

ESD Open Forum
Conformity Magazine
Provided by the ESD Association
December 2007

Q. I am in the process of restructuring a 1,600 square foot production line so that employees will work while standing. I am going to lay down an ESD wax on our regular vinyl tile. What is the proper method of grounding ESD wax tiles? How many waxed tiles must be grounded per square feet?

A. It is unlikely that you will actually be able to ground a floor that is only treated with wax. Generally, the wax is not sufficiently conductive to allow peripheral grounding but relies upon the very large surface area to act as a capacitive sink. The floor must be cleaned very well and rinsed completely. The pH of the final rinse and the floor must be close to a neutral level (7) and most certainly must not measure as a base level (8 or more). Most waxes and other surface treatments react chemically with a base level pH and this will probably hurt the electrical performance of the coating. After the thorough cleaning, it may be necessary to install copper foil tape strips to the floor. The tape strips should be about 12 inches onto the floor and go up the wall several inches. The separation between strips is difficult to determine but a starting point might be 3 feet. Bond the strips across the wall with a strip of tape. Attach the copper strip network to ground. The recommended ground connection point is to the equipment-grounding conductor, which is the 3rd wire electrical ground in a North American electrical system. If electrical outlets are available, terminate a connection from the tape with a wire to the center screw of the outlet or to a metal electrical box or conduit. All of these points are electrically common to the equipment-grounding conductor in a properly wired electrical system (the electrical system needs to be verified by a licensed electrician).

Apply the wax over the floor following the manufacturer's instructions. After thorough drying or curing as appropriate, measure the electrical properties of the floor. The measurements are made using the procedures established in ANSI/ESD S7.1 – *Floor Materials, Characterization of Materials*. Two measurements are generally made on a new floor installation or, in this case, a new wax application. Point-to-point and resistance to ground measurements are made in this test method standard. The electrodes are 2.5 inches in diameter, have a conductive rubber or aluminum foil contact face and weigh 5 pounds. The measurement instrument is a high voltage ohmmeter (megger) that makes the resistance measurement at 10 volts and 100 volts. Place one electrode on the floor and set the other electrode three (3) feet away. Connect the leads from the megger to the electrodes. Select 10 volts and activate the instrument. If the measured value is less than or equal to 1×10^6 ohms, record the value. If the measured value is greater than 1×10^6 ohms, switch the megger measurement output to 100 volts, activate the meter and record the measurement. The point-to-point measurements are used to evaluate the coating or wax uniformity across the surface. Repeat the measurements across the floor in enough places to ensure that the floor coating is uniform. Five to ten measurements in a room of the size mentioned in this question (1,600 square feet) would be sufficient.

In the second test, place one electrode on the floor and connect one lead from the meter to the electrode. Connect the other lead from the test meter to a ground point and measure first at 10 volts and then at 100 volts if over 1×10^6 ohms. To qualify as an ESD protective floor per ANSI/ESD S20.20 – *ESD Association Standard for the Development of an Electrostatic Discharge Control Program for – Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding electrically Initiated Explosive Devices)*, the resistance will have to be $<1 \times 10^9$ ohms. ANSI/ESD S6.1 – *Grounding* is a good reference tool to assist with all the associated grounding issues.

A third test measures the resistance of a person to ground while standing on the floor. ANSI/ESD STM 97.1 – *Floor Materials and Footwear – Resistance Measurement in Combination with a Person*, measures how the floor will actually drain static charge from a person. This test procedure helps to evaluate not only the floor, but the footwear used by personnel as well. The S20.20 specification is <35 megohms using this method. To comply with the S20.20 requirement, the floor just about has to be in the 10^7 ohms to ground range.

A fourth test measures the voltage generated by personnel as they walk on the floor. The test method is ANSI/ESD STM97.2 – *Floor Materials and Footwear – Voltage Measurement in Combination with a Person*. This test method requires an instrument called a Charged Plate Monitor (CPM) – available from several ESD material and equipment suppliers. The voltage generated should be <100 volts when people walk on the floor. It is advisable do this test with the current floor before applying wax to determine a base line.

ANSI/ESD S20.20-2007 states that a floor and footwear grounding system for people must have a resistance to ground $<1 \times 10^9$ ohms and a voltage on personnel of <100 volts.

About the Author

David E. Swenson is President of *Affinity Static Control Consulting, L.L.C.* He is currently serving as Sr. Vice President, President-elect for 2008 and Professional Certification Chair in the ESD Association. He can be reached at 512-244-7514 and at inquire@affinity-esd.com.

About the ESD Association

Founded in 1982, the ESD Association is a not-for-profit, professional organization directed by volunteers dedicated to furthering the technology and understanding of electrostatic discharge. The Association sponsors educational programs, develops ESD standards, holds an annual technical symposium, and fosters the exchange of technical information among its members and others. Additional information may be obtained by contacting the ESD Association, 7900 Turin Rd., Bldg. 3, Rome, NY 13440-2069 USA. Phone: 315-339-6937. Fax: 315-339-6793. Email: info@esda.org. Website: <http://www.esda.org>.