TECHNICALLY SPEAKING

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Why Is ESD Becoming More and More Important?

ESD (electrostatic discharge) and its effects on electronic and electrical components is becoming more important as the industry adopts new devices that are extremely sensitive to very low voltage static discharge and electrical fields. The ESD Association has a published standard for establishing an ESD Control program to protect these devices from voltage discharge and electrical fields that are greater than 100 volts, but new MOSFET (metal oxide semiconductor field effect transistor) devices can be damaged by a discharge of as little as 10 volts. The ESD Association standard does cover these more sensitive devices, but only by saying that devices sensitive to voltages of less than 100 volts will require more stringent protection procedures.

The Standard (ANSI/ESD-S20.20-1999) covers the requirements for designing, establishing, implementing and maintaining an ESD control program for any operation that manufactures, processes, assembles, installs, packages, labels, services, tests, inspects or handles electronic or electrical parts, assemblies or equipment that may be susceptible to damage by an electrostatic discharge of greater than 100 volts. If the parts being handled are sensitive to discharge voltages of less than 100 volts more exacting Program Technical Requirements may be needed as well as an adjustment to the voltage ranges that are recommended in the Standard. Devices that are sensitive to ESD are referred to as ESDS (electrostatic discharge sensitive) items.

There are three basic control principles in an ESD Control Program. First, all electrical conductors in the ESD-controlled environment must be bonded or electrically connected to a known ground, or connected so that there is no difference in electrical potential between the conductors, even though the potential is not zero. Second, non-conductors like circuit board materials and some device packaging must not loose their charge when connected to ground.Third, transportation of ESDS items from outside an ESD protected or controlled area requires that the item be enclosed in low discharging or static discharge shielding materials.

Electronic components can be effected by an electrostatic charge in two ways. One way is by direct discharge of static electricity from a charged object to the device. This sends an electrical current through a device and will cause damage if the breakdown voltage of the device is exceeded. Direct discharge damage can be eliminated by placing insulating material between the charged object and the sensitive device. The other cause of damage is to those devices that are sensitive to the electrical field that is created by the presence of an electrical charge on an object. Insulating materials can stop the passage of an electrical current into a device, but cannot stop the passage of an electrical field through the device. Such field sensitive devices must be “shielded” in a conductive container to be protected. Shielding a device is therefore a different kind of ESD protection from insulating to protect the device from direct static discharge.

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The Standard establishes the ESD Control Program by requiring the use of grounding and bonding systems for all equipment and personnel that come in contact with an ESDS item. ESDS items are handled only in Protected Areas, where grounding systems, humidity control and other required or optional methods are employed to eliminate or reduce the chance of an electrostatic charge-induced component failure. Such Protected Areas must be properly labeled and access into a Protected Area is restricted to personnel that have had specific training in ESD hazards and their prevention. Insulating materials, like plastics, paper, and Styrofoam articles, that may collect a significant electrostatic charge, must be kept no closer than 12 inches from ESDS items, and are banned from the Protected Area altogether.

The Standard also mandates the use of ESD packaging for protecting ESDS items, especially when they must be transported outside the Protected Area, and for the proper labeling of ESDS items. The ESD packaging used may be conductive, dissipative, shielding, or low charging and the type of packaging used must be selected according to the specific type of ESDS item to be protected or for the particular kind of protection that is required.

The Standard requires that, along with internal audits to insure the efficacy of the ESD Control Program, periodic audits be performed by a qualified, independent agency to determine adherence to the requirements of the Standard. Companies are certified for compliance with the ESD Association Standard just as they are for compliance with the ISO Quality Standards. Failure to meet the requirements of the ESD Standard can result in a loss of accreditation, and the possible loss of business.

Why is the ESD Association ESD Control Program Standard important to ITW Chemtronics? Many of our customers are operating under the guidelines of this standard and are constantly looking for ways to make compliance easier, less costly and less time consuming. Recently a customer asked if we could produce the IPA Presaturated Wipes (SIP100P) in an ESD-safe container. They were recently audited for compliance with the standard and marked for having a container of SIP100P in the Protected Area.

We pointed out that incorporation of an anti-static agent into the container plastic would raise the cost of the container more than two-fold, while possibly weakening the container. The label used on the SIP100P container is already static dissipative and covers more than three-fourths of the container surface. Using the personnel wrist strap grounding and bonding systems required under the Standard as well as optional static charge elimination methods such as air ionizers, antistatic mats, counter-tops, static dissipative floor coatings, footwear, and seating would be more effective in eliminating ESD than using higher cost antistatic packaging for this product.

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