

ESD Facility Certification Newsletter

by the EOS/ESD Association

December 2015

The ESD Association Facility Certification Program evaluates a facility's ESD program based on industry standard ANSI/ESD S20.20-2014 or IEC 61340-5-1.

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Facility Certification Status

ANSI/ESD S20.20 and IEC 61340-5-1

2015 was a year where your clients could certify their facilities to either the 2007 or 2014 versions of ANSI/ESD S20.20. The ESD Association has been reviewing some of the checklists for Certifying Bodies that have issued 2014 certificates and have noticed some areas in the reporting that require improvement. This issue of the Facility Certification Newsletter will focus on the need for an improved audit focus.

Beginning January 1, 2016, all ESD certification assessments must be to the 2014 version of ANSI/ESD S20.20.

For assessment to ANSI/ESD S20.20-2014, all auditors must use the latest version of the ESD Association checklist which will be dated December 2015. Along with the checklist each auditor is required to use the Checklist Support Booklet (dated December 2015) that has now been sent to each approved Certifying Body as well as each auditor.

For facilities that have been certified to IEC 61340-5-1, it is expected that the new revision of this standard will be approved by the IEC early in 2016. The 2007 version of the IEC standard shall be used for all certification audits in 2016. In 2017, all facilities being certified to IEC 61340-5-1 will be required to follow the 2016 version of the standard. As soon as the IEC standard has been officially released to the public the Facility Certification Committee will issue information to all certifying bodies concerning the changes along with the impact to the certification process.

Setting the Global Standards for Static Control!

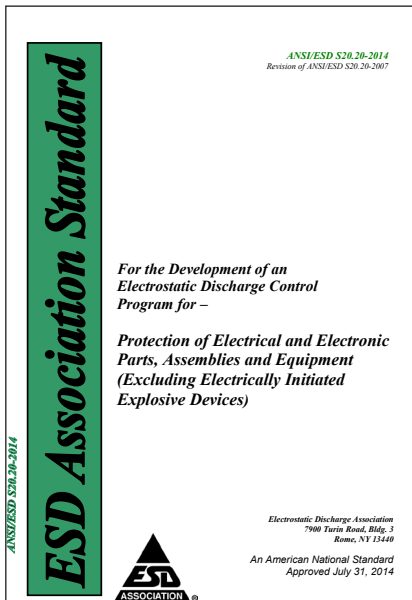
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Major Changes to ANSI/ESD S20.20-2014 and Auditor Expectations



Scope

The limits in previous versions of ANSI/ESD S20.20 only allowed facilities to claim that their installed ANSI/ESD S20.20 process could protect devices that had a Human Body Model (HBM) ESD sensitivity of 100 volts or greater if the test methods and limits from section 8.2 were adhered to.

The Scope of ANSI/ESD S20.20-2014 has been expanded to include the Charged Device Model (CDM) and Isolated Conductors. This means that if a facility complies with the requirements of the 2014 version of ANSI/ESD S20.20 the installed process should be able to safely handle devices that have ESD sensitivity thresholds that are greater than or equal to:

- 100 Volts Human Body Model
- 200 Volts Charged Device Model
- 35 Volts Isolated Conductors

Auditor Expectations: *The auditor must ensure that each of the above ESD sensitivity thresholds have been addressed in the Scope of the client's ESD Control Program when addressing checklist question 3B. If the client wishes to use different values that are greater than those documented in ANSI/ESD S20.20-2014 (i.e. 200 volts HBM) or eliminate one or more of the models from their program, then a tailoring statement is required in the ESD Control Program Plan.*

Product Qualification

Product Qualification of ESD Control Items is not a new requirement but due to its importance, section 7.3 was added to the 2014 version of the standard. All products and materials used with unprotected ESD sensitive devices must be qualified using the appropriate ESD Association Test method and the ESD Control Items must meet the limits established for that technical item as documented in ANSI/ESD S20.20. With the exception of the following, all ESD Control items must be qualified after conditioning in an environment set for 12% relative humidity and a nominal temperature of 23° C. The exceptions are:

- Wrist straps
- Air Ionization
- Soldering Irons

Auditor Expectations: *During the assessment the auditor shall review a sampling of the product qualification records for the ESD control items used. Evidence of qualification can be any of the following:*

- Product specification sheet from the manufacturer
- 3rd party test report
- Internally generated test report

The evidence of product qualification shall contain the following:

- Reference to the required ESD Association test method
- Limits that meet the requirements listed for that technical item in ANSI/ESD S20.20-2014

The 2014 version of ANSI/ESD S20.20 is a significant change from the 2007 version. These changes will have an impact on facilities seeking certification to the 2014 version. A presentation that addresses these changes can be found on the ESD Association's website at this location: <https://www.esda.org/assets/Uploads/WMV/S2020-Changes-Isolated-Conductors.swf>

All certifying bodies should be directing their clients to review this presentation. The following is a brief description of the major changes to the standard and how every assessor must address these new requirements.

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Product Qualification Auditor
Expectations: continued

If the ESD Control items have been qualified in different environmental conditions a tailoring statement must be added to the ESD control program AND the client must present evidence to prove that the temperature and relative humidity values used for qualification are the lowest values typically experienced by the facility over a twelve month period. Note: In the event that a facility had installed the ESD control item before the adoption of ANSI/ESD S20.20 product qualification data does not have to be presented. However, the client must have compliance verification data to show that the ESD control item meets the limits in ANSI/ESD S20.20-2014 over a one-year period in order to account for any periods of low relative humidity. Note: The exception to this is a footwear/flooring system. Product qualification data must be developed for footwear/flooring systems that are used as a primary ground for personnel.

Finally, in the comments section of the checklist, the auditor must list:

- The ESD control items that were checked
- The standard used to qualify the item
- The limit for the ESD control item

Personnel Grounding

There was a major change to the **Personnel Grounding** section of ANSI/ESD S20.20-2014. The new revision requires that system resistance (from person through footwear and floor to ground) and walking tests be performed as part of product qualification if personnel are grounded using a footwear/flooring system. Both tests, as required by ANSI/ESD STM 97.1 and ANSI/ESD STM 97.2, must be performed at 12% relative humidity and 23° C. The testing shall be done on each style of footwear used by the client. If environmental chambers are not available, the client must perform testing at the lowest relative humidity that the facility will experience during the year.

Auditor Expectations: *The auditor must record the system resistance values and the peak walking voltage values for each style of footwear that is checked. This information should be available from the product qualification report prepared by the client. If the client is using a footwear/flooring system as the primary ground for personnel and product qualification data is not available, the auditor shall write a Major Non-conformance against Personnel Grounding.*

Insulators

Section 8.3.1 has added a new limit for process required insulators (insulators that are required by the process) when located closer than 1 inch (2.5 cm) of unprotected ESD sensitive devices. The maximum electrostatic field on these insulators must be less than 125 volts/inch. If it is not possible to keep the field to less than 125 volts/inch the facility must either move the insulator more than 1 inch from the ESD sensitive device or add air ionization or use some other technique to reduce the charge (measured field) on the item to acceptable levels. The addition of this clause has allowed the ESD Association to add Charged Device Model (CDM) to the scope of ANSI/ESD S20.20. If the static field limits are followed facilities can claim that their process can protect devices that have a CDM sensitivity of 200 volts or higher.

Auditor Expectations: *The auditor must have the client measure, on a sample basis, operations where unprotected ESD sensitive devices are handled. The client should measure items within 30 cm of ESD sensitive devices and the static field limit must be less than 2,000 volts/inch. Insulators shall be measured as found without additional handling that is not part of the normal process. Additionally, the auditor should ask the client if the station being checked has operations where ESD sensitive devices must be placed closer than 1 inch from process required insulators. If the answer is "yes", then the static field on that item must be less than 125 volts/inch.*

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Isolated Conductors

Section 8.3.2 was added to the standard to address discharges from charged, ungrounded conductors. The maximum limit for isolated conductors must be less than 35 volts. For facilities seeking certification a process must have been internally assessed at the time the process was released to production. These measurements cannot be made using the meters normally seen by auditors. The company claiming compliance must have purchased (or have access to via an outside supplier or consultant) a contact or non-contact voltmeter. These devices are different from the meters used to measure electrostatic fields per section 8.3.1. A **voltmeter** is required for this measurement because it can measure the voltage on items that are much smaller than an electrostatic field meter can accurately measure. Note: This requirement only applies to items that come into contact with ESD sensitive devices that cannot be grounded either by placing them on a grounded work surface or when held by a grounded operator. See question 25 in the Checklist Question Support booklet for more information.

Auditor Expectations: *The client must have made measurements of their process looking for isolated conductors before releasing the line to production. The auditor must ask for reports that document that these measurements took place and that they used a contact or non-contact voltmeter. The auditor should also ask the client to demonstrate how they made these measurements.*



Work Surfaces

A clarification note was added to table 3 of ANSI/ESD S20.20-2014 in regards to work surfaces that better defines a work surface. A work surface is any surface where an unprotected ESD sensitive device is placed on top. This would apply to items such as conveyors and production aids. These items must meet the same qualification and compliance verification requirements as any work surface.

A minor change concerning work surfaces was also added to the Packaging Section (8.4). A “note” was added to the section to address a question that has been asked by many auditors. Some clients place their ESD sensitive products on top of the packaging materials that they use to protect the product during transport. The surface resistance values for some packaging materials is higher than the resistance to ground requirements for work surfaces. If a client wishes to use

packaging materials as part of the ESD sensitive device handling or assembly, then the package becomes a work surface and must meet the resistance to ground requirements of a work surface. The picture above shows a printed circuit board on top of a static shielding bag. In this situation the shielding bag becomes a work surface and the resistance to ground from the top surface of the bag must be less than 1×10^9 ohms.

Auditor Expectations: *The auditor must have the client demonstrate, via measurement, that the resistance to ground requirements for all work surface (including conveyors, packaging and production aids where unprotected devices are placed) is less than 1×10^9 ohms.*

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New ESD Control Items

The following ESD control items were added to the 2014 version of ANSI/ESD S20.20:

- Wrist Strap Jacks
- Soldering Irons

Wrist Strap Jacks

Wrist Strap Jacks are grounded points where an operator connects their wrist strap cord in order to ground themselves.

The diagram below shows the basic components of the wrist strap jack. The resistance of the wires from the wrist strap jack to ground should be less than 2 ohms. Note: Some manufacturers add a one megohm resistor to the wire. The addition of the one megohm resistor would not be considered to be a non-conformance.

Auditor Expectations: The auditor should be asking the client to measure wrist strap jacks during the on-floor measurement portion of the assessment.

Soldering Irons

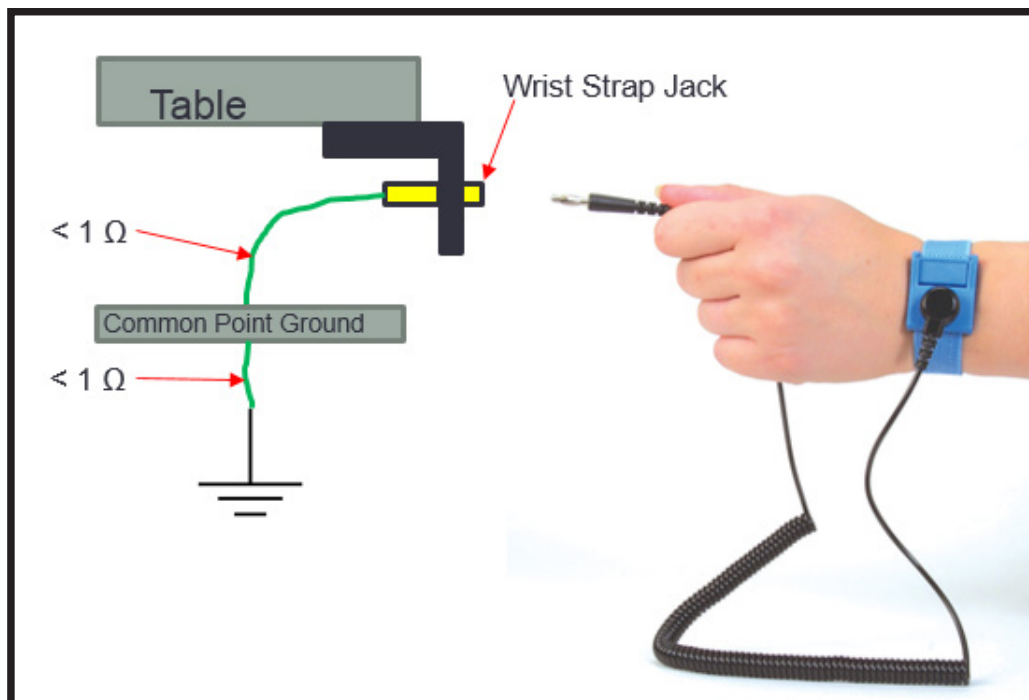
Soldering Irons are a new ESD control item that must be qualified and periodically checked as part of the compliance verification program. The Product Qualification requirements (tip to ground resistance, tip voltage and tip leakage) are based on a recent standard published by the ESD Association ANSI/ESD S13.1. For Compliance Verification testing the client must be able to demonstrate that the tip to ground resistance is less than 10 ohms.

Auditor Expectations: The auditor should be asking the client to measure the tip to ground resistance of some of the soldering irons used during the on-floor measurement portion of the assessment.

Air Ionization

Major changes were made to the air ionization requirement in the 2014 version of ANSI/ESD S20.20. The separate classification for "Room Ionization" systems was dropped from the standard. Based on the 2014 version of the standard ALL ionization systems must now have an offset voltage (ion balance) of less than ± 35 volts.

Auditor Expectations: The auditor is expected to check a sampling of the installed air ionizers. The client must demonstrate that the balance is within specification AND that the positive and negative decay times meet the limits that the client has established in their program. Note: Decay time has a starting and stopping voltage. The client must select these values along with the time required for the voltage to go from the starting to the stopping voltage on the Charged Plate Monitor.



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Review of 2014 Certificates Issued in 2015

The Facility Certification Committee has been reviewing all of the certificates issued to ANSI/ESD S20.20-2014 in 2015 to ensure that the changes described above are being checked adequately.

The following are some of the major concerns found during the review of the checklists and reports submitted by the certifying bodies.

“Question 3B – Does the ESD Control Plan document the lowest level of device ESD sensitivity that the ESD process is capable of handling?”

Many companies that adopt ANSI/ESD S20.20 do not know the ESD sensitivity of the devices that they handle and it is not expected that they attempt to develop that information. However, if they adopt the ANSI/ESD S20.20 standard as written they can claim that their process can handle 100 Volts HBM, 200 Volts CDM and 35 Volts on Isolated Conductors. At a minimum, these three values should be included in the ESD Control Program Plan unless the client has developed a tailoring statement for either not including these values or for using different values. The auditor should confirm that the three models are included in the client's ESD control program plan.

Question 6A – Product Qualification – “Have all ESD Control Items been qualified for use per the ESD Association Standards listed in ANSI/ESD S20.20-2014 (tables 2 and 3)?”

The auditor must review the product qualification evidence compiled by the client. Acceptable evidence: Product Specification Sheet, 3rd party test report or internal test report. If the ESD control item was installed prior to the adoption of ANSI/ESD S20.20, the client must have a

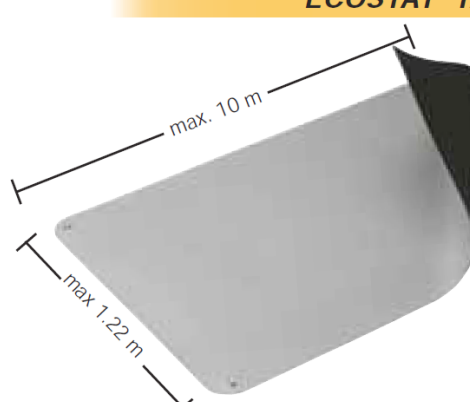
documented tailoring statement and the auditor will have the client measure samples of the installed ESD control item during the assessment to ensure that these items meet the compliance verification limits listed in ANSI/ESD S20.20.

Question 6B – “If Product Qualification data does not reference ESD Association standards can equivalency be demonstrated?”

If the client is using test standards for product qualification other than those required by ANSI/ESD S20.20-2014 then the client must have a documented report that

*demonstrates that the standard used by the client and the one required by ANSI/ESD S20.20 are technically equal. Note: The only exception to this requirement are the standards from the IEC series with a designation of IEC 61340-X-X. These test methods are considered to be technically equivalent to the ESD Association test methods. The following is an excerpt from a European ESD Material supplier who references IEC standard 61340-5-1. In this case the client would **NOT** have to demonstrate why the IEC standard can be used in place of the ANSI test method.*

ECOSTAT® TABLE MATS



- Two layer material
- Rugged synthetic rubber
- Resistant to solder and heat
- Abrasion resistant
- Halogen free
- Elastic
- Volume conductive
- Thickness: 2 mm
- Includes 2 x 10 mm snaps and rounded edges*

Typical resistance to groundable point
 $R_{sp} = 10^6 - 10^7 \text{ ohm}$

IEC EN symbols used throughout this catalogue to define products in compliance with DIN EN 61340-5-1 (2008-07) / IEC 61340-5-1 Ed. 1.0 (2007-08).

If such a report is not available for review then a Major Non-conformance shall be issued. If the client did not use non-ESD Association test methods for product qualification, then the auditor should place an “NA” (not applicable) in this checklist box.

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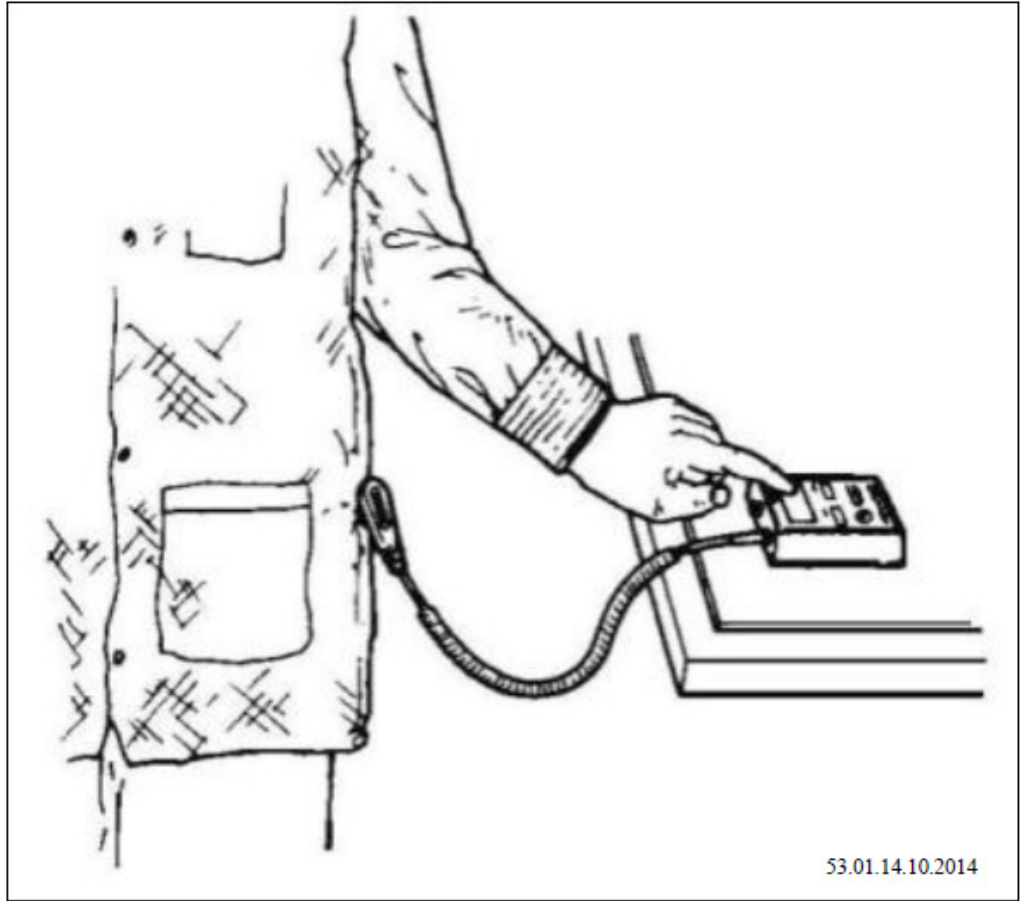
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Question 13 – “If a footwear/flooring system is selected, does it meet the product qualification requirements for System Resistance AND Body Voltage Generation?”

The auditor must review the product qualification reports and document the system resistance (resistance from the operator's hand through their footwear and floor). The auditor must also document the reported peak body voltage of the operator as they walk on the ESD flooring wearing the ESD footwear used at the facility. The peak voltage must be less than 100 volts. Also, the product qualification testing must be conducted at 12% relative humidity. If performed at another relative humidity value the client must have data to show that the humidity value used for qualifying the system is the lowest that the client's facility will typically experience throughout the year.

Question 14 – “If an ESD Static Control Garment System is used to ground personnel, does the garment meet the resistance requirements for a static control garment system AND the wrist strap system requirement from Table 2?”

Most auditor reports reviewed to date have a “Y” for this question. In actuality, most companies do not use Static Control Garment Systems. For this type of a product, the path to ground is from the person to the garment which is connected to ground. The picture above shows the grounding path for a person and how the garment is tested while being worn.



For a “groundable garment” the garment is connected to the wearer's skin and the person is then connected to ground either through the use of a wrist strap or ESD footwear and flooring.

If the client's facility does not use a Static Control Garment system the auditor should place an “N/A” on the checklist

Questions 20, 22, and 23. The auditor must ask the client to make sample measurements in the ESD Protected Area to demonstrate that the static field limits in ANSI/ESD S20.20 are being adhered to.

Question 25 – “Is the voltage on isolated conductors that come into contact with ESDS < 35 volts?”

Most of the audit reports reviewed include a “Y” for this question. However, when reviewing the equipment list a non-contact or a contact voltmeter is not listed. It is imperative that auditor ensure that the client has the correct equipment to measure isolated conductors or the third party that qualified the line used the correct equipment.