

Example ESD Control Program Document Based on ANSI/ESD S20.20-2007

The following document demonstrates the structure for an ESD control program that is compliant to ANSI/ESD S20.20-2007. The basis of this program is as follows:

1. Personnel are grounded by either a wrist strap or footwear-flooring system.
2. Handling operations are performed at a grounded work surface.
3. ESD sensitive devices are moved from operation to operation inside a metallized shielding bag.

The company name for the purposes of this example is ACME Electronics Factory Ltd.

1.0 Purpose

The purpose of this procedure is to document the key administrative and technical requirements of the ESD Control Program used by ACME Electronics Factory Ltd. This program has been developed to comply with the ESD Control Program requirements of ANSI/ESD S20.20-2007.

2.0 Scope

This procedure applies to all manufacturing areas and the associated manufacturing operations where unprotected ESD sensitive products are handled.

3.0 Responsibilities

ACME Electronics Factory Limited has assigned an ESD Coordinator who is the owner of this document and shall be responsible for ensuring compliance with this procedure.

4.0 References (example)

ANSI/ESD S20.20-2007
ANSI/ESD S541-2003
ESD ADV1.0-1994 – Glossary of Terms

5.0 Definitions (example)

ESD Protected Area (EPA)

A designated environment provided with materials and equipment to limit electrostatic potentials.

6.0 ESD Control Program Plan

This procedure meets the requirements of ANSI/ESD S20.20-2007. The controls referenced in this document have been selected to ensure that ESD sensitive devices (ESDS) that are susceptible to Human Body Model discharges of 100 volts or greater will not be damaged. For the purposes of this ESD program, it is assumed that all ESDS have a Human Body Model ESD sensitivity of greater than or equal to 100 volts. ESDS devices that are more sensitive may require additional control measures.

The basic guidelines that comprise the local ESD control Program are as follows:

1. All semi-conductor electronic devices are considered to be ESD sensitive.
2. All employees that handle unprotected ESD-sensitive products shall have successfully completed the company initial ESD training class and must attend re-certification training every 24 months.
3. All employees shall be grounded when handling unprotected ESD sensitive devices.
4. ESD sensitive products shall be moved between grounded workstations in metallized shielding bags. ESD Sensitive products are only to be handled in an ESD protected area by grounded employees.
5. All ESD control elements must be periodically verified per the compliance verification plan.
6. Non-essential insulators must be removed from the ESD Protected Area (EPA).

7.0 Training Plan

7.1 Initial Training:

All ACME Electronics Factory Ltd. employees who handle ESD sensitive products (whether on a continual or intermittent basis) must attend initial ESD orientation training **before** handling ESD sensitive products.

The initial training classes are provided by the ACME Electronics Factory Ltd. training department personnel. The initial ESD class covers ESD basics as well as a description of the ACME Electronics Factory Ltd. ESD controls. At the conclusion of the ESD training class each employee shall write an ESD comprehension test. The ACME Training department will mark the test and in order to pass the employee must obtain a score of 80%.

If an employee passes the test a training record will be set up in the training database that is controlled by the Training Department. If the employee fails to obtain a score of 80% the employee will have to attend a supplemental class held by the Training Department. The employee will be required to write a second test and obtain a score of 80% in order to pass. If the employee passes the second test a record will be set up in the training database. If the employee fails to obtain a score of 80% on the second test the Human Resources manager will need to make a determination on whether or not the employee will continue their employment with ACME.

7.2 Refresher Training

All ACME Electronics Factory Ltd. employees who handle ESD Sensitive products must receive refresher training once every 24 months. On a monthly basis, the Training department shall prepare a list of employees who require re-training in the next two months. The employees on the list as well as their immediate supervisor will be notified that re-training is required and the affected employee will be invited to attend a re-training session held by the training department. At the conclusion of the re-training session the employee must pass a written test and obtain a score of at least 80%. The training department will update the records for the employees who pass the test. If the employee fails to obtain a score of 80% the procedure outlined in the initial training session will be followed.

If an employee fails to attend a re-training session before their certification period expires, the employee will not be allowed to have access to the manufacturing areas until the re-training session has been successfully completed.

8.0 Compliance Verification Plan

The ESD control program verification requirements established by ACME Electronics Factory Ltd. to control ESD can be found in **Table 1**.

The ESD Coordinator is responsible for ensuring that all of the ESD control items used in the facility (see Table 1) have been qualified per the requirements of tables 2 and 3 in ANSI/ESD S20.20-2007. Product qualification data, to the required test methods and standards, is compiled and maintained by the ESD Coordinator.

The ESD Coordinator is responsible for defining the ESD control items that require periodic verification. The ESD Coordinator is also responsible for the development of the audit procedures as well as the training of any person performing ESD audits.

The ESD Coordinator will ensure that all non-conformances found during the audits have been closed prior to publishing the quarterly audit report to management.

Note: The audit test methods not covered by the ESD Association Technical Report (TR) 53 can be found in Annex 1 of this document.

Table 1 – Compliance Verification Requirements

Technical Control Item	Limits	Test Procedure	Test Frequency	Checked By
Wrist strap (system test)	$R_s < 1.0 \times 10^7 \Omega$	ESD Association publication TR53: Wrist strap section	Daily (before use)	Operator
Footwear	$R_s < 1.0 \times 10^7 \Omega$ Ohms	ESD Association publication TR53: Footwear Section	Daily (before use)	Operator
Flooring	$R_g < 1.0 \times 10^6 \Omega$	ESD Association publication TR53: Flooring Section	Once every 3 months	Site Facilities maintenance
Work surface	$R_g < 1 \times 10^9 \Omega$	ESD Association publication TR53	Once every 3 months	ESD Coordinator
Wrist strap connection point	$R_g < 1 \Omega$	Annex A.1 of this procedure	Once every 3 months	Quality Department
Static Generators	< 2,000 Volts/inch	Annex A.2 of this procedure	Once every 3 months	Quality Department
Shielding bags	Visual indications of damage	Random visual inspection	Once every 3 months	Quality Department
Rs refers to system resistance including person, the wrist band and the grounding cord or ESD footwear Rg refers to resistance to ground				

9.0 ESD Protected Area Requirements

ESD sensitive products will only be handled in an ESD Protected Area.

For the purposes of the ESD control program at ACME Electronics Factory Ltd. the ESD Protected Area (EPA) is defined by yellow floor tape that outlines the borders of the EPA.

The ESD protected work stations within the EPA are identified with a sign indicating that the workstation is ESD protected. Unprotected ESD sensitive devices shall only be handled at an ESD protective workstation by grounded, ESD certified employees.

Visitors to the EPA as well as untrained employees shall be escorted by ESD certified employees. In no instance shall untrained visitors or employees handle unprotected ESD sensitive devices.

Non-essential insulators (insulative items not required in the manufacturing process), including packaging materials, shall be removed from all ESD protected workstations. Process required insulators are permitted at an ESD protective workstation as long as the measured electrostatic field does not exceed 2,000 V/inch (see the measurement procedure in annex 1). If the measured field exceeds 2,000 V/inch the process required insulator must be moved a minimum of 12 inches from the ESD sensitive device.

9.1 Grounding Plan

Equipment (AC) ground shall be used as the ground reference for all ESD control items used by ACME Electronics Factory Ltd. All wrist strap connection points, and work surfaces shall be connected to ground via a common point ground as defined in

ANSI/ESD S6.1-2005. All newly installed work surfaces and wrist strap connection points shall be tested before use to ensure that they are connected to ground.

The ESD floor shall be connected directly to AC ground.

9.2 Personnel Grounding Plan

Personnel shall be connected to ground with either a wrist strap system or, for standing operations, through the ESD floor when wearing approved ESD footwear.

Wrist strap system:

The wrist band must be worn such that there is 360 degrees of contact with the employee's skin. The wrist cord must be plugged into the wrist strap receptacle that is located at every ESD protected work station.

Footwear System:

Employees working at standup operations while handling ESDS must wear ESD footwear that has been qualified by the ESD coordinator per the requirements in ANSI/ESD STM 9.1 and ANSI/ESD STM 97.1.

Note: Product qualification data has shown that the total system resistance of the employee, ESD footwear and flooring is less than 3.5×10^7 ohms when tested per the requirements of ANSI/ESD STM 97.2. This allows the footwear/flooring system used in this facility to follow the "Method 1" qualification and compliance verification requirements as listed in Table 2 of ANSI/ESD S20.20-2007.

Testing:

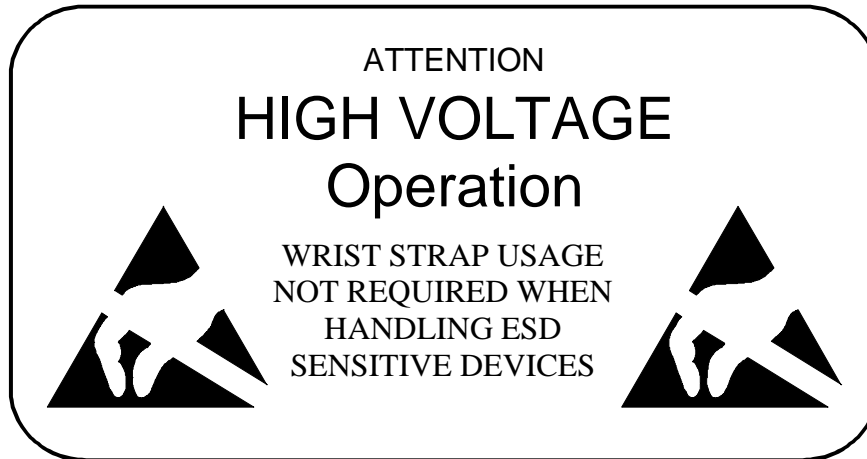
Employees shall test their wrist strap and footwear at least once per day (before use) using the testers located at the entrance to the manufacturing area. If the tester gives a "pass" indication the employee shall initial the log sheet located next to the tester. If the tester gives a "fail" indication the employee shall contact their supervisor or the ESD coordinator. The ESD coordinator or the supervisor will help to determine the cause of the failure. Employees must not handle ESDS until both the wrist strap and footwear have passed the daily test.

Employees who only visit the manufacturing lines periodically must test their wrist strap and footwear on the days when they handle ESD sensitive devices. The testing must be done before ESD sensitive devices are handled. The test log sheet must be initialed (if pass indication is achieved) before the employee handles ESD sensitive devices.

Tailoring Statement:

ACME Electronics Factory Ltd. has one process step where the Personnel grounding rules do not apply. The operation involves personnel who work at the repair operation and work with exposed, powered products. Since there is a risk that the operators might come into contact with dangerous voltages management has decided any person working on this operation must not wear their wrist strap. In addition, an insulative floor mat is installed at this process step to isolate the operators from the ESD floor while

wearing their ESD footwear. The final product is to be handled by the edges and contact with ESDS is to be avoided where possible. As an additional protective measure, an air ionizer has been installed at this location in order to reduce charge levels. The following sign is posted above the workstation to inform personnel of the special handling conditions.



9.3 Work surfaces

All work surfaces within the EPA on which ESDS may be placed shall have a grounded surface that is compliant with Table 1. Any surfaces that do not comply shall be marked to indicate that they are not suitable for holding unprotected ESDS.

9.4 Packaging

Only new metallized shielding bags (qualified per ANSI/ESD S541) shall be used to transport ESD sensitive products from one ESD protected workstation to another. ESD sensitive products must be completely enclosed by the shielding bag. ESD sensitive products are to be removed from the packaging only at an ESD protected work surface by grounded employees.

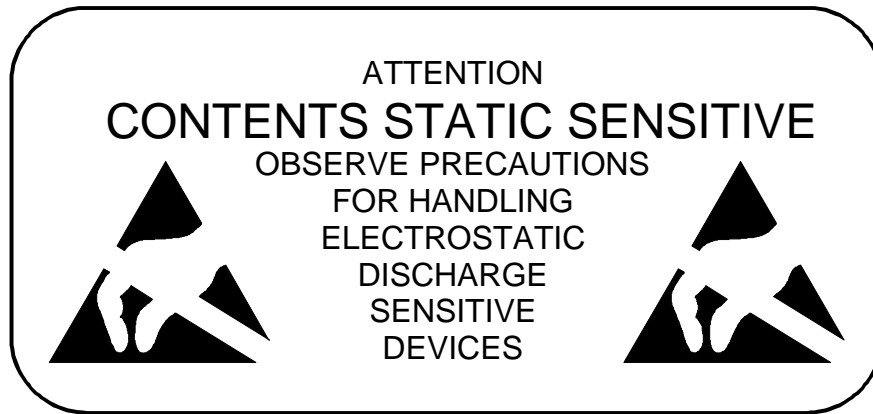
Once the ESD sensitive product has been tested it will be returned to the shielding bag and sealed. The sealed shielding bag will then be placed in a protective container for shipment to the customer.

In the case where specific ESD protective packaging is specified by the customer, by either contract or purchase order, these materials shall be used.

9.5 Marking

ACME Electronics Factory Ltd. has not received any specific marking requirements from its customers. However, in order to ensure that the customer is aware that the product is

ESD sensitive the following label will be used to seal the metallized shielding bag that is used to ship all products to the customer.



ANNEX 1 – Audit Procedures

Annex A.1 – Testing of wrist strap connection point

Equipment: Calibrated multi-meter

1. Connect one lead of the multi-meter to ground.
2. Connect the second lead to the wrist strap connection point.
3. Turn on the multi-meter and read the resistance.
4. If less than 2 Ohms then the reading is acceptable.
5. If greater than 2 Ohms have the wiring connection checked and fixed if necessary.

Annex A.2 – Checking for Static Generators

Equipment: Calibrated electrostatic field meter

1. Turn on, ground and zero the electrostatic field meter.
2. Measure all the items the work area (where the ESD sensitive devices are handled) with the field meter. If the reading exceeds 2,000 V/inch then the non-compliant material must be either:
 - a. Moved 12 inches away from area where ESD sensitive products are handled. or
 - b. Removed from the area completely
3. If the readings are less than 2,000 V/inch then no further action is required.