Static Control
Flooring Basics

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What Is Static Control Flooring?

- A floor with a level of conductivity that minimizes static charge generation and drains charges to ground from mobile personnel wearing conductive footwear. Static control (ESD) floors may be “conductive” or “static-dissipative.”
What Does ESD Flooring Do?

Minimizes static charge generation and drains static electricity from personnel working in areas where an Electrostatic Discharge (ESD) may cause damage to product or people.
How Does ESD Flooring Work?

- As a person walks on the floor and generates a static charge, the charge is drained to ground through conductive footwear and the floor.
Where Is ESD Flooring Used?

- Electronics manufacturing
- Electronics laboratories
- Electronics repair facilities
- Medical facilities
- Explosion hazard areas:
  - Munitions & fireworks factories
  - Solvent handling areas
Why Is ESD Flooring Used?

- Reduce component / part failure
- Reduce equipment malfunction
- Reduce fire and explosions
- Prevent personnel injury
- Reduce down time
- Improve profits
Types of ESD Flooring

- “No wax” vinyl tile / sheet
- Standard vinyl tile / sheet
- Seamless epoxy
- Carpet
- Rubber
- “Spiked” concrete
- Metal
- Surface treatments (wax)
Resistance Ranges of ESD Flooring
(surface-to-ground)

Conductive: $2.5 \times 10^4$ to $1 \times 10^6$ ohms

Dissipative: $1 \times 10^6$ to $1 \times 10^9$ ohms

Non-ESD: Greater than $1 \times 10^9$ ohms
How to Select the Correct Resistance Range

- Company preference
- In electronics manufacturing, the trend (greater than 90%) is conductive
- Hospitals use conductive per NFPA 99
- Explosion and fire hazard areas require conductive per NFPA 77 & DOD Specs.
How to Select the Correct Product for the Application

- What will the installation conditions be?
- What type of traffic will the floor see?
- What type of product will be manufactured in the facility?
- What is the desired useful life of the floor?
- Are aesthetics important?
- Is this a cleanroom application?
Product Features
“No Wax” Tile

- Available in “conductive” and “dissipative” ranges
- Installed with conductive adhesive
- Uniform size - easy installation
- No wax needed to maintain ESD properties
- Easy to repair
- Low maintenance cost
- Good durability
ESD Tiles Requiring Wax

- Lower initial cost
- ESD polish or wax required for high tech appearance, electrical performance, or both
- High maintenance cost
ESD Wax on VCT
(Vinyl Composition Tile)

- Lowest initial cost
- Temporary solution
- Static-dissipative only
- High maintenance cost
- Effectiveness is application dependent
Epoxy Flooring

- Available in “conductive” or “dissipative” resistance range
- Seamless / self-leveling
- Excellent durability
- Ideal for heavy forklift traffic
- Chemical-resistant
- Abrasion-resistant
- Low maintenance cost
Carpet

- Slight noise reduction
- Sold as tiles or broadloom
- Limited ESD conductivity range
- Not typically used for heavy production traffic
- Easy to repair
- Softer walking surface
- Moderate maintenance cost
Rubber Flooring

- Higher initial cost
- Matte finish
- Moderate maintenance cost
- Good durability
Important Subfloor Preparation Considerations
Moisture in the Subfloor

Excessive moisture in the concrete subfloor can result in adhesion problems and/or surface defects (blistering, cracking or delamination) in any flooring material.
The Moisture Vapor Transmission Rate through the subfloor must be less than 3 pounds per 1,000 square feet per 24 hours (per ASTM F-1869)

The calcium chloride test is the industry standard and a reliable method of measurement
Standard Moisture Test Kit
MVTR Measurement

- Weight gain of calcium chloride is measured and MVTR is calculated
Subfloor Surface Texture

- Proper texture is important to attain the best adhesion of the flooring to the substrate
- Surface texture should resemble 100 grit sandpaper
Typical Shotblasted Concrete
Subfloor Smoothness

- Defects in the subfloor will “telegraph” through finished flooring and become visual defects in the finished floor...
Subfloor Smoothness

…therefore, it is important to:

• Remove protrusions
• Fill and level depressions with a polymer-modified cementitious underlayment
Subfloor Flatness / Levelness

- Subfloor must be flat and level. Uneven surfaces may cause:
  - Alignment problems with tile
  - Thin spots with polymeric coatings
Tile Installation

Install ground strip

Mix conductive adhesive
Tile Installation

Apply adhesive

Install tile
Tile Installation

Roll to ensure good adhesion

Verify resistance to ground with megohmmeter
Cure Time - Tile

- Ideal cure temperature - 70° to 75° F
- Wait 24 hours after installation before allowing foot traffic
- Wait 48 hours before moving equipment onto the floor
- Whenever possible, protect the new tile floor when moving heavy equipment
Grounding Detail

- Use a jumper wire to connect the ground strip to electrical ground
  - Secure the ring terminal to the copper foil tape
  - A licensed electrician should attach the other end of the jumper wire to electrical ground
“Seamless” Installation

- Seamwelding is a technique used to fuse the seams of larger tiles (24” or 36”) to achieve a “seamless” appearance.
Seamwelding

- Cut a “v” groove in seams to be welded and vacuum up dust
Seamwelding

- Heat weld with vinyl welding bead

- Trim excess bead
“No Wax” ESD Tile Floor
ESD Epoxy Installation

Prepare subfloor

Apply insulative primer layer (squeegee and roller)
ESD Epoxy Installation

- Locate and install grounding strips (1 per 1,000 sq. ft)

  Apply conductive groundplane layer (squeegee and roller)
ESD Epoxy Installation

Apply ESD top coat

Trowel on

Backroll
Cure Time - Epoxy

- For primer and conductive groundplane layers, cure time is 12 to 18 hours at 70°F (approximate time between coats)
- Wait 24 hours after application of the topcoat before allowing foot traffic
- Wait 48 hours after last coat application before equipment installation
ESD Epoxy Floor
Maintenance

• Proper maintenance is important for all ESD Floors
  – Dirty floors do not look good
  – Dirty floors may not work electrically
  – Abrasion from dirt will cause floors to wear prematurely
  – Inadequate or improper maintenance may void manufacturer’s warranty
Use Entrance Matting to Reduce the Amount of Dirt Tracked into Area
Total “Life Cost” Considerations for an ESD Floor

In addition to the initial installed cost, maintenance costs must be considered when calculating the true cost of ownership of an ESD floor. Proper maintenance is critical to the floor’s performance and can represent significant cost over the life of the floor.
ESD Floor Maintenance Costs

- Epoxy - $
- “No wax” tile - $$
- Rubber tile - $$
- Carpet - $$$
- ESD tile with wax - $$$$$
- ESD wax on VCT - $$$$$