ESD: No Problem with Mapei

How conductive floors can solve the problem of Electrostatic Discharges

All the more often on the market, the relationship created between client and supplier implies the expectation of excellent quality from the goods being offered. This is a concept which starts during the design phase, and continues right up to the manufacturing and storage of the product in question.
Especially with electronic products, the "manufacturing" factor is vitally important to obtain a high quality product. Therefore, right from the design phase of the production area, it is important that the presence of machinery, people, the production processes themselves and the components used are all taken into consideration. In particular, all aspects of the environment where the work is actually carried out must be controlled in order to guarantee reliability and quality of the goods manufactured.

The Problems at the Elemaster Building Site
Amongst the various elements which go to make up a working environment, the floor covering materials must also be taken into account. There is a specific norm which unites all these items, and defines how to behave to avoid "invisible" phenomena - that is, electrostatic discharges (ESD) – causing electrical damaging to machinery and the products.
ESD is a very serious problem in the electronics industry, because the integrated circuits are made using insulating materials such as silicon, which may be damaged if subject to high voltages. Manufacturers and users of integrated circuits must take the right measures to avoid this problem. One such measure is the use of suitable (anti-static) materials to avoid the build up of static electricity in the human body and the adoption of anti-static countermeasures to discharge accumulated charges towards the ground.
The analysis and study of solutions to electrostatic discharges have demonstrated how a conductive or static dissipative floor, together with other elements such as tables, people and storage equipment correctly equipped with ESD countermeasures, may absorb these discharges without damaging loose and assembled com-

Photo 1.
Topcem special hydraulic binder was used to make the screed, which allows a residual humidity level of less than 2% to be reached after only a few days curing.
The screed was reinforced with electro-welded mesh to improve distribution of the loads.

Photo 2.
Control joints were made in the layer of Topcem while it was still fresh.

Photo 3.
Before the smoothing operation, Primer G was sprayed on the surface.


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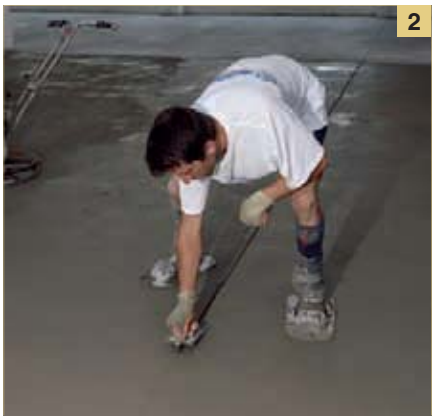
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ponents on electronic circuit boards.
And it is exactly because of the problems mentioned above that the customer Elemaster, a company which produces electronic circuit boards for railways and transport, electro-medical, power control, domestic appliances, UPS and automative sectors, wanted to cover the floors of their new production facilities in Lomagna (in the province of Lecco, in northern Italy) with conductive rubber tiles (norament 928 al grano, by Nora) to achieve the required ESD protection for the plant.

The Answer to the Problem Starts from the Screed

The type of floor designed for the Elemaster plant initially required a cementitious substrate with well defined characteristics: less than 2% residual moisture when laying the floor. Also, considering their resilient characteristic and low thickness, the rubber floors are not able to distribute concentrated loads. To guarantee that the floor is long lasting, therefore, the substrate on which the floor was applied had to have adequate mechanical strengths.

Finally, it was fundamentally important that the substrates had no cracks. Because of the floors' reduced thickness, such cracks would have then been visible on the surface.
Taking into account the above considerations, the technicians from the Mapei Technical Service Department who were contacted to carry out this project, suggested starting off by placing compressible material, such as 1 cm thick polystyrene, around the perimeter of the laying surface and around the pillars which run through it.


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Sheets of polyethylene with a thickness of 4-10 mm were laid on the concrete layer, and folded up against the perimeter walls and the pillars.
The polyethylene sheets, which were overlapped by about 20 cm, were held in place using adhesive tape. To guarantee a more efficient vapour barrier, they recommended using two layers of sheets, with the second layer applied perpendicularly to the first layer. This operation was particularly important, and it was also essential that the sheets were not moved or torn during the successive operations: damage or tears could cause rising damp in the overlying layers, and compromise the durability of the floor.
In order to meet the client's requirement of installing the floor in a short space of time, the technicians proposed the use of TOPCEM* to make the screeds.
TOPCEM* is a special hydraulic binder for normal-setting, rapid-drying, controlled-shrinkage screeds. When mixed with graded aggregates of 0-8 mm, it is possible to make screeds with a residual humidity level of less than 2% after only 4 days of curing.
The screed was reinforced with electro-welded mesh net (mesh size: 5x5 cm, with 2 mm diameter). Apart from offering better load distribution, the mesh also reduces the risk of cracking in correspondence with construction joints and levelling strips.
While the layer of TOPCEM* was still fresh, control joints were made (approximately every 5x5 metres), by cutting the screed to a depth of one third of its thickness. Particular care was taken during this phase to avoid cutting the electro-welded mesh.
The use of TOPCEM* on this particular site helped to considerably reduce the time required to install the floor. Not only, screeds were made only a very short time before laying the floor covering, thus avoiding the screeds being damaged while other essential site activities were being carried out.

Photo 4.
Ultraplan self-levelling smoothing compound was used to perfect the evenness of the surface.

Photo 5.
The equipotential ground contact (grounding) was made using a network of copper strips bonded to the substrate with Adesilex VZ Conductive.

Photo 6.
After completing the conductivity tests, the rubber tiles were then laid using Adesilex G19 Conductive.

Photo 7.
The tiles were "massaged" using a roller from the centre to the edges to improve bonding and to eliminate the air bubbles.

Photo 8.
A view of the floor. Two colours were chosen for the rubber tiles of the floor covering: blue and beige.

Laying the Rubber Floor
To perfect the flatness of the laying surface for the rubber floor, the unevenness on the surface of the screed was eliminated by applying a layer of ULTRAPLAN* ultra-fast hardening, self-levelling smoothing compound for thicknesses from 1 to 10 mm. ULTRAPLAN* was spread on at a thickness of at least 3 mm. Before applying the compound, PRIMER G* synthetic resin-based primer in water dispersion with very low emission of volatile organic compounds, diluted with water at a ratio of 1:1, was sprayed on the surface.
After levelling off the surface, the equipotential ground contacts were made, according to the methods described in current norms and regulations.
The conductive network of copper strips (0.08-0.10 mm thick and 10-25 mm wide) was bonded to the substrate using ADESILEX VZ CONDUCTIVE* polychloroprene contact adhesive.
Once this operation had been completed, the conductivity was tested before laying the rubber floor. Homogenous pressed rubber tiles (tile size: 1002 x 1002 mm, 3.5 mm thick) were chosen as floor covering, as they feature proper electrical conductivity for those areas where good protection against electrostatic discharges was required.
The covering material was chosen in two colours by the client: blue for the paths which connect the production areas and the warehouse, and beige for all the open space areas.
The rubber was laid using ADESILEX G19 CONDUCTIVE*, a two-component epoxy-polyurethane adhesive for conductive floors.
The rubber tiles were applied on the adhesive and carefully "massaged" with a special roller from the centre to the edges, to make sure there was perfect contact between the covering material and the surface of the screed, and to eliminate all the air bubbles. During the laying operation, the structural joints were followed while, as far as the control joints in the screed were concerned, they were sealed beforehand with EPORIP* adhesive in order to create a continuous surface without interruptions.
The entire operation was completed by applying skirtings in a colour which matched that of the floor. They were also bonded using ADESILEX VZ CONDUCTIVE.

***Mapei Products:**
the products referred to in this article belong to the "Products for the Installation of Resilent, Textile and Wood Floor and Wall Coverings" range.
The technical data sheets are available on the "Mapei Global Infonet" DVD or at the web site: www.mapei.com.

Adesilex G19 Conductive: *two-component epoxy-polyurethane adhesive for conductive rubber and PVC floorings.*
Adesilex VZ Conductive: *double coat polychloroprene adhesive for conductive flooring.*
Eporip: *two-component epoxy based adhesive for cold joints and monolithic sealing of cracks in screeds.*
Primer G: *synthetic resin based primer in water dispersion with very low emission of volatile organic compounds (VOC).*
Topcem: *normal-setting, rapid-drying (4 days), special hydraulic binder for screeds.*
Ultraplan: *ultra-fast hardening (12 hours), self-levelling smoothing compound for thicknesses from 1 to 10 mm.*

TECHNICAL DATA

Elemaster, Lomagna (Lecco, Italy)
Work: preparation of screeds and installation of conductive rubber floorings
Year: 2006
Customer: Elefin
Work Management: arch. Ing. Luca Ceppi
Contractor: Emmezeta snc from Gardone Valtrompia (Brescia, Italy) for preparing the screeds
Contractor: Carrara Andrea sas from Cologno al Serio (Bergamo, Italy)
Mapei Co-ordinators: Enrico Geronimi and Angelo Nobili, Mapei SpA