Section eight

INSTALLATION OF ESD

Static dissipative or electrostatic conductive tile or sheet, in a variety of decorations, the hardwearing ESD ranges facilitate a uniform flow of static electricity directly to a ground point:

- Palettone SD
- Finesse SD
- Polyflor SD
- Finesse EC
- Polyflor EC
- OHMega EC
- Conductive ROF

8.1 OVERVIEW

The Polyflor ESD family of vinyl floor coverings consists of products which are designed to meet specific electro static resistance requirements needed in areas where sensitive electronic components, magnetic media or explosive materials are manufactured; stored or used. EN 14041 specifies procedures for testing to allow for the evaluation of conformity of the products and the requirements for CE marking and labelling, as required by The Construction Products Regulation (EU) No. 305/2011. It also describes the various categories to ensure that the same terminology is used by all parties.

> Antistatic (AS)
These products do not accumulate static charges above 2.0 kV and are classified as 'Antistatic' when tested to EN 1815.

> Static Dissipative (SD)
These products when tested to EN 14041 should record a resistance to earth that shall not exceed 1 x 10^9 ohms.

> Electrostatic Conductive (EC)
These products when tested to the test methods identified in our literature have a resistance to earth of ≤10^6 ohms. (When tested in accordance with EN 1081 at minimum 100v.)

> Polyflor Royal Ordnance Factory (ROF)
These products when tested to the test methods identified in our literature have a resistance to earth between zero and 5 x 10^4 ohms.

8.1.1 Overview of relevant standards & test methods

Worldwide, there are a great many test methods for electrical grade floor coverings and, with rapid developments in the electrical and electronic industries, standards are constantly being reviewed. To ensure that the floor is tested to the latest specification, it is suggested that the architect or specifier obtain a copy of the test method and requirements from the local office of the National Standards Authority. This should then be attached to the specification prior to the ordering of materials and installation of the floor.

In 2017 The IEC harmonised the main ESD Standard IEC 61340-1 with the US: (ANSI 20/20 & ESD s1) and various other International counterparts. This section offers an overview to both the Standards that Polyflor ESD products meet and the test methods used to define those results.

EN 1815 – measured in kV (kilovolt)
This test determines the ability of a floor covering to generate static electricity.

EN 1081 – (R1 – R2) measured in Ω (Ohms)
This Standard determines the electrical resistance of a floor covering through a test sample. The resistance is measured between a Tripod Electrode on the surface and a metal plate electrode placed beneath the

test sample. This test measures how quickly a floor covering discharges electrostatic charge from its surface to its base. Results are calculated using an arithmetic mean.

IEC 61340-5-1
The overarching and probably most important standard in terms of the overall management of ESD controlled areas. This standard lists the various testing methods covering from footwear (IEC 61340-4-3) to packaging. Floor coverings are covered in this Standard under Section IEC 61340-4-1. The documents specific to both foot wear and floor coverings (IEC 61340-4-5) outlines the various resistance test methods that should be employed to meet the requirements of the overarching standard IEC 61340-5-1.

IEC 61340–4-1 (Rtg) Resistance to ground – measured in Ω
This test method can determine the electrical resistance of both installed and non-installed floor coverings. This test measures how quickly a floor covering discharges electrostatic charge to the ground. As this test covers installed floors it can involve taking many measurements. The final value is therefore determined by calculating the geometric mean of the measurements taken.

IEC 61340–4-5 System resistance – measured in volts
This test method measures the electro static protection of footwear and flooring in combination with a person; and is used to evaluate the conductivity of the overall system ("person>footwear>flooring" - Human Body Method) against person-specific discharges.

BS EN 2050 – measured in Ω
This Standard outlines the resistance levels needed when using conducting and antistatic products made from flexible polymeric material

JSP 482 - measured in Ω
Ministry of Defence (MOD) UK specification that determines the level of resistance to earth permissible for installed floor covering in areas manufacturing or storing explosive or highly sensitive military grade electronic material.

8.2 SPECIFYING THE CORRECT PRODUCT

The Polyflor ESD family of products is designed to minimise or eliminate the risk of Electro Static Discharge (ESD) and it is essential that the correct product be selected for the intended application.

An electrical performance specification must be identified at the outset. This will not only stipulate the maximum and minimum electrical resistance requirements of the installed floor, but will also identify the method of test, the electrodes to be used, the method of measurement and the testing environment.

From this information, the correct Polyflor ESD product can be identified, taking into account both the electrical performance and the method of installation. Whenever specifying a Polyflor ESD vinyl floor covering, Polyflor strongly recommends that you discuss your requirements with our Customer Technical Services Department (CTSD). They will advise on which products are best suited for the particular application, and where no specification has been identified, will advise on the specifications used in similar installations and industries.

To assist in selecting the correct product group the table below lists the product groups by their classification together with the relevant standards / test methods and results required (as described in section 8.1.1.). This clearly illustrates if person specific protection against electro static charge – Human Body Method is required, only Electrostatic Conductive (EC) products will meet this criterion.

		Standard Requirements		Test Methods	
CE CLASSIFICATION **EN 14041**		EN 1081 R1-R2 Resistance Test Laboratory Test	EN 1815 Static Charge Generation Test Laboratory Test	IEC 61340-4-1 Rtg Installed Floor Resistance Test In Situ Test	IEC 61340-4-5*** Human Body Chargability Test In Situ Test
Antistatic		N/a	≤ 2.0kV	N/a	N/a
Static Dissipative		≤10^9Ω	≤ 2.0kV	≤1 x 10^9Ω*	N/a
Electrostatic Conductive		≤1.0 x 10^6Ω	≤ 2.0kV	≤1 x 10^9Ω*	<100v**

* When calculated to a geometric mean
** Measured using ESD Footwear tested via IEC 61340-4-3 and meets the requirements listed in IEC 61340-5-1
*** Foot/Floor-combination meets requirements listed in IEC 61340-5-1

8.3 ISOLATION OF SUBFLOOR

KEY POINT
Suspended timber subfloors are not conductive and do not require an isolating barrier.

The electrical conductivity of a solid subfloor can vary greatly, and as a result the installed floor may have resistances lower than the minimum stated in the specification. Cementitious underlayments provide an isolating barrier of known resistance beneath the vinyl floor covering.

> Polyflor recommends that all solid subfloors should be covered with a cementitious underlayment which must be at least 3mm thick.

> The choice of underlayment is dependent upon the end use location, and consideration should be given to such properties as point load resistance and protein content.

> The underlayment should be allowed to dry prior to the application of the floor covering.

NOTE Polyflor accepts no responsibility for non-conformance due to the resistance of the installed floor being below the minimum specified, if an isolating barrier has not been used.

8.4 CONDUCTIVE ADHESIVES

Polyflor recommends the use of a Polyflor approved conductive adhesive for all Static Control floor coverings and a Polyflor approved contact adhesive for the installation of earthing strips. In areas where high rolling loads can be expected Two part Polyflor approved epoxy or polyurethane based conductive adhesives should be selected over acrylic based conductive adhesives. When selecting the conductive adhesive to be used always use products listed on Polyflor's Approved Adhesive List.

NOTE Access plank/tiles vary from manufacturer to manufacturer, both in design, materials used and electrical performance specification. We strongly recommend discussing your individual requirements with your plank/tile supplier or alternatively with Polyflor CTSD.

8.5 CONDUCTANCE TO EARTH

> Installing an earth system is a prerequisite for all ESD floors. This gives the end user the ability to test to earth. It ensures the conductance of the installed floor is to a known earth via a predetermined and controlled path.

> The choice of material used for the earth system can be brass, copper or stainless steel and should be nominally 50mm wide and 0.1mm thick. The width and gauge are governed by the performance standard for products such as Polyflor ROF.

> The use of at least two connections to earth is recommended; if the first is disconnected or damaged, the second is a security back-up.

> Connection of the earth system to the building earth is normally carried out by a qualified electrician and not the flooring contractor.

8.5.1 Polyflor Static Dissipative (SD) range, OHMega EC and Polyflor EC

> The earth strip is laid 150mm from one side of the room, in the same direction as the vinyl sheets are to be laid. This strip is connected to a known earth (Fig 1).

> A second strip is laid at 90° to the first, 150mm from the edge and running full width across the room.

> Further strips are laid at 20 metre intervals as determined by the size of the room.

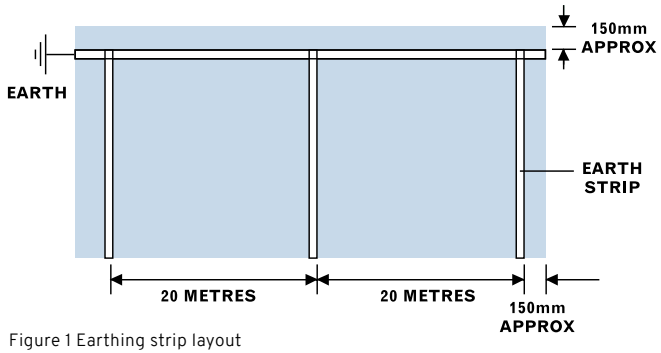

Figure 1 Earthing strip layout

8.5.2 Polyflor Finesse EC range

> The earth strip is laid 150mm from one side of the room, in the same direction as the vinyl sheets are to be laid. This strip is connected to a known earth (Fig 2).

> A second strip is laid at 90° to the first, 150mm from the edge and running full width across the room.

> Further strips are laid at 10 metre intervals as determined by the size of the room.

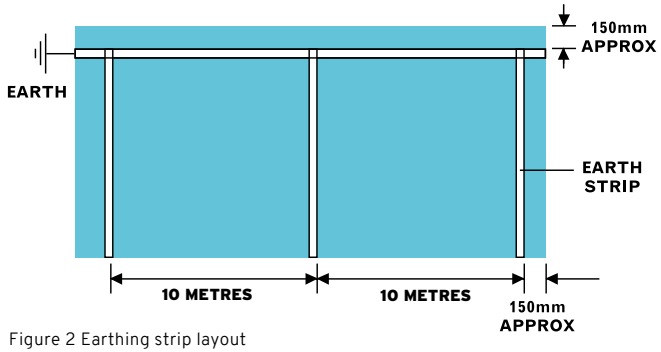

Figure 2 Earthing strip layout

8.5.3 Conductive ROF and Polyflor EC to JSP 482 Standard

> With this type of flooring, a Stainless Steel earth grid using the correct size strip (50mm wide, 0.2mm thick) is preferred.

> The strips should be laid to form 600mm square grid across the floor, the perimeter strips being 150mm from the wall (Fig 1).

> At least 2 Earth points should be connected at suitable locations.

> Confirmation of the layout of the grid with the end user is important as there are variations in the requirements for some military specifications.

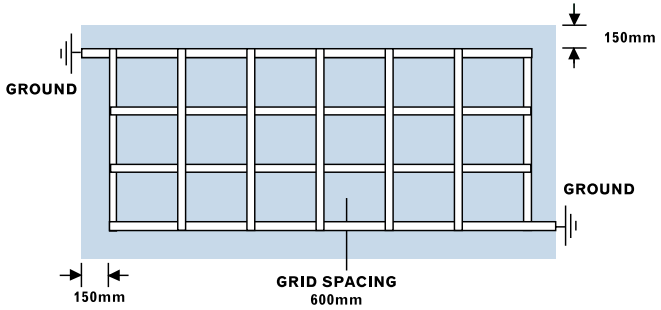

Figure 1 Earth strip layout

8.6 INSTALLATION METHODS

The basic techniques for installation of Polyflor ESD floor coverings are the same as described for standard vinyl sheet and tile in Sections three and four respectively; however there are a number of important differences:

8.6.1 ESD Vinyl Sheet

Polyflor ESD/EC vinyl sheet should be installed by the double drop method. This is because the conductive adhesive contains carbon, which results in low tack. When installing using the double drop method it's important to not put out too much adhesive at any one time; this is especially important for installations carried out in warmer temperatures (>21°C) as conductive adhesives can "flash off" very quickly in warm conditions which can seriously impair the final adhesion of the SD/EC sheet material leading to the installed sheet becoming dimensionally unstable.

> Once the adhesive has been spread, the vinyl sheet is laid into it and pressed all over to ensure an even transfer of adhesive.

> The vinyl sheet is then folded back and left until the adhesive becomes tacky.

POLYFLOR ESD
Conductive welding rod is **not** a requirement with ESD floor coverings.

> When the adhesive is tacky, the vinyl sheet should be accurately re-laid, ensuring it does not twist or trap air bubbles.

> Seams must be without gaps and any excess adhesive should be removed as work proceeds.

> The vinyl sheet is then rolled with a 68kg articulated floor roller in the short direction first, then the long, and the rolling repeated between one and four hours later.

8.6.2 ESD Vinyl Tiles

Polyflor ESD vinyl tiles are installed by the same method as standard vinyl tiles – the single stick method. The grid layout for static control tiles is the same as for sheet vinyl, as described previously.

ESD vinyl tiles must always be heat welded. For further information on heat welding can be found in Section ten.

8.7 SPECIAL PRECAUTIONS

Special precautions must be taken with the following products:

8.7.1 Electrostatic Conductive (EC) Floor coverings

Pipes or metal projections such as metal gullies, door spring plates etc. must be insulated from the EC floor covering and free from conductive adhesive. The following method of installation is recommended:

> Cut the EC floor covering 50mm short of any pipe or metal fixture.

> This infill area should be laid with a suitably coloured standard Polyflor sheet vinyl, adhered with a non-conductive adhesive.

> This infill piece should then be welded to the ESD floor covering with a standard weld rod.

8.7.2 Conductive Floor covering

Polyflor Conductive does not provide protection from a short circuit on a 240/250 volt mains. Where this material is installed, all electrical equipment and switches must be located outside the building. No portable electrical tools should be used inside, unless earth leakage circuit breakers are fitted to the switchgear.

8.8 HEAT WELDING

All Polyflor ESD floor covering installations (excluding access plank/tiles) must be heat welded. Ideally, the floor should be left for a minimum of 24 hours before welding the joints. This will prevent adhesive bubbling up into the seams when heat is applied.

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NOTE The relative humidity and temperature are only critical for Polyflor Static Dissipative floor coverings.

Further information on heat welding can be found in Section ten.

8.9 TEST METHODS

Section 8.1.1. offers an overview of the International Standards and test methods relevant to ESD Floor Coverings with the idea that this will assist in selecting the correct product for the correct application. Where no test method is specified Polyflor recommends and approves the following procedure(s):

8.9.1 Test Conditioning

It is essential to condition the floor prior to testing. The floor should be cleaned at least 24 hours before testing, and then conditioned for 24 hours at 40-60% RH and 20-25°C.

Further information on cleaning can be found in Section fifteen.

8.9.2 Test Procedure (BS 61340-4-1)

The electrical testing of the floor must be carried out using a suitable insulation tester, in accordance with the guidelines stated in both the European Norm the International Electrotechnical Commission (IEC) Testing Method 61340-4-1.

8.9.3 Test Electrodes (BS 61340-4-1)

A compliant electrode consists of a brass cylinder 65mm (2.5 inches) in diameter, weighing 2.27kg. (5lbs). On the underside is attached a round conductive rubber pad – of 5mm thickness and 65mm in diameter – compliant with IEC 61340-4-1.

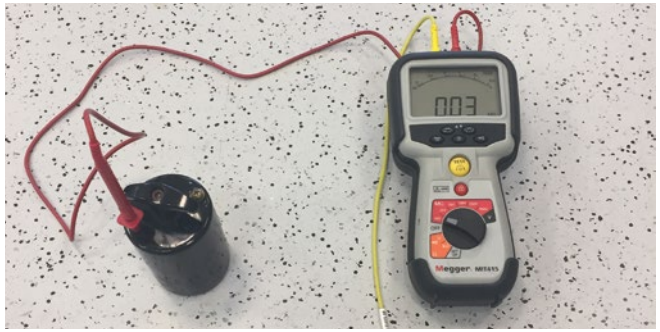

Figure 3 Test electrode with an insulation tester

NOTE The test may not be reliable if made within 24 hours of the flooring being laid or cleaned.

8.9.4 Test Method (BS 61340-4-1)

One electrode should be placed on the floor. The second connection should be made to the earth point, the resistance being measured between the electrode and a known earth. One test should be made for every 2 square metres of flooring.

8.9.5 Testing to a Grid

The procedure of always testing the same points 'on a grid' is not recommended. The whole floor should meet the specification, not just selected points. To ensure continual performance of the whole floor, it should be periodically tested at random points.

8.9.6 Test Results

Polyflor ESD floor coverings are manufactured to specific levels of conductance and are tested, prior to despatch, in laboratory conditions. On-site testing not only takes into account the floor covering, but also the adhesive, the subfloor and the environment.

When installed and tested in accordance with the instructions laid down by Polyflor and detailed in this manual, the electrical resistance should be as follows:

EARTH TEST RESULTS		
	MINIMUM	MAXIMUM
Palettone SD	1×10^6 ohms	1×10^9 ohms
Finesse SD	1×10^6 ohms	1×10^9 ohms
Polyflor SD	1×10^6 ohms	1×10^9 ohms
Finesse EC	10^4 ohms	10^6 ohms
OHMega EC	1×10^6 ohms	1×10^9 ohms*
Polyflor EC	5×10^4 ohms	1×10^6 ohms
Conductive ROF	Zero ohms**	$<5 \times 10^4$ ohms**

* When tested in accordance with IEC 61340-4-1. Calculated on a geometric mean

** When tested in accordance with JSP 482 (MOD).

8.10 STATIC CONTROL SYSTEMS

In many instances, a Polyflor ESD floor covering is sufficient to give the necessary control, but in highly static-sensitive areas, additional precautions may be necessary.

These include:

> Dissipative clothing and footwear

> Wrist and heel straps

> Special work stations

> Dissipative packaging and sealing

> Ionisers and humidity controllers

8.11 SUMMARY OF RESISTANCE CLAIMS BY STANDARD AND PRODUCT

Product:	EN 1815	EN 1081 R1/R2	ESD 7.1	IEC 61340-4-1	IEC 61340-4-5	BS2050	JSP 482
Polyflor SD	≤2.0kV	1.0×10^6 - 1.0×10^9 Ω	1.0×10^6 - 1.0×10^9 Ω	1.0×10^6 - 1.0×10^9 Ω	-	-	-
Finesse SD	≤2.0kV	1.0×10^6 - 1.0×10^9 Ω	1.0×10^6 - 1.0×10^9 Ω	1.0×10^6 - 1.0×10^9 Ω			
Palettone SD	≤2.0kV	1.0×10^6 - 1.0×10^9 Ω	1.0×10^6 - 1.0×10^9 Ω	1.0×10^6 - 1.0×10^9 Ω			
Finesse EC	≤2.0kV	10^4 - 10^6 Ω	-	10^4 - 10^6 Ω	<100v*	-	-
OHMega EC	≤2.0kV	1.0×10^4 - 1.0×10^6 Ω**	≤1.0×10^9 Ω	≤1.0×10^9 Ω	<100v*	-	-
Polyflor EC	≤2.0kV	5.0×10^4 - 1.0×10^6 Ω	5.0×10^4 - 1.0×10^6 Ω	5.0×10^4 - 1.0×10^6 Ω	<100v*	-	-
Conductive ROF†	≤2.0kV	<5.0×10^4 Ω	-	-	-	<5.0×10^4 Ω	<5.0×10^4 Ω

† Conductive ROF flooring for explosive handling areas, no protection from short circuit on a 240/250 volt mains

* Result when tested with conductive shoes, tested according to IEC 61340-4-3 & compliant to the requirements of IEC 61340-5-1

** Tested at 100v

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