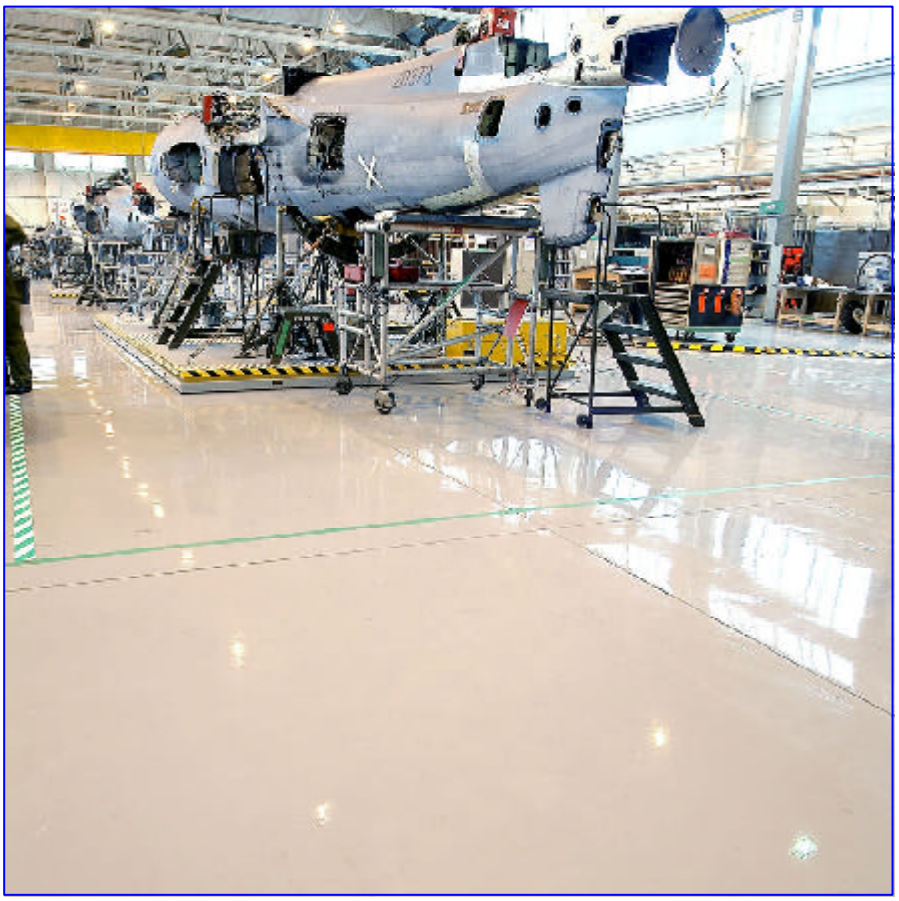
GUIDANCE

The Resin Flooring Association

ANTI-STATIC FLOORING



FeRFA Guidance Note: No. 4

THE NEED FOR ANTI-STATIC FLOORING

We will all be familiar with the effects of the build up of static electricity. Taking off a sweater made from synthetic fibre will often be accompanied with 'crackling' sounds as sparks jump across. On some days we can experience unpleasant shocks from touching car door handles particularly when wearing shoes with synthetic soles. The same effects are responsible for the adhesion of dust on still surfaces. Under normal conditions these effects are, at the most, merely unpleasant but not particularly dangerous. However in the industrial environment such electrostatic build-up can cause sparks of sufficient intensity to ignite vapours of flammable gas, cause dust explosions, or disrupt sensitive electronic equipment.

Concrete floors are normally sufficiently conductive due to their pore water to dissipate any electrostatic charges on the surface. However resin flooring, often used to provide a more hard wearing or chemically resistant surface, is an effective natural insulator and could lead to substantial problems in some circumstances. In such cases an anti-static grade of Resin flooring should be selected: in the most severe cases a flooring that is fully conductive will be necessary. Anti-static grades are generally derived from normal Resin flooring grades by incorporating a small proportion of carbon powder or fibres, but other more sophisticated solutions may be used by the manufacturer.

TYPICAL APPLICATIONS FOR ANTI-STATIC FLOORING

Any industry where dust can present a problem or where stray electric currents are undesirable will have requirements for anti-static floors.

Typical examples are: Electronic assembly, computers, TV tubes, Magnetic tape production, Semi-conductor production of integrated circuits, Micromechanics, Gyroscopes, Miniature bearings, CD or DVD players, Optical lenses, Photographic film, Lasers, Biotechnology, Antibiotic production, Genetic engineering, Pharmaceutical manufacture, Sterile disposables, Medical devices, Heart valves, Cardiac by-pass systems, Food & drink production, Hospitals, Immunodeficiency therapy, Operating theatres, Clean rooms generally.

CAUSE OF ELECTROSTATIC BUILD-UP

All contact between objects, separation of one item from another and each sliding of one thing on another causes a disturbance of electrical charge. When this takes place faster than charge redistribution, static charge accumulates. The discharge of this electrostatic charge can lead to damage of sensitive devices such as integrated circuits and the resultant spark as bodies at different electrostatic potential approach one another can ignite materials such as solvents and dust clouds leading to fire or explosion.

Less obvious consequences of static charge build up on floors are cleaning problems arising where materials adhere to the floor surface, for example, tea leaves. Sick building syndrome has been attributed to static electricity build up in the human body leading to stress and anxiety.

Many people have created problems by having old concrete floors re-furbished with normal resin flooring, not realising that this diminishes the excellent but unpredictable anti-static properties of ground floor concrete.

SELECTION OF FLOORING MATERIAL

Anti-static grades of resin flooring are available in Types 3 to 8 (coatings, self-smoothing and trowel applied screeds). It is important for the specifier to understand that there is a wide range of products and properties available and to select the system that best meets the requirements for the working environment as a whole and to not treat the individual elements in isolation. Colour should be discussed with the flooring manufacturer, as there may be certain colour limitations on anti-static flooring due to the darkening effect of carbon.

STANDARDS

Terms such as conductive and dissipative should be avoided as they mean different things to different people. The exact range of acceptable resistance, test method (including test voltage) and any specific charge decay requirements should be specified by the end user before selection of resin flooring. Where a resistance value

is quoted (in Ohms) it should be specified whether this refers to surface resistance (the resistance measured between two electrodes placed on the surface of a material after a given time of electrification) or resistance to ground (the resistance measured between a single electrode placed on the surface of a material and a groundable point). In this case it should be specified whether 'ground' refers to the protective earth of the power distribution system (resistance to earth) or, for example, the steel frame of a building used as a return path for electric currents and as an arbitrary zero reference point. The test voltage must be specified as the measured resistance will depend upon the applied voltage.

Different industries have varying requirements and standards vary from country to country. Many industries or organisations have their own internal standards for anti-static flooring. Requirements may relate to the anti-static or conductive nature of the flooring material to be used or to the anti-static characteristics of the finished floor.

In the UK the standard frequently specified has been BS 2050, but this merely determined the electrical resistance across the surface (between 25 mm square electrodes placed 50 mm apart)and did not consider either the resistance through the thickness of the flooring onto the concrete base, or the resistance from the surface to ground, both of which are important factors.

Other standards have since come into force that are more comprehensive in their approach. The standard now specified for flooring materials is EN 1081. This uses a tripod electrode with conductive rubber feet and provides procedures for determining surface resistance, through resistance and resistance to ground. However it does not give any guidance as to what levels of conductivity are appropriate in different industrial situations. This is where the designer needs to refer to industry-based specifications.

For the protection of Electrostatic Sensitive Devices BS IEC 61340-5-1 (superseding BS EN 100 015-1) Basic Specifications: Protection is the current standard for the electronics industry in 22 European countries. This gives general requirements for surface resistivity, volume resistivity, resistance to ground and charge decay for flooring. However, requirements may be different for the munitions industry, explosive handling areas, hospitals, solvent stores etc.

There is currently no single British Standard that is universally applicable to all industries and all requirements for anti-static flooring. Therefore, the electrical properties, test method and test agency (contractor, client or third party) should be agreed with the end user and discussed with the product manufacturer at the tendering stage. The Health & Safety Executive may be able to offer advice on specific issues (08701 545500).

APPLICATION OF ANTI-STATIC FLOORING

General

If the programme allows, it is often helpful to lay a trial area of the anti-static flooring, preferably 4 to 10 m^2, at the beginning of the contract. This will enable parties involved to agree on the appearance and testing of the floor before the work progresses too far.

Surface Preparation

It is recommended that abrasive blasting be undertaken to prepare the surface. Cutting of rebates and structural repairs such as making good of cracks, day joints and other defects should be undertaken prior to application of the primer. Where additional earthing is required, care should be taken to ensure that all sections of the floor are linked together i.e. expansion joints bridged with copper tape to provide electrical conductivity and that an earthing point is installed or available in a suitable location. The application of a surface damp proof membrane will render any floor insulative whether on ground floor concrete or not and additional earthing methods should then be employed.

Earthing

Where an anti-static floor is laid directly onto ground floor concrete there is usually enough electrical dissipation to ground so that no additional earthing is required. However, if an anti-static floor is laid on an insulating sub-floor, whilst it would create an anti-static floor surface of equal potential, it is far better to include copper earth strips which are subsequently connected to the building's earth point to provide an anti-

static floor not at equal potential but at ground potential. These strips, most commonly self-adhesive copper foil tapes, are typically applied in a grid pattern of 4 to 8 metres a side or in a herringbone pattern before application of the anti-static primer. In some cases, application around edges or columns only may be required. The electrical continuity of the copper tape network should be verified before application of the primer. Copper tape is also used to bridge gaps such as expansion joints, beam joints, repairs or where any feature breaks up the continuity of the floor.

In some cases an unmodified non-conducting primer is laid first in order to maximise adhesion to the concrete surface. Such a primer will act as an insulating layer and additional steps as outlined above will be needed to ensure adequate earthing.

It is essential that sufficient earthing points are provided and these should be agreed with the building owner's electricians.

Priming

In addition to the usual purpose of improving the bond between sub-floor and resin flooring, in some anti-static systems the primer forms the main conductive layer and is critical to the electrical performance of the floor. As such, the resistance of the primer layer should be verified prior to application of subsequent layers.

Application

The application of anti-static flooring (including earthing and priming) is a specialised process. It is essential that the materials are mixed and applied according to the manufacturer's instructions to the correct thickness onto suitable surfaces and properly tested for continuity and resistance at the various stages.

Testing should always be carried out in conjunction with a qualified electrician to assess the quality of the connection to earth.

In some cases, the film thickness can affect the electrical properties therefore it is important to make suitable allowances for the profile (roughness) of the floor to ensure sufficient material is applied. The application should be made in a continuous process to ensure that continuity is achieved in each area and that electrical bridges are installed between areas. The applicator should provide evidence of the system meeting the specified requirements on completion.

Post Installation

Routine cleaning and wear may alter the electrical properties of flooring. Therefore, routine test methods and frequency of tests should be agreed before completion, as should the agency responsible for these tests. The manufacturer should be contacted for their recommendations regarding cleaning methods, materials, polishes etc. In particular selection of polishes should be done with care as some may act as insulators.

Repair and maintenance of the floor should be carried out in such a way as to preserve the electrical properties. If parts of the floor become worn it needs to be borne in mind that a simple overcoating or patching with a conductive system may not be effective because of the need to ensure electrical continuity between the new and old layers.

FeRFA

FeRFA, the Resin Flooring Association represents resin flooring product manufacturers, specialist contractors and allied trades. Established in 1969, FeRFA now represents over 60 UK based companies. The Association has established Codes of Practice for full members. It takes an active role in promoting resin flooring and in developing both national and international standards.

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