paints & Coatings and Pharmaceutical industries. However many of the footwear testing devices available on the market are designed to work in conjunction with footwear used in the electronics industry. This is made to EN61340-5: Protection of

Electronic Devices

from Electro-Static Phenomena, and has an upper limit of 3.5×10^7 ohms (35 meg ohm). It can be seen that the Electronics industry level and those selected in the other industries mentioned are different. It is therefore very important to understand which type of footwear is being used and to select the appropriate test device, in order to ensure that the footwear and the tester are compatible. The Cenelectrex Sole-Mate Footwear Test Station is available to work with either of the upper levels commonly used in the Chemical, Paints & Coatings and Pharmaceutical industries. It should be noted that, at present, by far the most common type of footwear used by

these industries in Europe and the U.S.A. has an upper limit of 1×10^9 ohms (EN345 or NFPA77).

The standards also mention types of outer garment materials (such as cotton or anti-static coatings), which are best at preventing charge build up. Whilst these garments may be necessary in explosive atmospheres with very low MIEs, in general, it is recognised that the main action to avoid is the removal of garments in the flammable area, as this can lead to a rapid generation and build up of static.



It can be seen that the prevention of the build up of static charge on people is equally important as any other static prevention measures. A clear policy on footwear type to be used and regular testing, to ensure that the footwear of both staff and visitors is correctly specified, is always recommended.

Physiological effects and igniting powers of sparks

Energy discharge (mJ)	Physiological effect	Ignition possibility
0.5	Undetectable	Ignites many vapour / air mixtures
1	Barely detectable	Ignites vapour / air mixtures
5	Detectable	Ignites some dust clouds
10	Prickling sensation	Ignites dust clouds
100	Slight contraction	Ignites many dust clouds
1000	Sharp contraction	Ignites powders