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for the world at your feet

STATIC ELECTRICITY & ANTISTATIC FLOORING EXPLAINED

Test Methods, Flooring Classification & More

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Static electricity can cause many problems if the flooring materials chosen are not appropriate for use in electronic processing areas. These complex problems should be properly determined by an electrical engineer, so that the correct flooring can be specified.

Here, Flowcrete covers the issues to be considered during specification, as well as some of the other requirements for a floor finish in electronic manufacturing and processing environments.

WHAT IS STATIC ELECTRICITY?

Electrical energy is generated by movement and if an object is insulated from earth the electrical charge builds up, this is known as a static charge because it does not flow to earth.

If the charge is large enough, when an earthed object nears the charged object the charge will jump through the air to go to earth, resulting in a spark and if you are the earthing object a static shock.

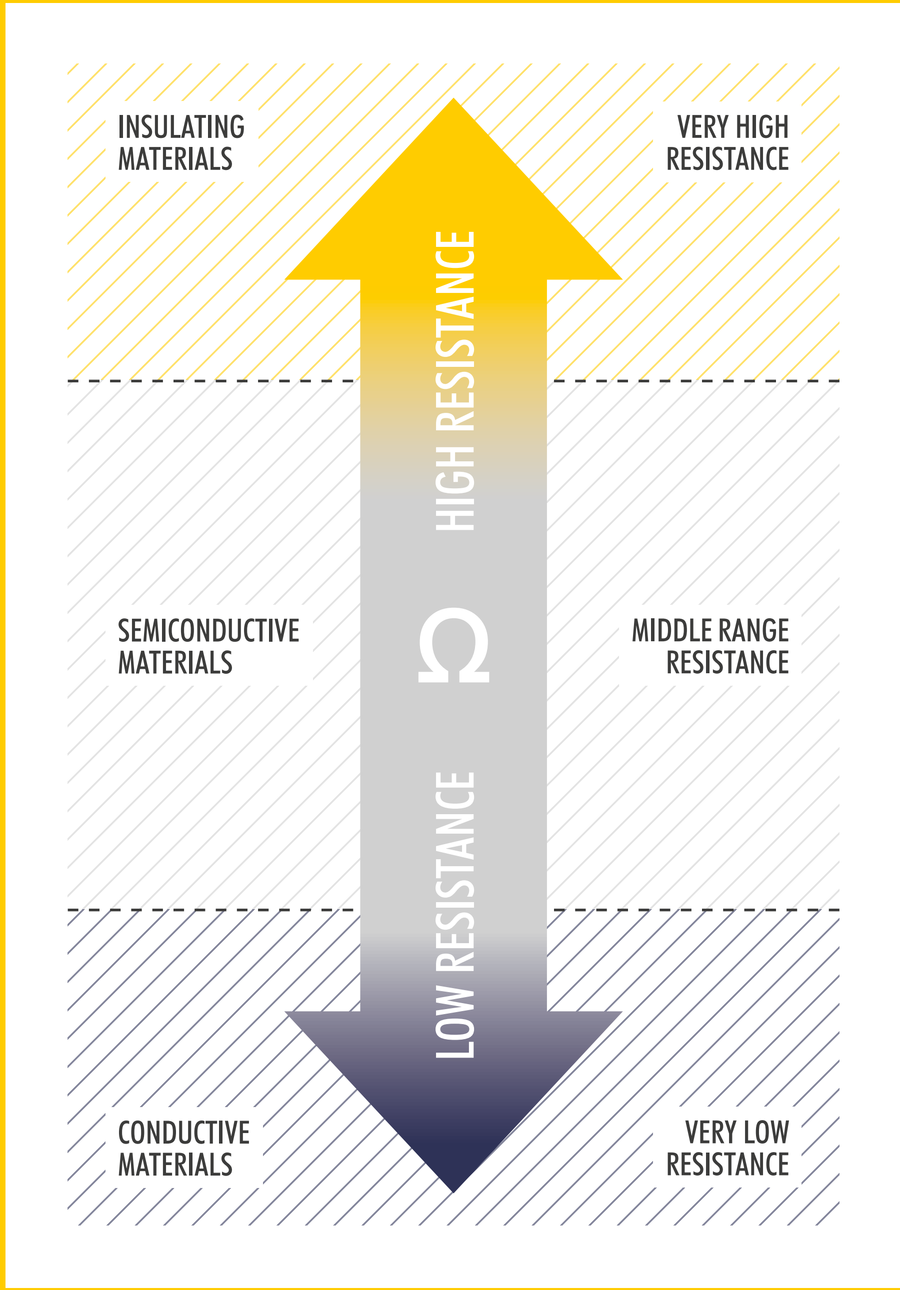
In most cases this is simply an uncomfortable nuisance but if there are explosive atmospheres or sensitive electronic components involved then the consequences can be disastrous.

WHAT IS ELECTRICAL RESISTANCE?

Every material has an electrical resistance and this is measured in ***ohms*** (Ω).

Materials range from **conductive** (with very low resistance) which allow charge to flow to ***insulating*** (which do not allow charge to flow – think of electric cable, the electricity flows through the metal but is kept in the cable by insulating plastic cover).

In between are a whole range of resistances, often called **semiconductors**.

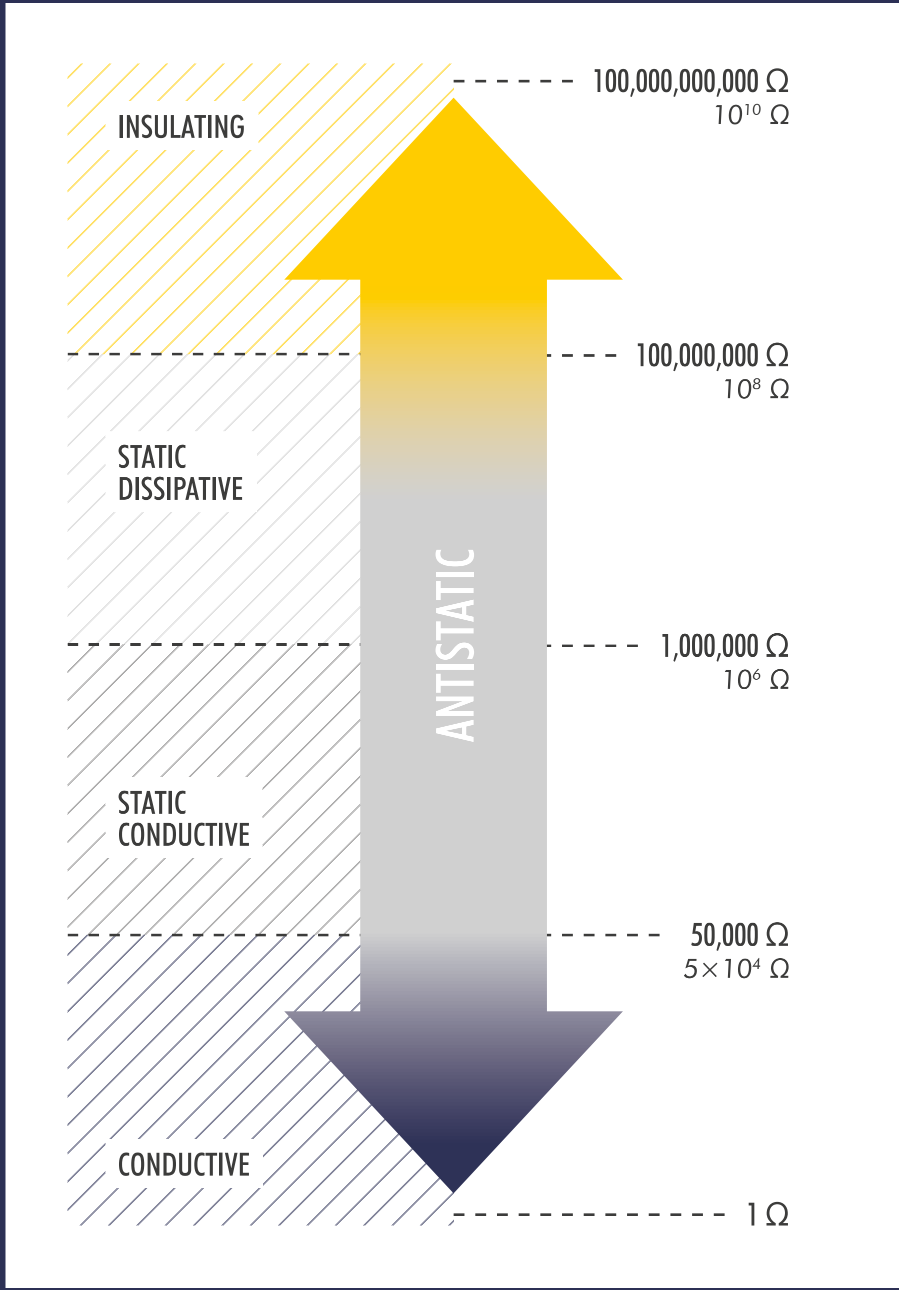


STATIC RESISTANCE: CONDUCTIVE & DISSIPATIVE

In the area between conductors and insulators, sometimes known as antistatic, values have been further subdivided into static conductive and static dissipative.

This can lead to confusion between antistatic, static conductive and static dissipative as well as between conductive and static conductive.

INSULATING	> 100,000,000 Ω (10^8)
STATIC DISSIPATIVE	1,000,000–100,000,000 Ω (10^6–10^8)
STATIC CONDUCTIVE	50,000–1,000,000 Ω (5×10^4–10^6)
CONDUCTIVE	< 50,000 Ω (5×10^4)



WHAT IS NEEDED FOR FLOORING?

In very simple terms the greater the danger from a spark or electrical discharge (shock) the more conductive the floor should be.

However, the lower the resistance of a floor the greater the risk there is of electrocution from a mains supply shock and that this has to be balanced against the risk of a spark or static discharge.

Thus BS2050 called for the ratings outlined in the table here.

FOR EXPLOSIVE AREAS	$< 50{,}000\ \Omega\ (5\times10^{4})$
FOR ANATISTATIC AREAS	$50{,}000\text{–}10{,}000{,}000\ \Omega\ (5\times10^{4}\text{–}10^{8})$
FOR ANAESTHETIC AREAS	$50{,}000\text{–}1{,}000{,}000\ \Omega\ (5\times10^{4}\text{–}10^{6})$

However this is an old standard and as stated above the antistatic area is now subdivided, particularly for electronics areas where there is a risk of mains shock from hand tools, into static conductive and static dissipative in BS EN 100015-1 1992.

TEST METHODS

There are a large number of options available to measure electrical resistance and they can give different results for the same material, therefore it is important to know the details of the test method.

The main difference is the type of test i.e. surface resistance or resistance to earth.

EARTHING REQUIREMENTS

This is simply an electrical connection to allow any charge which is transferred to the floor to escape to earth safely.

Typically one per 200 square meters but the exact requirements should be specified by an electrical engineer as should whether surface resistance or resistance to earth measurements are required.

COPPER GRIDS OR NOT?

Surface resistance simply measures between two points a fixed distance apart, the location can be anywhere on the floor provided the fixed distance between the electrodes is maintained.

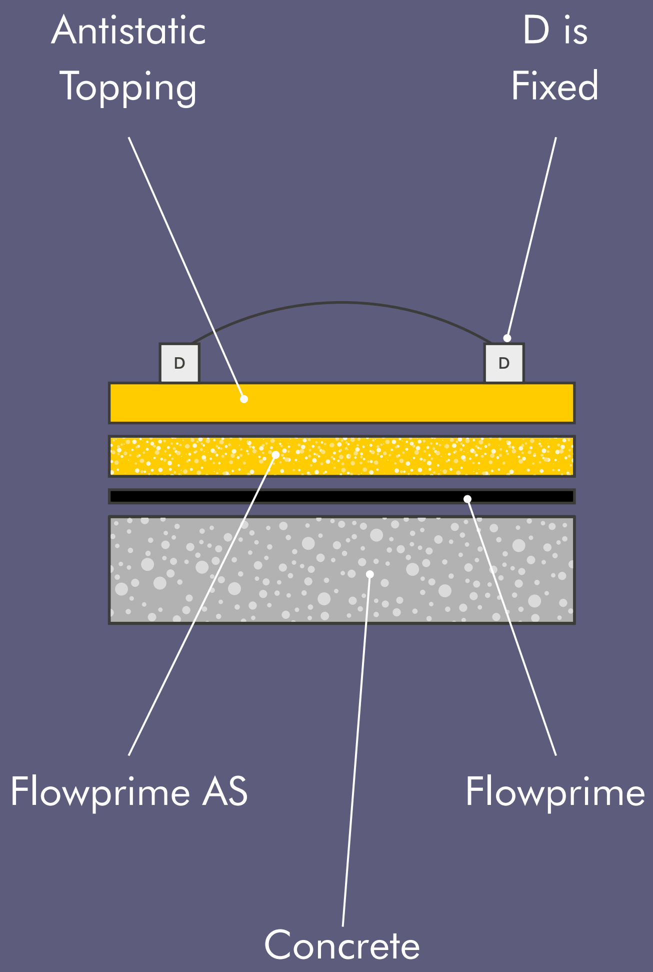
SURFACE RESISTANCE

Resistance to earth measures between a fixed earth point on the floor, the distance from the point of measurement to the earth point has to be specified, if it is not then it should be assumed that it could be at any point on the floor.

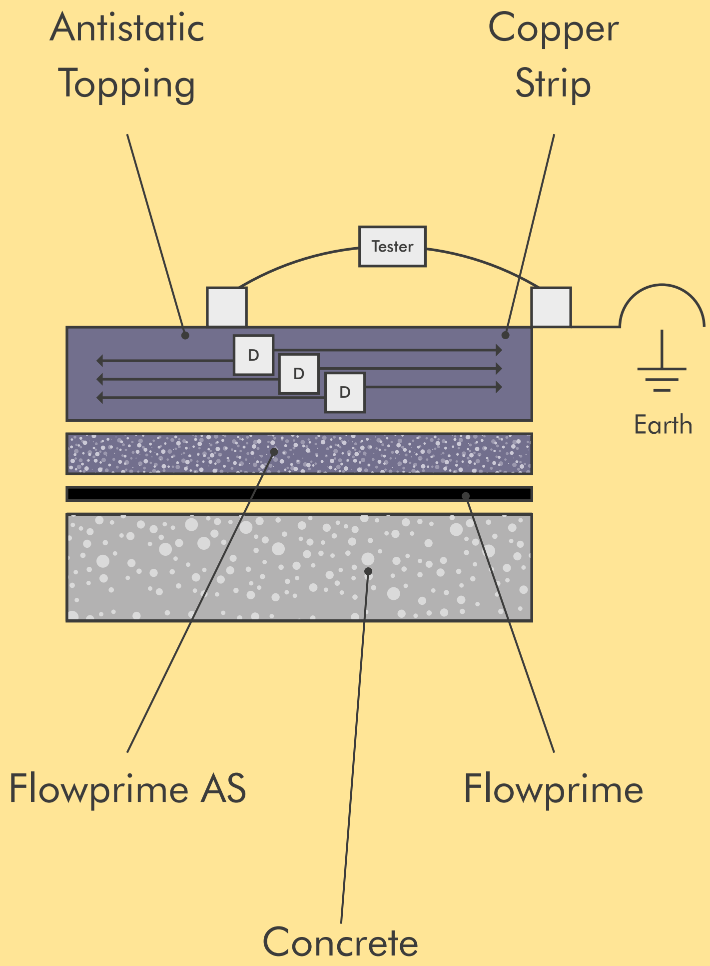
This has a major impact on the need for a copper grid since for materials which are not conductors the measured resistance will increase with increasing distance between the measuring points. Thus the surface resistance will not change across a floor because the electrodes are fixed distance apart; the resistance to earth will increase as the electrode is moved further from the earth point.

To combat this, a conductive grid will be required to increase the size of the earth point and ensure that all parts of the floor are close to the earth point.

SURFACE RESISTANCE



RESISTANCE TO EARTH



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