

Choosing the Correct Flooring for hazardous/static-sensitive environments.

Terms such as "anti-static", "static-dissipative" and "conductive" are often used interchangeably to describe materials which have properties designed to reduce or eliminate problems caused by static electricity. No doubt in many cases products are specified according to these terms without any great awareness as to the various mechanisms by which each technique is able to control static electricity. In applications where incorrectly specified techniques are used, this may have serious consequences. In the electronics industry large financial losses may be suffered owing to component damage and product recalls, while in the chemical process sector and related industries, use of unsuitable control materials and equipment can lead to fires and explosions, with devastating results. **One place where it is vital to understand the correct terminology and prevailing technical standards is in the proper selection of flooring and surfaces for work environments that are sensitive to static electricity.**



Floor Prior to Application



Applying a Static Dissipative Floor Coating



Completed Static Dissipative Floor



Testing a Static Dissipative Floor

To begin, it is useful to attempt to define what exactly is meant by the terminology in common use, as this will help determine the most suitable type of flooring for any particular area: (remembering that flooring specifications may be different to traditional electrical terminology)

Anti-Static: The ability to reduce or prevent static charge accumulation on surfaces of (normally insulating) materials.

Static-Dissipative: The ability to dissipate static electricity faster than it accumulates.

Conductive: The ability to conduct static electricity to ground.

Which control technique to use largely depends on the application. For instance in a general office environment, a carpet, tile or coating with anti-static characteristics to reduce triboelectric charging on contact surfaces will normally be sufficient. However in an area where any significant charge accumulation may damage sensitive components or create a spark risk, the emphasis is on dissipating electrostatic before it has a chance to build up to dangerous levels. In practice, this is usually achieved by a combination of static dissipative personnel footwear and flooring, where there is an adequately low resistance path from the person, via footwear and flooring to ground (zero/earth potential). Technical standards and guidelines govern the maximum resistance values for footwear and flooring (see table below). It is normal for these to also incorporate a minimum low level resistance threshold to offer some protection against electric shock hazards for people working in the area, in the event they are exposed to faulty electrical equipment.

Today, there is a wide range of floor materials available for static-sensitive/hazardous environments, ranging from anti-fatigue matting, tile, carpet, poured epoxy, urethane and other preparations. Designers and Architects can select from materials which are appropriate for all types of work areas, including offices, corridors, laboratories, clean-rooms, heavy-use production areas and warehouses. With the range of innovative solutions offered by manufacturers, aesthetics and design flair can easily be incorporated into static-protected areas, and several companies have actually won architectural awards for creating harmonious work environments that are also "static-free". One question which is often asked, especially in the chemical and related process industries, is about the suitability of bare concrete in static-sensitive/hazardous environments. Bare concrete may indeed exhibit characteristics of anti-static, static dissipative and conductive flooring, depending on factors such as moisture and humidity. However, since these are largely dependent on the time of the year, (unless the atmosphere is controlled) concrete cannot be said to be inherently suitable for all static-sensitive environments, unlike made-for-purpose flooring which has static control features designed in. Concrete typically loses its hydration at a rate of 1/4 - to- 1/2 inch per month, so in some cases this is extremely temporary and shouldn't be relied on as a means for effective and reliable static control.

It is also often the case that a highly conductive concrete floor is also damp, dirty and dusty - in short an unhealthy work environment. Finally, it is probably true to say that a bare concrete floor would be unlikely to pass any form or certification or third party audit according to EOS/ESD S7.1-2005, ANSI/ESD S20.20-1999 or any other industry standards, as the performance of the floor will undoubtedly vary as the year progresses.

In selecting the optimum material for the work area, due consideration should be given to on-going maintenance and testing. Some flooring materials will require periodic treatment with special finishes to maintain their static control characteristics, while others may only require routine cleaning with a vacuum or wet mop. It will also be necessary to monitor and verify the effectiveness of the flooring in an on-going program. Simple to operate instruments requiring no special skills or knowledge are available for flooring, to enable the operating organisation to carry out their own in-house test program. Typically, results will be recorded and compared against the required specification and relevant Technical Standards, and similar user-friendly instruments are also available for static-dissipative footwear, such as the Sole-Mate® SD Safety Footwear Test Station.

Flooring selection check list for static sensitive environments

1. Assess the electrostatic risk factors that need to be controlled - (nuisance, component damage, fire and explosion risk)
2. Refer to published technical standards for guidance (including personnel footwear)
3. Consider other requirements for the flooring (appearance, durability, loading, chemical resistance, noise, repairability, ergonomics)
4. Don't forget the need for maintenance and testing
5. Draw up specification and contact specialist vendors

In essence, much of the criteria for specifying and selecting a floor for a static-sensitive work environment are no different to flooring surfaces for regular working areas. However it is always necessary to properly determine the type and level of risk from static to the operation or manufacturing process, and to design in the correct control measures. This requires an understanding of the terminology and technical standards, and building a positive working partnership with a specialist vendor. Newson Gale has a wealth of experience in the subject of static control, particularly in those industries where an uncontrolled static spark may result in a fire or explosion, and can assist in the correct specification of materials for flooring, and other products designed to control electrostatic in sensitive environments.

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Chemical and related process industries

NFPA77:

BS5958 Pt 1 & 2:

CLC/TR 50404:

(Flooring & Footwear combined)

Resistance to ground of between 1×10^6 and 1×10^9 Ohms*

Resistance to ground of $< 1 \times 10^8$ Ohms*

Resistance to ground of between 1×10^5 and 1×10^8 Ohms

Electronics, Semi-Conductor Industry

ANSI/ESD S20.20-1999:

(Flooring & Footwear combined)

Resistance to ground of $< 35 \times 10^6$ Ohms

*Unless very low ignition energies, when resistance to ground of $< 1 \times 10^6$ Ohms is recommended.