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Installing ESD Flooring Without Adhesives and Downtime

By Dave Long, Founder and President, StaticWorx, Inc.

EMS companies often handle devices that are extremely sensitive to static electricity. If the manufacturer does not have a static-control program in place, it can be tricky to implement one without shutting down the facility for days. Operations managers have to balance the enormous cost of lost productivity against the need to protect new parts and devices.

A major part of any ESD control program is getting the proper flooring in place. Foreign objects and debris (FOD) can affect the reliability of parts and assemblies. How can one replace a floor without generating any debris? What if the subfloor is in such poor condition that it prevents a standard installation? What will make up for the lost time?

Failing Floors Fail Again

AMC, a manufacturer of motion control equipment located in Ventura County, California, had a fire in its building, with extensive smoke and water damage. Repairs included installation of a conductive ESD vinyl tile floor. The timing was fortuitous: their 30-year-old vinyl composition tile (VCT) had curled, pulling loose from the concrete substrate. By replacing the floors in their manufacturing and stockroom areas, they could also change the layout of their SMT operation.

Proper flooring is a necessary part of any ESD control program.

They purchased the ESD vinyl tiles from a distributor and hired local flooring contractors for the installation. Because the old VCT was lifting, it had to be removed. The installer determined the root cause of the flooring failure to be a combination of vapor permeation from moisture below the concrete and chemical residues from the bond breakers used to erect the original concrete walls, part of a process known as tilt-up construction.

The solution was to shot-blast the concrete and install a vapor-resistant topical barrier on its surface. Shot-blasting generates FOD, so the areas had to be cordoned off with plastic sheeting, with positive-pressure air handlers to filter the air.

The installers blasted the concrete, applied a vapor barrier, installed conductive epoxy adhesive over the barrier, and set the tiles in place. The installation looked great. The seams were tight, and the white tile added brightness to the building.

A few months later, however,

the new tiles began to dimple. Lifting them revealed moisture under the floor, confirming that the vapor barrier was not functioning properly. The installation was a failure.

Dissecting the Problem

StaticWorx visited the facility in May 2019. A huge challenge was the underlying condition of AMC's concrete substrate. The building had been constructed before California building code required the placement of a plastic vapor retarder below the concrete.

A plastic vapor retarder helps prevent the permeation of water vapor through the slab. Without a vapor retarder, water vapor migrates through concrete and becomes alkaline. If the floor installed over the concrete cannot breathe, the alkaline vapors degrade the adhesive, and the floor fails. In AMC's case, the problem was exacerbated by the bond breakers spray on their concrete slab.

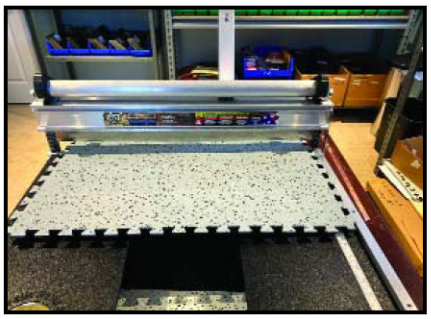
What AMC needed was a free-floating floor that would meet the stringent ESD requirements in ANSI/ESD S20.20 while projecting their facility's best-in-class appearance.

GroundLock Interlocking Tile

GroundLock Extreme interlocking tile met all the requirements. AMC appreciated the ruggedness of the tile, its chemical resistance and visually appealing, low-maintenance surface, which never needs wax.

Because the tiles interlock, GroundLock installations require no adhesive. This adhesive-free installation allowed AMC to maintain full operations throughout the project. Expansion, contraction and doming of tiles, due to minor shifts in subfloor temperature, are the biggest obstacles to a perfect glue-free installation.

With GroundLock, two layers of fiberglass, sandwiched between the top and bottom layers of each tile, ensure dimensional stability. A completely automated manufacturing process — from the moment resins are extracted from rail cars all the way through packaging and palletization — guarantees precision interlocking and consistent tile thickness.



GroundLock tiles can be installed by customers themselves with a bullet cutter, chalk line and dead-blow hammer.

These precision joints enable workers of all skill levels to install GroundLock quickly, despite uneven subfloors, tight spaces or time constraints. The only necessary installation tools are a chalk line, dead-blow hammer and a bullet cutter. Many users install GroundLock tiles themselves, over surfaces ranging from old carpet to raised access panels to failing VCT and epoxy floors.

Once placed, GroundLock tiles can handle any level of traffic, including forklifts and scissor lifts. Heavy SMT lines are easily moved and relocated, and carts and trolleys roll as easily as they would over bare concrete. As GroundLock requires no adhesives, vapor permeation has no effect on the integrity of the installation. The installation crew at AMC installed about 30,000 ft² at a rate of almost 1,000 ft² per installer per day.

Not Just for SMT

This past year, StaticWorx was approached by FW Chase, a company that builds engineered environments and cleanrooms, to provide flooring for Macom, a semiconductor fabricator in Lowell, MA.

Macom wanted to transform its ISO Class-3 wafer fab facility into an ESD-protected environment without shutting down the cleanroom. With the same tools used on the AMC job, the Chase flooring team installed almost 15,000 ft² of flooring directly over the vinyl floor in the existing cleanroom.

Despite the uneven surface of the old floor, there was no visual telegraphing through the GroundLock tiles. Like AMC, Macom put GroundLock through a rigorous evaluation for compliance to ESD standard ANSI/ESD S20.20 as well as evaluating the tile for FOD generation, ruggedness, flatness and appearance.

Because of the tight space constraints in a cleanroom, the Chase installation team had to carefully coordinate the placement of tiles with ongoing cleanroom traffic.

They were also required to adhere to all the same cleanroom protocols as the Macom personnel. The project was a complete success, with Macom deciding to duplicate the installation at another location.

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