staticworx™
grounded solutions

**Staticworx.com**
(617) 923-2000

## Managing Static, The Invisible Threat To Call Centers

by David H. Long

**RANDOM STATIC DISCHARGE WILL WREAK HAVOC INSIDE YOUR CALL CENTER— LOST OR CORRUPTED DATA, DROPPED CALLS, PC LOCKUP AND BLOWN HEADSETS.**

# MANAGING STATIC:

## The Invisible Threat to Call Centers

ESD Carpet installed in a call center environment.

Designers of mission critical spaces such as 911 call centers, mission control command centers and flight control towers routinely design their spaces to withstand external threats—weather, power outages, earthquakes and, in some cases, even biological threats. While clearly all of these external threats must be addressed, an invisible threat, inside the call center, is sometimes overlooked. Electrostatic discharge (ESD) can wreak havoc inside the mission-critical command center. Dropped calls, blown headsets, PC lockup and lost or corrupted data represent just a few of the problems caused by random static discharge.

Microcircuits inside electronic equipment perceive a static discharge as an overwhelming burst of energy. Older, more rugged components, though still prone to ESD failure, contained special microcircuit gate protectors, capable of diverting the random charge away from the heart of the device. These interior shields, while protecting the circuitry, slowed the performance of the devices. Today, many designers of the new breed of electronics have done away with these cumbersome internal protection devices. This progress in design translates into a world of faster, more capable computers and telephony equipment. Without the internal shields, however, devices are far more susceptible to the invisible threat of static electricity, a phenomenon even more ubiquitous than the common cold.

Most people, having experienced the nuisance of static cling or felt the zap of a shock, assume that static is something that can be seen and felt. Yet it takes 3500 Volts of static electricity for human beings to perceive the effects of a static discharge. To put that number in perspective, sensitive electronic components can be damaged or destroyed by a discharge of under 25 Volts. Random static discharge and field effects caused by such common events as sliding a chair, rising from a seated position or walking across a floor can wreak havoc on computers and sophisticated telephone systems. Last year, Palm Source, Inc., the manufacturer of the Palm Pilot, was engaged in a class action suit after low levels of static inside its PDA caused lost and corrupted data during transmission to PCs.

## Defining Antistatic

In almost all cases, the floor is the primary site of ESD generation. Fortunately, it is also the easiest place to mitigate the problem. At one time, conductive vinyl was the only choice for a static control flooring material. Today, almost every conceivable floor covering can be manufactured with some sort of static protective properties. Products ranging from ergonomically-friendly conductive carpets to super hard, carbon-filled epoxies are used everywhere, from networked office spaces to circuit manufacturing facilities that require maximum static protection along with a tough, durable surface.

Resilient materials such as rubber and vinyl are also available in static-free versions.

Selecting the right static control floor can be confusing, particularly when people toss around terms such as static dissipative or conductive—words that are unfamiliar and often meaningless to architects and facilities managers. Most flooring materials currently on the market claim to have some antistatic properties. Almost every carpet product produced in the U.S. contains some form of antistatic ingredient, with companies often advertising their products as computer-grade or 3kV.

For the call center facilities manager, these terms may be misleading. As with any industry, the static control field has its own technical jargon. In fact, relative to the selection of flooring, the word antistatic is too broad to be useful. By antistatic, people usually mean that the floor will reduce the generation of static between footwear and the floor. But which footwear? What type of floor?

Some shoe soles produce low levels of static when they rub against certain flooring materials and high levels of static when they interact with others. When the resultant charge measures in the low range, we call the condition antistatic. When the charge is high, we call the condition static-generating. The important distinction is that antistatic is a snap shot condition that will easily change if any parameter—from humidity to surface hardness to footwear composition— is altered.

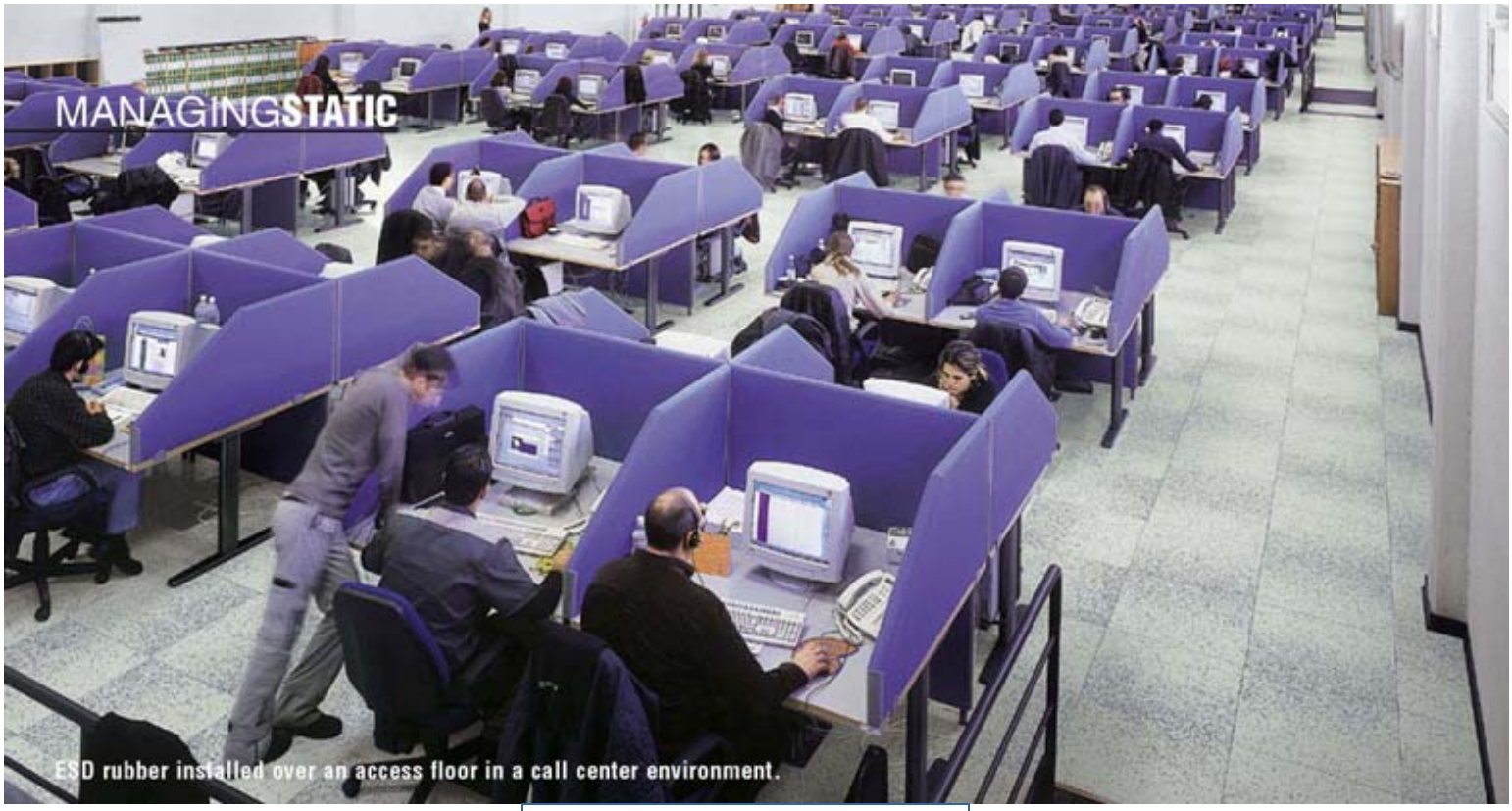
As for computer-grade, the term means only that the floor will suppress static charges to a level of 3.5 kilovolts—so you won't feel a discharge. As we know, call centers and other mission-critical command centers house some of the most sophisticated electronics and telephony equipment available today. What good is a computergrade flooring product that will reduce static charges to under 3.5 kV when sensitive equipment can be destroyed by a static charge of less than 1/100 of that? And how will an antistatic or computergrade floor tested in the summer at 50 percent humidity fare in dry winter conditions when the RH drops to 10 percent? The keys are finding a product that requires no special sprays or coatings, provides a low static rating at all humidity levels and one that also provides a verifiable path to ground.

## Two objectives – One solution

To ensure electrical performance, the static control floor must meet two basic objectives:

1) The floor must not contribute to static generation;
2) It must be groundable after it is installed.

Many static control floors are capable of meeting one of these objectives, but not the other. A computer-grade carpet, for example, might marginally address the first objective, but it cannot be grounded. An ungrounded floor can allow a person to remain charged just as an electrical capacitor stores energy. And because electricity is always looking for the path of least resistance, as soon as the charged person makes contact with equipment or some other item in the room – unwanted rapid discharge will take place.



ESD rubber installed over an access floor in a call center environment.

What is to be gained from a floor that prevents shocks if it cannot be grounded, so will not reduce charges below the threshold of damage to the mission critical equipment it was intended to protect? That type of floor could provide false security and contribute to the very problem it is supposed to eliminate.

Similarly, certain excellent conductors— conductive vinyl, for instance—are comprised primarily of ordinary staticgenerating materials (standard VCT) with a small distribution of carbon or graphite chips or veins to provide conductivity.

Although the embedded conductors do make the floor groundable, the regular VCT in the floor is highly static generating. When shoe soles contact and separate from the VCT, static builds. To prevent static buildup, everyone who walks on the floor must wear special conductive shoes or conductive heel straps, a requirement that would be difficult if not impossible to enforce in a call center: Can you imagine the local sheriff putting on heel grounders every time she touches her computer?

## Static Control Carpet

Intuitively, it makes sense that conductive carpet would be less effective than conductive vinyl in preventing static buildup, but in fact the opposite is usually true. Conductive carpet tiles contain thousands of grounded conductive fibers that sweep off static from shoes, safely discharging the static to ground, similar to the way small brushes eliminate static on high speed copiers as the paper is fed into the collator.

With so many options, choosing the right static control floor can be a challenge for architects, designers and facilities managers. The most important criteria to remember are these:

1. The floor must be compatible with the environment.
2. The material should require a minimal amount of maintenance.
3. The floor must meet the electrostatic requirements of the facility.

This does not mean that conductive vinyl is an inferior product. It simply means that conductive vinyl works best in applications—such as electronic manufacturing and assembly— where footwear and traffic are monitored and controlled.

Conductive carpet resembles standard carpet except for the addition of special carbon fibers that are woven throughout the surface and backing. (See figure 1, page 4). When a person walks on the carpet, the conductive fibers extract excess static build-up from the shoe sole—before it damages components—and safely discharge the static through the conductive backing.

The charge is then routed through a conductive release adhesive that secures all of the tiles in place. The release adhesive—also known as pressure-sensitive adhesive— contains millions of conductive fibers. These fibers create a conductive network below all of the tiles in the installation. The adhesive is connected to ground along the edges of the room through eighteen-inch copper strips (one ground strip per one thousand square feet) that bridge the gap between the perimeter floor tiles and electrical conduit. When properly installed, every single floor tile is at the exact same electrical potential as all of the others. This condition is called electrical continuity. This procedure may sound technically challenging but in actuality requires no more skill than a standard carpet tile installation. The key to success is doing the homework up front and specifying carpet tile products manufactured with conductive fibers in conjunction with conductive adhesive and grounding strips.

# STATIC CONTROL FLOORING CHECKLIST

1. Only conductive floors can be grounded. Standard flooring installed with ground strips or conductive adhesive will not offer any static protection.

2. Any effective conductive floor can be verified with an ohm meter to determine the electrical resistance of the material. If the material does not pass the ohm meter test than it cannot be grounded.

3. Conductive floors should never require any antistatic sprays or waxes to enhance or maintain performance. The conductivity should be achieved by the actual permanent physical composition of the material.

4. The floor should reduce static electricity regardless of relative humidity. Ask the supplier specifically about performance in very dry conditions.

5. The floor must prevent static buildup in real world conditions without special conductive shoes or shoe straps. When in doubt, ask for independent test data verifying this property. It should be available.

6. Never assume that a shock-free environment means a static-free environment. A shock-free environment only means that static charges are below 3500 Volts.

7.Do the homework up front. It is much more costly to remove an ineffective floor and replace it than it is to do it right the first time. Any mission-critical space is only as secure as its Achilles' heel.

8. Even if your present electronics are immune to static, if at some point in the future they will be upgraded or replaced with state-of- the-art equipment, then static will be a problem. As with any potential security breach, it is always best to plan ahead.

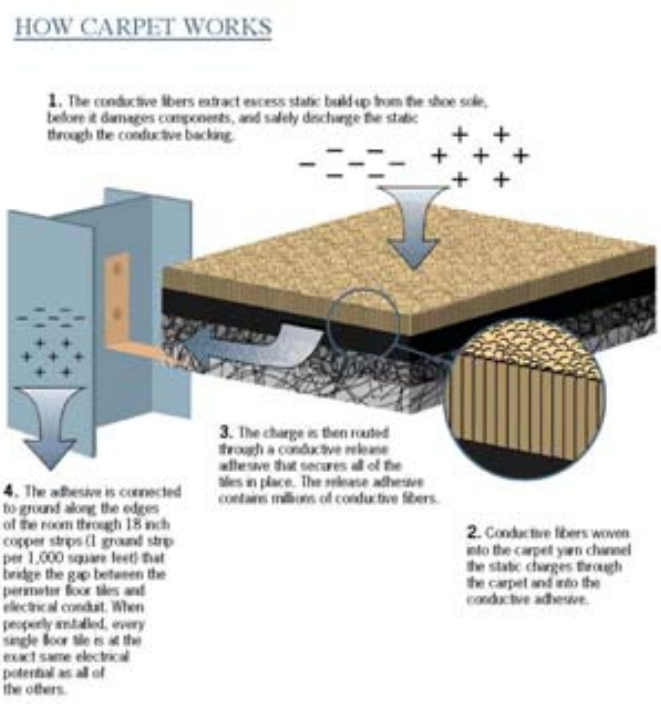
## Rubber Flooring

Carpet may be the wrong choice for certain applications. Entry areas can become a maintenance nightmare during inclement weather. Carpet could become unsightly or stained if continuously exposed to salt and chemicals used to control ice and snow buildup. Sometimes carpet is seen as a collector of dust and dirt. Although closed loop carpet tiles are easily vacuumed and steam cleaned, some facilities managers prefer floors that can be broom cleaned or damp mopped. Other people choose resilient flooring simply because a resilient floor was installed when their facility was built and no other flooring material has ever been tested or used. Some people see carpet as inferior to vinyl or other hard surfaces and there is no way to alter their thinking.

Fortunately, it is possible to meet the same static protection level of conductive carpet with certain rubber flooring alternatives. Dissipative nitrile rubber flooring, in particular, provides static inhibiting properties similar to conductive carpet tiles, but for very different reasons. From high school physics, we know that whenever two dissimilar surfaces are rubbed together, they generate static. The corollary is also true: Similar materials generate less static when they interact. The base compound used in rubber flooring sufficiently resembles most shoe soles to the degree that it inhibits the buildup of static by preventing static generation in the first place. Unlike conductive vinyl, nitrile rubber is a homogenous dissipative material with conductive properties distributed across one hundred percent of the surface and throughout the thickness of the tile. The full distribution of conductive properties means that shoe soles will never contact anything on the surface of the floor that can generate static.

And, like all effective conductive flooring options, rubber meets the second critical criterion: it can be grounded.

**Figure 1: ESD CARPET**




**ESD carpet attracts built up static charges and safely channels the charges away from an operational environment to an established ground point.**

A typical rubber installation relies on the same conductive adhesive as carpet tiles. Without conductive adhesive, the rubber tiles cannot reach electrical continuity or be grounded and an ungrounded floor has no means of dissipating static away from the floor.

## Summary

To protect their sensitive electronic equipment, call rooms and other mission-critical command centers need static protection on which they can rely. With so many options, choosing the right static control floor can be a challenge for architects, designers and facilities managers.

The most important criteria to remember are these:

1) The floor must be compatible with the environment.
2) The material should require a minimal amount of maintenance.
3) The floor must meet the electrostatic requirements of the facility.

By following these few simple guidelines, choosing the right floor can be relatively painless and easy. And static, the invisible threat inside the call center, will no longer compromise job performance or threaten to damage or destroy sensitive electronic or telephony equipment.

*David H. Long is the principle of StaticWorx, based in Newton, MA. He can be reached by phone at (617) 923-2000 or by e-mail at dave@staticworx.com. StaticWorx can be visited on the web at http://www.staticworx.com/.*