

ESD association technical report

Survey of Worksurfaces and Grounding Mechanisms

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Survey of Static Control Worksurfaces and Grounding Mechanisms

Static control worksurfaces play a critical role in the design and implementation of an ESD protective work place. A static control worksurface provides a path to ground for charge from conductive or static dissipative items placed on the worksurface. [Electrically insulative items will not allow all of their charge to transfer to ground]. This document will provide guidance for understanding the attributes of worksurface materials and their grounding mechanisms.

Worksurface Types

There are a variety of worksurfaces commonly used for static control purposes. The selection of a particular type of worksurface for an application is affected by many factors, including work activities, permanency of the work area, thermal stability, safety, maintenance, physical, chemical resistance, and electrical properties.

Mats

One type of worksurface is generally referred to as a mat. Mats are semi-permanent structures that are placed on a support surface. There are a variety of mats. The properties of each mat type helps determine its suitability for specific applications.

Mat properties are derived from the material used to make the mat. Vinyl is the plastic most widely used to make mats, though polyethylene and polypropylene are also used. The material is easy to render static dissipative, takes color well and remains pliable. In addition to the properties of vinyl mats, rubber mats provide high resistance to heat and chemicals. Both are easy to cut to shape. Laminate mats (melamine formaldehyde resin) are hard, abrasion resistant, rigid, and have a smooth surface that allows heavy assemblies to be moved freely.

Additional mat properties are:

- Color – Mats made of light colors make finding small parts easier but show dirt faster.
- Surface texture, (embossed or smooth) - influence cleanability of the mat.
- Beveled edge / thickness of the mat– an ergonomics consideration.
- Form – pre-made sizes, sheets or rolls for larger and custom size applications.
- Hardness / durometer / density – important properties used to determine cushioning ability for impact protection or positionability of heavy parts.

Mats are constructed from either a homogeneous sheet or from multiple layers of materials.

- Homogeneous (vinyl, other plastics and rubber) mats consist of the same material throughout. These mats usually provide good mechanical service. Resistance, top surface to ground, (R_{TG}) and Resistance, top surface to top surface, (R_{TT}) increase with the distance between the test points. R_{TG} for conductive mats are typically 10^2 to 10^6 ohms and for dissipative mats are typically 10^8 to 10^{10} ohms. See figure 1-1.

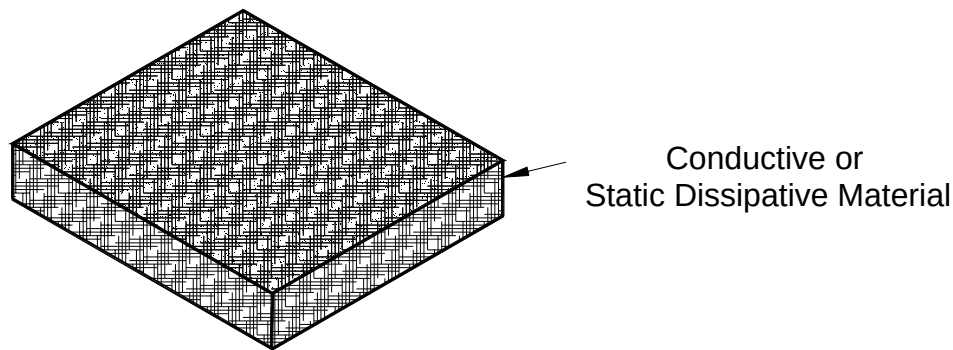


Figure 1-1 Homogeneous Mat

- Three layer mats typically consist of a top layer of static dissipative rubber or vinyl, a conductive middle layer called a scrim (usually metallic or carbon material), and a bottom layer of vinyl or rubber. Many vinyl mats employ a foamed bottom layer to provide cushioning properties. The conductive scrim / middle layer reduces the R_{TG} to 10^4 to 10^8 ohms by acting as a low resistance path to move charge to the groundable point. These mats typically have very uniform resistance to ground readings from any point on the surface. See figure 1-2.

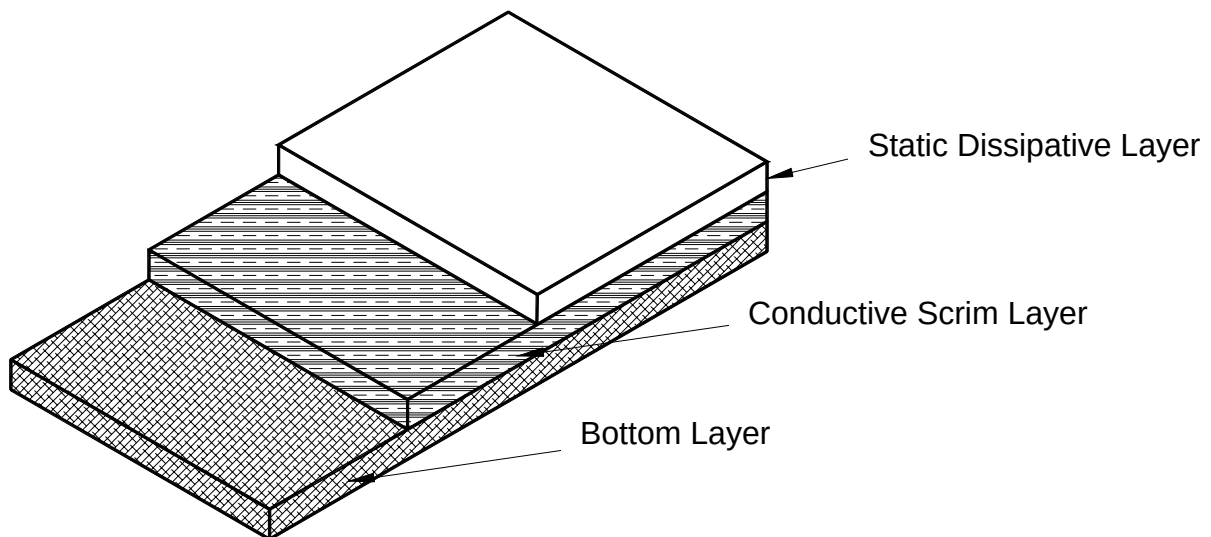


Figure 1-2 Three-Layer Mat

- Two layer mats typically consist of a top layer of static dissipative rubber and a bottom layer of conductive rubber. The bottom layer provides the same function as a scrim layer in the three-layer mat. Rubber mats provide good resistance to heat, abrasion, and chemicals. R_{TG} is typically 10^4 to 10^8 ohms. See figure 1-3.