ESD Handling Procedures

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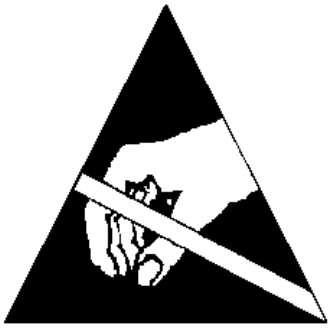
All personnel in an organization who handle ESD sensitive items [ESDS] are to receive ESD control training. In addition, facilities personnel and those who design products or purchase electronic items should also receive ESD control training. Training should occur yearly and is to include objective evidence that the person has understood the information. Training typically includes an explanation of electrostatic charges and discharges [ESD], however this article is limited to basic ESD handling procedures.

There is an ESD susceptibility symbol (also called sensitivity or warning symbol) which should be used to identify components, assemblies, and products that are sensitive to ESD. Subcontractors and suppliers of ESDS must have effective ESD control programs. Unless the company has a policy to consider all electronics as ESD susceptible, it must be clear what items are ESD sensitive prior to having packaging opened or the item otherwise handled.



ESD Susceptibility Symbol

Unpackaged ESDS is to only be handled, stored or transported in an ESD protected area [EPA] which could be an entire building, one or more rooms in a building, or one or more workstations in a room. Each EPA must be clearly identified with adequate signage which may include floor boundary tape. Access to an EPA is to be limited to ESD trained personnel; others are to be escorted by a trained person. ESDS should not be touched or otherwise handled unless necessary. When handled, the person is to be grounded via a wrist strap system or a flooring/footwear system. Outside the EPA, ESDS is to be enclosed in packaging having the ESD control property of shielding. An unpackaged ESDS inside the EPA is to be stored or transported on grounded worksurfaces or shelving.

ANSI/ESD S20.20-2007 requires a written ESD control plan which is to detail the technical requirements, training and compliance verification plans. There are many EPA ESD control items and the company has the option of which ones to require. A company's required EPA ESD control items must be clearly understood by all trained personnel. ANSI/ESD S20.20-2007 requires that Compliance Verification periodic tests be per ESD TR53, and the written plan is to document the testing frequency and sampling percentage if used.

Test equipment and ionizers used in the ESD control program should be identified and included in the company's calibration and maintenance schedules. Ionizers are to be checked for discharge times and offset voltage balance. Test equipment including wrist strap and footwear checkers and continuous monitors need to be in calibration. Soldering irons are to be tested for tip to common point ground voltage potential to prevent EOS damage to components.

If some workstations are ESD protective while others are not, the ESD protective workstations are to be clearly identified. All conductors, including people, in the EPA are to be grounded. To do so, each workstation and process equipment must have an adequate number of ground points available. All items should be directly connected using a ground cord to the workstation's common point ground. There is a common point ground symbol which is to identify all common point grounds. Best practice is when an ESD workstation is created that it be certified by a qualified technician and that the certification thereafter be kept current and visible.

Common Point Ground

Insulators are non-conductors and cannot be grounded. All insulators are to be replaced with ESD protective versions which should be low charging and/or dissipative/conductive. Dissipative items are in the higher conductive range being 1 x 10E4 to less than 1 x 10E11 ohms and are to be grounded. Fixtures at the ESD protective workstation should be dissipative and grounded or the materials low charging. If the material is insulative, another alternative is to periodically coat with topical antistat; otherwise, it should be removed from the EPA. There is an ESD protective symbol which should be used to identify products having ESD control properties.

ESD Protective Symbol

If the insulative item is essential and cannot be removed, or if a dissipative/conductive item is isolated and cannot be grounded, then an ionizer should be used to neutralize charges. Examples may be plastic test equipment cases, safety shields, microscope stands, magnifiers, etc.

Static generating tape that may be used in wave solder or conformal coating masking operations, should be dispensed and removed in the presence of an operating air ionizer.

If not using a continuous or constant monitor, wrist straps should be checked while worn at least daily. Typically, a tester is used by plugging the wrist strap coil cord into the tester, select the wrist strap setting, and pressing or holding an electrode with either hand. Best practice is to during the test to wiggle the coil cord area nearest to the wristband as intermittent failures are first

likely to occur where the current limiting resistor is located. Usually, a green light will signify passing and a red light will signify failing.

ESD footwear, dissipative or conductive shoes or foot grounders installed over regular shoes, will only remove charges from a person if the floor is ESD flooring. The ESD footwear is to be worn on both feet. If foot grounders with a conductive ribbon tab, the tab should be placed in the shoe under the foot. The resistance path-to-ground on a person is the perspiration layer, and typically under a sock is adequate and direct contact with the skin is not necessary. After setting the footwear setting, typically a tester is used by standing on a footplate electrode and pressing or holding an electrode with either hand. If the tester has a spit footplate that can measure each foot independently, it is just one test. When not, there are two tests, and the opposite foot should be raised off the floor. Usually, a green light will signify passing and a red light will signify failing.

Typically dirt is insulative, so best practice is to avoid soiling personnel grounding items and to test each time re-entering the EPA. A common failure is due to dry skin and an approved ESD lotion can be applied and the personnel grounding item retested. If a failure cannot be resolved, a supervisor should be contacted. Test records for wrist straps and ESD footwear are to be maintained.

The flooring/footwear system is not allowed for seated personnel who must be grounded using a wrist strap system. This is due to the fact that when seated, people do not reliably have the bottom of a foot in contact with the floor.

Disposable wrist straps and foot grounders are to be limited to one time use.

The company may require static control garments. Around the torso and arms, the garment should cover all clothing by having the front fastened and the garment sleeves extending pass the clothing sleeves.

Non-essential personal items are to be kept out of the EPA.

Packaging such as metalized shielding bags, tote boxes, boxes with a shielding layer, can provide protection for ESDS outside the EPA. Before ESDS is transported outside the EPA, they should be enclosed in such packaging that is low charging, conductive/dissipative, and having the ESD control property of shielding. To enclose the ESDS the shielding bag should be closed and lids in place on tote and boxes with a shielding layer. This includes moving ESDS from one EPA to another such as from one ESD workstation to another where there is an unprotected area in between.

ESD Packaging, to minimize handling should facilitate identification and counting without unpacking.

Regular packaging is often high charging and should not be used in the EPA even as packaging for items that are not sensitive to ESD. For non-ESDS items, the packaging should be low charging and dissipative/conductive.

ESD packaging can be reused, but should be tested before reuse. Packaging that is damaged, with tears, cracks or holes, should be discarded as the ESDS contents may extend outside of the packaging losing ESD and mechanical protection.

ESDS that has failed a quality control step should still be protected from ESD as it may be able to be repaired.

The ESD handling procedures should be used in all steps where the ESDS are not in packaging with the shielding property which may include receiving, stocking, kitting, testing, and shipping.

ESD Handling Procedures Checklist:

- Only handle unpackaged ESD sensitive items [ESDS] in the ESD protected area [EPA] when grounded
- Only trained or escorted people in the EPA
- Ground all conductors including people in the EPA
- Use continuous monitors or test wrist straps at least daily
- If ESD footwear is used, test at least daily
- Visually check that grounding cords are connected
- Keep wristband snug, foot grounder grounding tab in shoe, and ESD smocks fastened closed
- Keep work area clean and clear of all non essential insulators
- Neutralize essential insulators with ionizers with the airflow directed towards the work area
- Use packaging with shielding property to store or transport ESDS outside the EPA

Reference: ANSI/ESD S20.20-2007; ESD Handbook ESD TR20.20-2008 section 4.3.3 Compliance Verification Checklists