staticWorx®
GroundSafe® ESD Flooring

3 Reasons
to Avoid Topical SDT Polish or Wax

Why to Avoid Floors That Rely on Topical SDT Polish

Multiple flooring products fall into a category we loosely describe as ESD flooring. The term "ESD flooring" has no technical definition. It is purely a generic description. Calling a floor an "ESD floor" merely signifies that the floor is intended to control the build-up and discharge of static electricity.

ESD flooring products can be divided into two categories: conductive floors and dissipative floors. These floors can be comprised of vinyl, rubber, polyolefin, carpet, urethane, epoxy and sometimes floor polish. Some of these floors provide permanent static-control properties and some require periodic rejuvenation. The products requiring rejuvenation usually rely on some form of floor polish to provide the static control function.

When you consider that some ESD floors are manufactured to have intrinsic conductivity, using rejuvenators such as dissipative polish is not only problematic and expensive; it is completely unnecessary. In fact, there are three very good objective reasons to steer clear of ESD flooring options that require rejuvenators:

1

ESD floor polishes, regardless of manufacturer, are not very conductive. They measure approximately 100 million ohms (1.0 × 10E8) when first applied. As they wear, typically over several weeks, they become even less conductive. After a few months they measure over 1 billion ohms (1.0 × 10E9) which is no longer acceptable per ANSI/ESD S20.20. Once the polish has lost its conductivity, the SDT tile by itself has no intrinsic conductivity and cannot get rid of static.

- It's impossible to know when the conductivity is deteriorating.

2

In electronics manufacturing, the ESD floor is also the ground plane for chairs, mobile carts, portable workstations and people. No ESD floor polish will provide a long-term fixed path to ground for all of these items. For starters, ESD floor polish measures at the high end of the static-dissipative resistance range. That means that all grounding is predestined to operate at close to borderline acceptability.

The graph below was created by ESDA.org, the same organization that writes the testing standards and methods for all aspects of ESD programs. It clearly shows the difference in system resistance and charge decay between conductive and dissipative floors.

As you examine the chart, keep in mind that SDT polish would be categorized as a highly (high on the spectrum) dissipative floor. Clearly, the liabilities in performance of a highly dissipative floor polish cannot be overcome, even when using very conductive footwear. Simply stated, it takes too long to discharge a person when they walk on a floor polish that measures at the high end of the static dissipative range.

COMBINATION	CONDITION 1 (FLOORING TYPE)	CONDITION 1 (RESISTANCE - OHMS)	CONDITION 2 (FOOTWEAR TYPE)	CONDITION 2 (RESISTANCE-OHMS)	FOOTWEAR/FLOORING SYSTEM RESISTANCE (RTOTAL)
C1	Conductive (Low)	5.0E+04	Low Resistance	5.0E+05	5.5000E+05
C2	Conductive (High)	9.5E+05	Low Resistance	5.0E+05	1.4500E+06
D1	Dissipative (Low)	1.5E+06	Low Resistance	5.0E+05	2.0000E+06
C3	Conductive (Low)	5.0E+04	High Resistance	9.5E+08	9.5005W+08
D2	Dissipative (High)	9.5E+08	Low Resistance	5.0E+05	9.5050E+08
C4	Conductive (High)	9.5E+09	High Resistance	9.5E+08	9.5095E+08
D3	Dissipative (Low)	1.5E+06	High Resistance	9.5E+08	9.5150E+08
D4	Dissipative (High)	9.5E+08	High Resistance	9.5E+08	1.9000E+09

TABLE 1: Rtotal as a Function of Flooring and Footwear Combinations

InCompliance magazine

3

Floors with intrinsic conductivity cost less to own and provide superior static protection. Intrinsic conductivity means the floor has inherent electrical properties that do not wear off over time, providing permanent static control without the use of ESD wax. Since an intrinsically conductive floor does not require an ESD floor finish, it does not need to be audited for conductivity more than once per year during routine facility calibration. As shown above, an intrinsically conductive floor (C1, C2) provides rapid charge decay and superior total resistance to ground for floors used in electronics manufacturing.

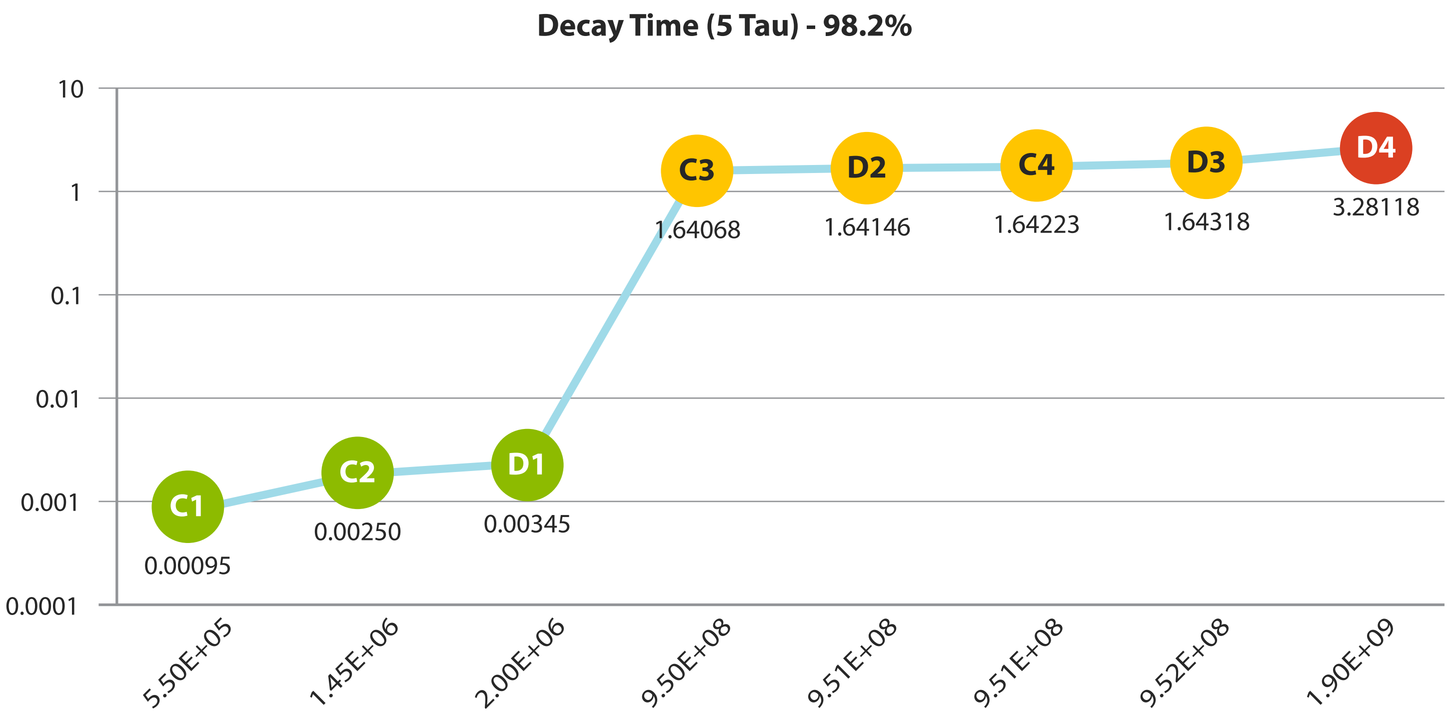


FIGURE 2: Decay Times for Flooring and Footwear Combinations (Logarithmic Scale)

InCompliance magazine

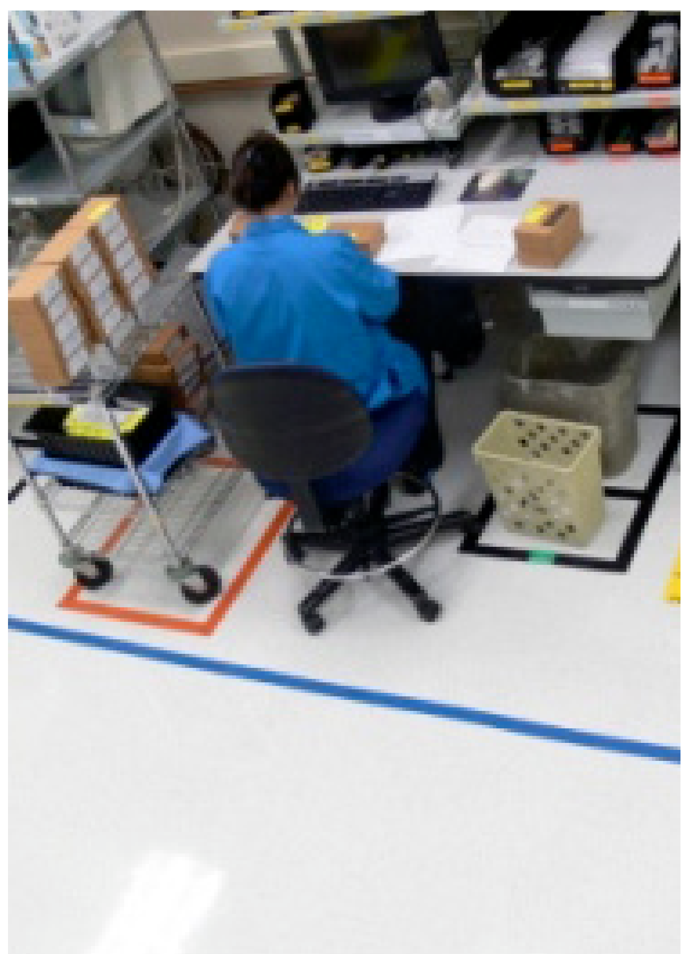
Evaluating SDT vs. Wax-Free ESD solid ESD Vinyl Tile

We performed spot testing of various "ESD" flooring products in our office as an exercise to further develop our library of resources available to those who struggle to understand ESD flooring and the underlying principles of static electricity. It is important to note that the day we tested was very cold, both outdoors and in our office; low relative humidity was our main reason for choosing this particular day to conduct these tests. Static problems are more prevalent when the air is dry. It is well known that many static control products lose effectiveness when it is dry – just when you need them the most.

Hypothesis

The hypothesis that we hoped to test with these evaluations was that static dissipates least effectively by humidity-dependent products like SDT and more effectively by carbon-loaded conductive ESD tile.

The super-dry winter conditions eliminated any chance that relative humidity would enhance the discharge properties of any tiles. It is a known phenomenon in the industry that elevated relative humidity can increase the effectiveness of anti-static flooring, one very important reason floors should be tested at low relative humidity and without the aid of waxes or antistatic polishes.



Samples and Testing Methodology

Remembering that the ideal range for ESD flooring systems is 10E5 to < 10E8, we decided to compare the results of the following flooring samples:

Unwaxed SDT VINYL SAMPLE
Armstrong SDT Static Dissipative Tile (*figure 1*)
Samples provided by the manufacturer's distributor

Carbon loaded VINYL SAMPLE
StaticWorx Ameriworx Series ESD Vinyl Tile (*figure 2*)
This sample was pulled from the StaticWorx warehouse of samples

EC (electrically conductive) RUBBER SAMPLE
StaticWorx Eclipse EC ESD Rubber (*figure 3*)
This sample was pulled from the StaticWorx warehouse of samples

Figure 1

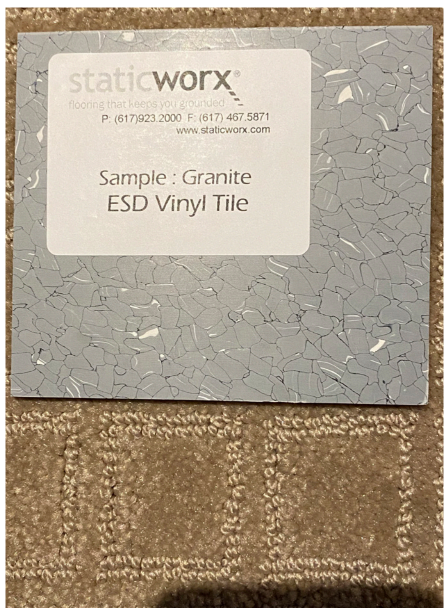


Figure 2

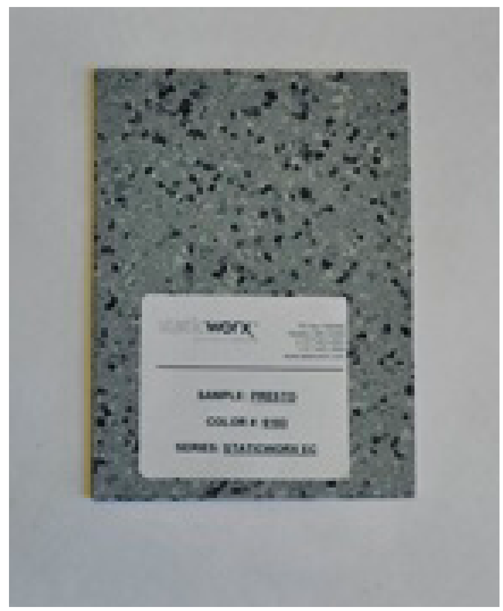


Figure 3

The size of the sample does not influence the effectiveness of the results of this test. These sizes appear as provided by the manufacturer. All samples are shown here, prior to testing, on a standard 8.5" × 11" piece of paper.

To conduct the test, we used:

- Prostat, PRS-812 Resistance Meter (*figure 4*)
- Copper stripping that StaticWorx supplies with all ESD flooring orders
- The three flooring samples listed above

An easy way to determine if a flooring material can be grounded effectively is to measure its resistance with a megohm meter (see *figure 4 below*). A good reading is usually below 10,000,000 ohms, that's 10 to the 7th in ESD-speak. On the meter it's represented as "1.0 E 07". An unacceptable reading is any reading above 1.0 E 09—it's critical to understand that the meter's highest measurement is 10 E 10 and lowest reading is 0 E 00.

According to ANSI/ESD S20.20-2014 the system ground should always measure below 1.0 × 10E 09.

Sample Testing

After connecting the meter to the two-weights/conductive cords, we placed each sample with its midline on the copper-grounding strip. Then, we connected the meter—one weight on the copper strip and one on the flooring sample. Then we turned on our meter and measured electrical resistance.

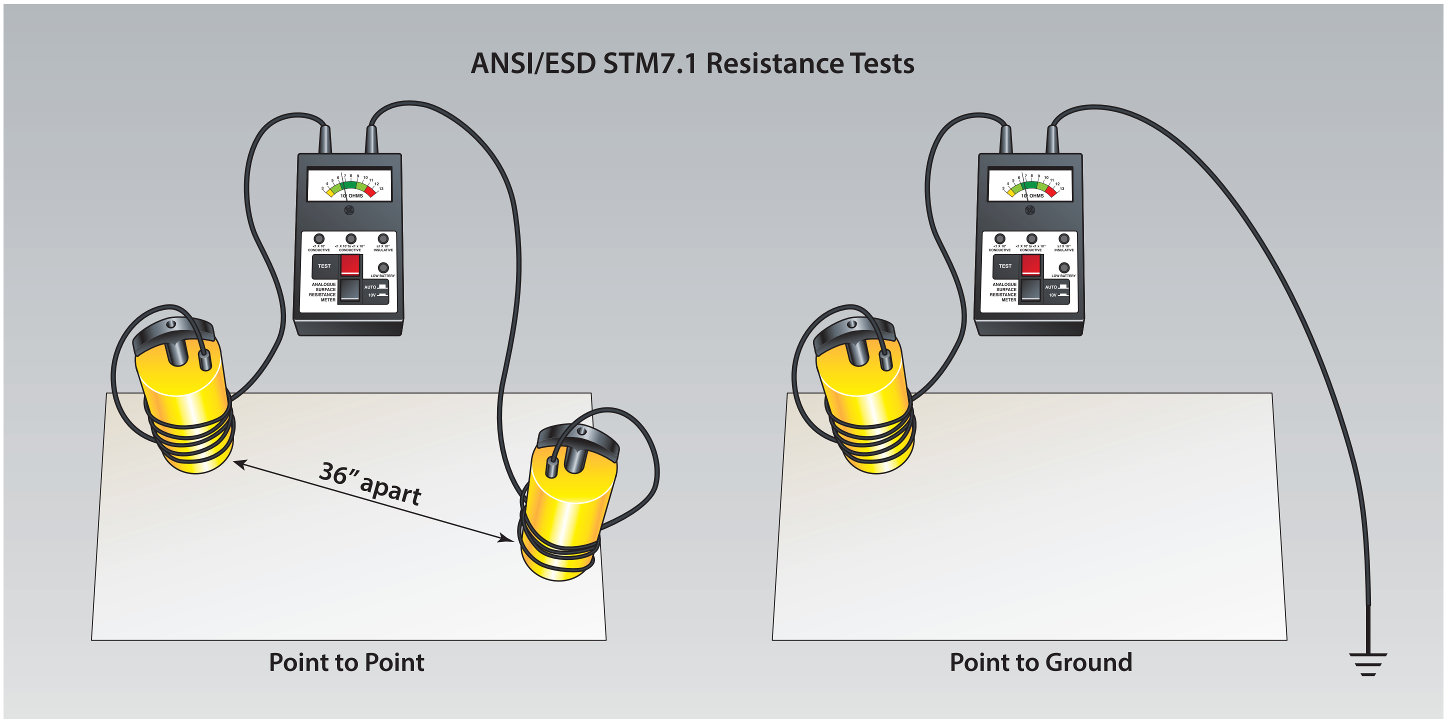


Figure 4: Resistance measured with an ohm meter

Results

Figure 5

Figure 6

Figure 7

In figure 5, the Armstrong SDT Vinyl Tile sample, reads 2.8E09, or 2.8×10^9 ohms. In figure 6, the StaticWorx carbon-loaded vinyl tile sample reads 8.7E05, or 8.7×10^5 ohms. In figure 7, the StaticWorx EC Rubber sample, reads 9.8E05, or 9.8×10^5 ohms to ground.

2.8 E 09 = 2,800,000,000 (Armstrong vinyl tile)

8.7 E 05 = 870,000 (StaticWorx vinyl tile)

9.8 E O5 = 980,000 (StaticWorx EC rubber)

Conclusions

As hypothesized, the tests confirm that SDT is an ineffective conductor of static. Carbon-loaded ESD tile and EC rubber flooring conduct static most effectively—regardless of the dry conditions.

What does this mean?

The main purpose of static-control flooring is to prevent discharges between people and static-sensitive electronic components or assemblies. A good static-control floor must safely ground static charges away from people regardless of environmental factors. A floor like Armstrong STD, with marginal or no conductivity, cannot effectively ground static charges because the resistance is too high. A high resistance (ohms rating) prevents charges from reaching ground. At low humidity, static charges will actually accumulate on people as they walk on SDT flooring. Carbon-loaded flooring like StaticWorx vinyl and EC rubber, on the other hand, performs equally well regardless of relative humidity.

Now add the need for finishes into the equation. STD relies on special waxes or polishes for its static-control properties. SDT cannot meet the requirements of ANSI/ESD S20.20 without the application of 3 to 5 coats of special polish. Without frequent - repeated - testing there is no way to know when the polish has worn off. If a new tile, with the polish intact, reads poorly in dry weather, what happens to the tile when the polish wears off? The tile floor provides no static protection.

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