



VPI Conductile[®] ESD Tile Testing to ESD STM97.1

Executive Summary

VPI Conductile[®] ESD Tile and two VPI ESD adhesives were tested to ESD STM97.1 in combination with a person wearing anti-static ESD heel straps and two different static dissipating shoes. The results show that the VPI flooring gave very consistent results across the test floor surfaces with both adhesives. In addition, comparison of the results obtained on the test floors versus the control metal plate showed that the most of the system resistance was due to the person and the footwear, not the VPI flooring, indicating that the VPI flooring contributes very effectively to fast static decay.

Floor Test Specimen Preparation

36" X 36" squares of VPI Conductile[®] in color White 02 were adhered to hardboard using both VPI #150 Epoxy and #165 Acrylic adhesive, rolled and allowed to cure and condition. See Figures I and II. Two grounding strips were included per STM97.1.

The ESD STM7.1 results on the test floors were as follows:

	<u>Point to Point</u>	<u>Point to Ground</u>
Conductile/VPI #150, ohms	3.7 X 10 ⁵	0.8 X 10 ⁵
Conductile/VPI #165, ohms	3.7 X 10 ⁵	0.4 X 10 ⁵

Test Apparatus

See Figure III. Resistance testing was performed with a PROSTAT[®] PRS-801 Resistance System Set. The PRS-801 measures resistance from 0.1 ohms to 2×10^{14} ohms at 10 or 100 volts, switching automatically at 1 Megohm from 10 to 100 volts. Voltage accuracy at 10 volts is ± 0.2 volts from $1.0\text{E}+04$ to $1.0\text{E}+06$ ohms. A chromed steel rod measuring 1" in diameter and 4" in length was used for the hand-held electrode. The heel grounders were 1 - 2 Megohm Pro'sKit 808-Q05 Foot and Heel Grounding Straps, using a nylon strap extending up and inside the person's socks to insure good body contact. The shoes included HyTest K11280 Static Dissipating Composite Toe Athletics and HyTest K30400 Static Dissipating Composite Toe Slip Ons. The test person was Jim Rosenthal. The metal plate was 36" X 36" aluminum $\frac{1}{4}$ " thick. Temperature and Relative Humidity (RH) were monitored with a Honeywell Vision PRO TH8000 Series Thermostat and a VWR Thermo-Hygro meter traceable to NIST calibration

Grounding

A brass bolt was inserted into the ground slot of a 3-pronged 110-volt electrical receptacle and used as the building grounding point for the test floors. The brass bolt was electrically connected to the metal plate and the grounding strips on the test floors.

Resistance Meter Connections

The negative lead of the resistance meter was attached to a 110-volt receptacle grounding slot, and the positive lead was connected to the steel rod electrode held by the test person. See Figures IV and V. All electrical connections thus conformed to Figure 1 of STM97.1.

Testing Procedure

Testing was performed at 68° to 70° F and at the Relative Humidity (RH) indicated in the Table. Per STM97.1, the metal plate and the test floors were divided into three general areas, identified as Locations 1, 2 and 3. The metal plate and the two test floors were then tested as follows: With the person standing at Location 1, resistance readings were taken with both feet in contact with the surface, then with the left foot only in contact with the surface, and finally with the right foot only in contact with the surface. This was repeated at Location 2 and 3. The entire sequence was then repeated two additional times, for a total of three readings at each location for each foot configuration.

Test Results

The resistance measurements are presented in Table I. The data is summarized below:

	<u>Average (Ohms)</u>	<u>Maximum (Ohms)</u>
Metal Plate/Heel Straps	1.0×10^6	1.1×10^6
VPI Conductile [®] /VPI #150/Heel Straps	1.2×10^6	1.3×10^6
VPI Conductile [®] /VPI #165/Heel Straps	1.1×10^6	1.2×10^6
Metal Plate/K11280 Shoes	2.8×10^6	3.4×10^6
VPI Conductile [®] /VPI #150/K11280 Shoes	2.9×10^6	3.5×10^6
VPI Conductile [®] /VPI #165/K11280 Shoes	2.8×10^6	3.4×10^6
Metal Plate/K30400 Shoes	2.7×10^6	3.3×10^6
VPI Conductile [®] /VPI #150/K30400 Shoes	2.8×10^6	3.3×10^6
VPI Conductile [®] /VPI #165/K30400 Shoes	2.7×10^6	3.3×10^6

This data indicates two important points. First, the maximum resistances for the VPI floors are very close to the average. This indicates very consistent performance of the tile, with no high resistance or 'dead' spots. Secondly, the test floor results are very close to the metal plate results. This means that the person, in combination with the footwear, is the major source of electrical resistance in this system, not the VPI ESD flooring, and demonstrates that the VPI flooring is providing an excellent path for the decay of static charges.



Figure I. Test Floor Preparation - #150 Adhesive

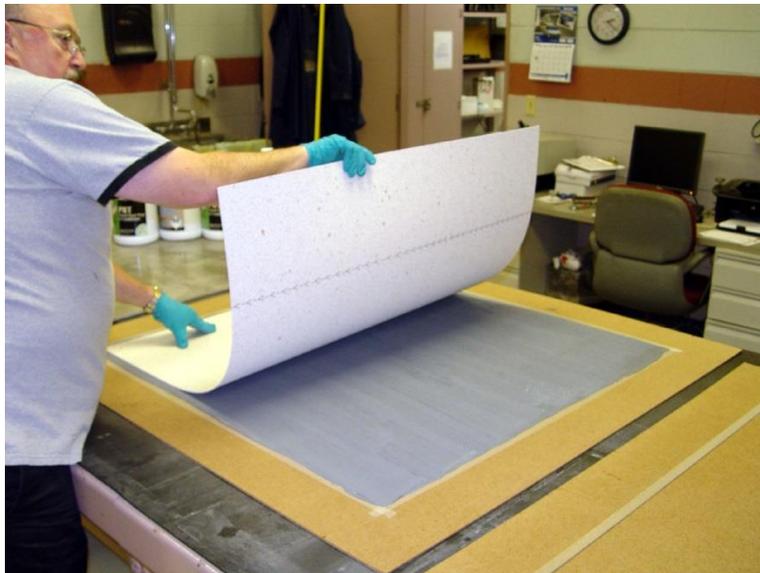


Figure II. Test Floor Preparation - #165 Adhesive



Figure III. Test Apparatus

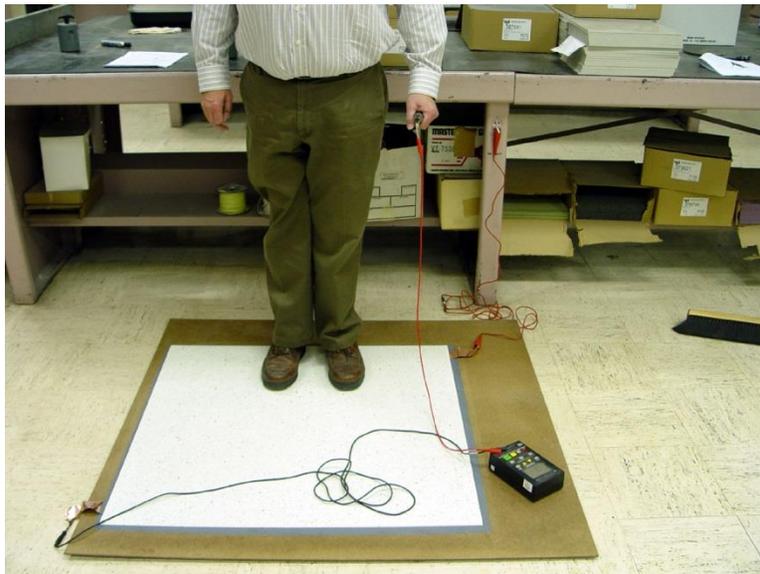


Figure IV. Electrical Configuration



Figure V. Metal Plate

Table I. ESD STM97.1 Test Results									
					Average Resistance, ohms			Extremes, ohms	
Floor	Adhesive	Foot-wear	RH, %	Number Tests	Both Feet	Left Foot	Right Foot	Minimum	Maximum
Metal Plate	N/A	Heel Straps	24	27	7.8E+05	1.1E+06	1.1E+06	7.4E+05	1.1E+06
Metal Plate	N/A	HyTest K11280	20	27	1.7E+06	3.3E+06	3.3E+06	1.7E+06	3.4E+06
Metal Plate	N/A	HyTest K30400	20	27	1.6E+06	3.2E+06	3.3E+06	1.6E+06	3.3E+06
Conductile	VPI #150	Heel Straps	24	27	9.8E+05	1.3E+06	1.3E+06	7.8E+05	1.3E+06
Conductile	VPI #150	HyTest K11280	20	27	1.8E+06	3.4E+06	3.5E+06	1.8E+06	3.5E+06
Conductile	VPI #150	HyTest K30400	20	27	1.7E+06	3.3E+06	3.3E+06	1.7E+06	3.3E+06
Conductile	VPI #165	Heel Straps	24	27	9.9E+05	1.2E+06	1.2E+06	9.4E+05	1.2E+06
Conductile	VPI #165	HyTest K11280	20	27	1.8E+06	3.3E+06	3.4E+06	1.8E+06	3.4E+06
Conductile	VPI #165	HyTest K30400	20	27	1.7E+06	3.2E+06	3.3E+06	1.7E+06	3.3E+06