

June 2024 Standards Summary Session

Additional Information

- For more information on the Standards Business Unit and the standards development process, please visit <https://www.esda.org/standards/standards-working-groups/#references> > Standards Development Presentation or scan the QR code



- A copy of these slides will be posted on our website <https://www.esda.org/standards/standards-working-groups/#references> > Standards Activity Summaries or scan the QR code



- For more information on recent WG activities, please visit <https://www.esda.org/standards/standards-working-groups> > Committees Drop Down Menu or scan the QR code



WG 1 – Wrist Straps

Currently published documents

- ANSI/ESD S1.1-2021 Wrist Straps
- TR1.0-01 Survey of Wrist Strap Continuous Monitors

Summary of discussions/activities/document reviews during the most recent WG meeting.

- Working on updating the Technical Report to include new technologies and to expand on descriptions of current technologies

Currently published documents

- ANSI/ESD STM2.1-2018 Garments
- ESD TR2.0-01-00 - Consideration for Developing ESD Garment Specifications
- ESD TR2.0-02-00 - Static Electricity Hazards of Triboelectrically Charged Garments

Summary of discussions/activities/document reviews during the most recent WG meeting.

- Worknig on the 5-year review of STM2.1.

Published Documents

- ANSI/ESD STM3.1-2024 - Ionization
- ANSI/ESD SP3.3-2016 - Periodic Verification of Air Ionizers
- ANSI/ESD SP3.4-2016 - Periodic Verification of Air Ionizers Using a Small Test Fixture
- ANSI/ESD SP3.5-2020 - Air Assist Bar Ionizers, Soft X-Ray (Photon) Ionizers, Room Ionization Alternatives, and Non-Airflow Alpha Ionizers

Summary of discussions/activities/document reviews during the most recent WG meeting:

- STM3.1 was re-affirmed to allow for re-writing of the document.
- The document will likely have the current instrument sections, with some modifications to allow for low voltage and higher speed detection.
- SP3.3 & 3.4, while being mostly compliance verification documents, will likely be re-affirmed and updated after STM3.1 is re-written and released.

Currently published documents

- ANSI/ESD STM4.1, “Worksurfaces – Resistance Measurements” (2017)
- ESD TR4.0-01-02, “Survey of Worksurfaces and Grounding Mechanisms” (2002)

Summary of discussions/activities/document reviews during the most recent WG meeting.

- WG discussed and decided on comments of the final WG review on ANSI/ESD STM4.1 (5-year review); document almost ready for submission to TAS

WG 5 – Device Testing

Currently published documents

- ANSI/ESD SP5.0-2023 - Reporting ESD Withstand Levels on Datasheets

Summary of discussions/activities/document reviews during the most recent WG meeting.

- The WG is planning to make changes to both the ANSI/ESDA/JEDEC JS-001/JS-002 documents to allow reuse of HBM-stressed units in CDM testing and CDM-stressed units in HBM testing. Also discussed was the use of step stressing.
 - Finalized wording that will be added to both JS-001 and JS-002 that will allow the reuse – appropriate cautions will be added
 - It is still recommended to use fresh units for each stress – but new wording will allow reuse
- Good discussion on the need for more guidance defining what is a failure.
 - Both JS-001 and JS-002 indicate the need to pass parametric/functional testing pre/post ESD zapping
 - Is it possible to give more guidance on parametric shifts? A TR may be an option – will need a champion to drive this if WG feels there is value.

JWG HBM - Documents and Activities

Currently published documents

- ANSI/ESDA/JEDEC JS001-2023 - Human Body Model (HBM) – Device Level
- ESD JTR001-01-12 – User Guide of ANSI/ESDA/JEDEC JS-001 Human Body Model Testing of Integrated Circuits
- ANSI/ESD SP5.1.3-2022 - Human Body Model (HBM) – A Method for Randomly Selecting Pin Pairs

Documents in review

- ANSI/ESDA/JEDEC JS001 → 2024 limited ballot @ Jedec BoD
 - Introduced an alternative decay time calculation method.
 - Created better waveform verification equipment specifications.
 - Created better descriptions of pre-pulse voltage rise detection test and trailing pulse detection apparatus.
- ESD JTR001-01 – User Guide → Complete revision @ TAS
- ANSI/ESD SP5.1.4 – A Method for Random Sampling of Power Pins → New SP @ Industry review

Current Top 3 WG activities

- Pin Grouping and Resistance Measurement Review
- Cloned IO allowance review
- Round Robin testing to elevate SP5.1.4 to STM5.1.4

- Pin Grouping and Resistance Measurement Review
 - Three allowances
 - Package connection
 - Pin grouping (<3 Ohm)
 - APL connection (<1 Ohm)
 - Allowances introduced in the documents during the time
 - Allowances rational review → internal document
 - Proposals to be agreed
 - New definitions
 - Text review
- Cloned IO allowance review
 - Cloned IO definition
 - Definition to be modified to address high buses resistance
 - Engineering judgment on applicability of the methodology
 - Busses resistance limit specification
 - Additional pins to be selected based on design (to be included in the statistic?)
 - ATE in addition to curve trace for functional failure
 - V1 and VM are crucial for statistical approach and need to be confirmed
 - Proposal 1: ATE @ 1.5SPL and VM
 - Proposal 2: ATE @ V1-100V and VM

- Round Robin testing to elevate SP5.1.4 to STM5.1.4
 - Parts
 - Parts shall be distributed to labs in different sites/companies
 - Either packaged parts, die or wafer
 - At least one supply shall have more than one pin/ball
 - Connection shall be in the die only having resistance > 1 ohm and < 3 ohm
 - Device shall have at least 10 IOs
 - Failure shall be detectable using curve trace
 - Otherwise, preliminary tests shall be done to identify exact failure level with ATE and parts shall be tested at different level and sent for ATE
 - Laboratories
 - Laboratories shall have a 2-channel tester available

If interested, please contact HBM chairs or ESDA HQ

- Parking lot/walk-in
 - Revisit JS001 to incorporate JTR reference
 - Add in a definition for “positive clamp test socket” and “non-positive clamp fixtures” in section 3.
 - Shall/Should use parts already used for another test → WG 5.0
 - Cannot discount failure if device passes simply changing test table or pin association
 - Inductive connection
 - SP5.1.1 and SP5.1.2 withdrawal
 - JTR001
 - How to report tester setting?
 - Delay between zaps
 - Pin/Polarity Partitioning
 - Reverse pin/ Reverse polarity
 - Continuity
 - Thermal pads

Currently published documents

- ANSI/ESDA/JEDEC JS-002-2022 – Joint Standard - Charged Device Model (CDM) – Device Level. 2024 update draft in industry review.
- ESDA/JEDEC Joint Technical Report - JTR002-01 CDM User Guide. 2024 update to be published when JS-002-2024 is published.
- ANSI/ESD SP5.3.1 – Contact CDM (50 ohm)
- ANSI/ESD SP5.3.3 – Low Impedance Contact CDM (LICCDM)
- CC-TLP SP5.3.4-2022 – Capacitively Coupled Transmission Line Pulsing as an Alternative CDM Characterization Method
- ESD TR 5.3.1-01-18 - Contact Charged Device Model (CCDM) Versus Field Induced CDM (FICDM) A Case Study

Summary of discussions/activities/document reviews during the most recent WG meeting.

- Bare Die TR Update – TR draft nearing completion, JWG review in summer before September TAS meeting
- CC-TLP Round Robin Experiment: updated Infineon initial plan presented – JWG discussion, plan for further meetings to fully define experiment and statistical needs
- 3-zap vs. 1-zap CDM – presented update from AEC Reliability Workshop presentation, JWG discussed / planned next steps for AEC involvement to change AEC Q100-011 to allow single zap

WG 5.5 – Transmission Line Pulse (TLP)

Currently published documents

- ANSI/ESD STM5.5.1-2022, the standard test method for (VF-)TLP
- ESDTR5.5-04-23, the user and application guide for (VF-)TLP
- ESDTR5.5-05-20, technical report on transient analysis with TLP
- 3 older technical reports

Current focus

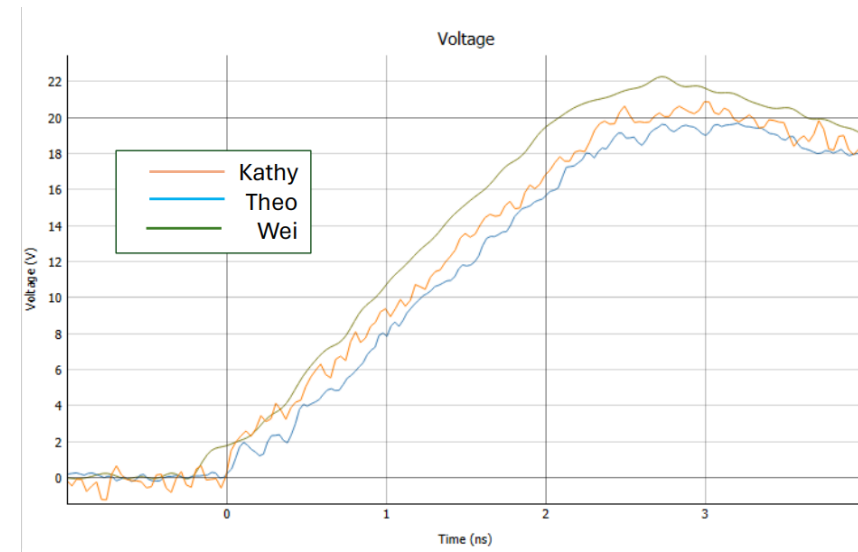
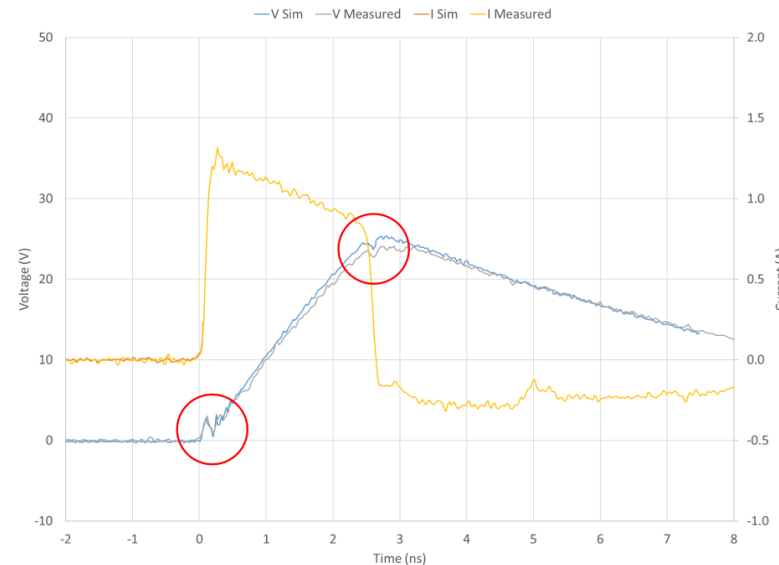
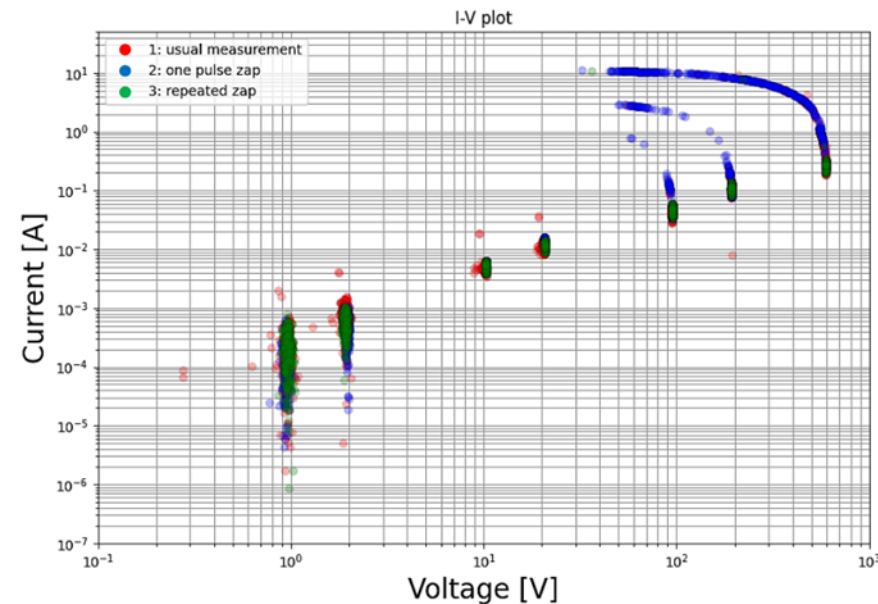
- Working on SP for use of VF-TLP for transient response analysis
 - Discussion on suitable definition of transient region and overshoot
 - Question: do we need additional calibration on top of the standard quasi static calibration?
 - Preliminary analysis of collected data using measurements on L and C DUT with different VF-TLP set-ups → simulations vs. measurements, data comparison among different labs and set-ups
- Working on TR on statistical applications of TLP methods
 - Preliminary variability analysis for VF-TLP Kelvin measurements on Open and Short, using different procedures for applying stress on DUTs (403 dies, 7 voltage levels per measurement)
- Above 2 topics are addressed by 2 separate writing teams
- Example results on next slide

WG 5.5 – TLP - Examples

- Marko Simicic (IMEC)
- Variability for 3 ns pulses with 200 ps rise time applied on Open, using 3 different stress procedures (usual measurement, one pulse zap, repeated zap)

- Robert Ashton
- 2.5 ns pulse with 100 ps rise time applied on 100 pF capacitor. Comparison of measured waveforms with simulations (0.2 nH parasitic inductance)

- Leonardo Di Biccari (ST)
- 2.5 ns pulse with 100 ps rise time applied on 100 pF capacitor. Compared voltage waveforms among 3 different labs and set-ups



WG 5.6 – Human Metal Model (HMM)

Currently published documents

- ESD TR5.6-01-09 Human Metal Model – A technical report (TR) describing the motivation for writing ESD SP5.6
- ESD SP5.6-2019 Human Metal Model – A standard practice (SP) describing a best practice for stressing components with IEC 61000-4-2 waveform

Summary of discussions/activities/document reviews during the most recent WG meeting.

- Working on updates to HMM technical report TR5.6-02-24 after TAS and an industry user review
 - Including positive feedback about the document
 - Suggestions for better measurement techniques
 - Will add on PCB current probes to document
 - Will include section on advanced measurement techniques
- WG actions:
 - Writing team will adjudicate comments
 - Send for WG review before return to TAS
 - Virtual meetings as needed
 - After TR, review HMM Standard Practice > Go dormant?

Currently published documents

- ANSI/ESD STM7.1-2020 – Flooring Systems – Resistive Characterization
- ESD TR7.0-01-23 – Protective Flooring Systems

Summary of discussions/activities/document reviews during the most recent WG meeting.

- WG 7 is developing a training module based on the contents of TR7.0.

WG 11- Packaging

Currently published documents:

- ANSI/ESD S11.4 – Bags
- ANSI/ESD STM11.11 and 11.12 – Surface and Volume Resistance
- ANSU/ESD STM11.13 – Two-Point Probe
- ANSI/ESD S541 – Packaging
- ANSI/ESD STM11.31 – Bags – Discharge Shielding

Summary of discussions/activities/document reviews during the most recent WG meeting.

- Review TAS comments on DS541 and DSTM11.31. Substantial changes will be made to update both documents. In DS541 discussion revolved around the property “Low Charging”.
- In DSTM11.31, the discharge wave form verification will be moved to Annex since test is not done (normally) by end-users. Those that make their own testers still need to do this so the Annex will give that information. Discussion about internal bag waveform analysis needs some additional information to make it more useful in an Informational Annex.

Currently published documents

- ANSI/ESD STM12.1 “Seating – Resistance Measurements” (2019)

Summary of discussions/activities/document reviews during the most recent WG meeting.

- WG reviewed and adjudicated TAS comments on ANSI/ESD STM12.1
- ANSI/ESD STM12.1 is ready for submission to STDCOM
- Topics identified in TAS review to be discussed/addressed in next revision of ANSI/ESD STM12.1 require significant technical work of WG:
 - Clarify need of resistance measurements of all components of a chair, particularly footrest etc.
 - Extending scope of document to chairs with resistance to groundable point less than 1.0×10^4 ohms (metal/conductive chairs)

Currently published documents

- ANSI/ESD S13.1-2019 - Electrical Soldering/Desoldering Hand Tools
- ESD TR13.0-01-99 - EOS Safe Soldering Iron Requirements

Summary of discussions/activities/document reviews during the most recent WG meeting.

- S13.1 – Reviewed the need to update this document now that it is in the 5year review. This document needs to take precedence over the work on TR13.0.
 - Add Verification section
 - Align verification and point to TR53
 - Wording updates
 - Review need to keep this document as a S, or remove limits (already in S20.20) and move the document to a STM
- TR13.0 – Discussed continued work and updating for the document. Specifically, the need to update it with two test methods. No updates were done on the document shared at the meeting. It was the opinion of the working group that there was a different, more updated document.
 1. Point-to-Point teste capturing the concern of conductive contact point with ESDS item.
 2. System level test capturing the concern of charged person causing an injection of charge into the ESDS item.
 3. A guest in the meeting brought up the need to consider noise on ground as an EOS possibility. Information has been sent and will be reviewed.

Currently published documents

- **TR14.01** Calculation of Uncertainty Associated With Measurement of Electrostatic Discharge (ESD) Current (Formally TR-07-00)
- **TR14.02** System Level Electrostatic Discharge (ESD) Simulator Verification (Formally SP14.1)
- **SP14.5** Near Field Immunity Scanning - Component/Module/PCB Level (EMC/ESD Scanning)
- Meeting focused on a proposed Direct Pin Injection test method
 - Although the IEC61000-4-2 standard states that this method should not be used directly on connector pins, device manufacturers are being asked to provide test levels on external connection pins
 - Discussing Direction Pin Injection testing, brings up the question as to whether CDE (Cable Discharge Event) are simply just another stimulus type of Direct Pin Injection testing?
- Industry Council Survey on Direct Pin Injection testing
 - To drive this testing method further the Industry Council created a survey to gather additional information on the testing requirement.

- New Business Discussion
 - During the discussions on a Direct Pin Injection test method, concerns were raised that developing a new test method may drive users of the method to “misuse or misunderstand” the testing requirement.
 - A member mentioned, they have seen this on other methods, where customers will request testing based on a “comments” made within a document.

- A suggestion was made to write a “Position Statement” on this, which could be made available on the ESDA website and could be used by suppliers to help defend against unrealistic requests.
 - A sub-team will draft a statement and provide to members for review.

Currently published documents

- ANSI/ESD STM15.1-2019 - Methods for Resistance Measurement of Gloves and Finger Cots
- ESD TR15.0-01-99 - ESD Glove and Finger Cots

Summary of discussions/activities/document reviews during the most recent WG meeting.

- Focused on the 5-year review of ANSI/ESD STM15.1.
- Review has been completed through the main body of the document and the next meeting will focus on completing the Annex reviews.
- Discussion in the meeting on options to verify the setup before starting testing. WG will need to determine the best options to address this and add it to WIP15.1 as part of this update.

Currently published documents

- ANSI/ESD SP17.1, “Process Assessment Techniques” (2020)
- ANSI/ESD SP10.1, “Automated Handling Equipment (AHE)” (2016)
- ESD TR17.0-01-15, “For ESD Process Assessment Methodologies in Electronic Production Lines – Best Practices Used in Industry” (2015)

Summary of discussions/activities/document reviews during the most recent WG meeting.

- WG reviewed and adjudicated TAS comments on ANSI/ESD STM12.1
- ANSI/ESD STM12.1 is ready for submission to STDCOM
- Topics identified in TAS review to be discussed / addressed in next revision of ANSI/ESD STM12.1 require significant technical work of WG:
 - Clarify need of resistance measurements of all components of a chair, particularly footrest etc.
 - Extending scope of document to chairs with resistance to groundable point less than 1.0×10^4 ohms (metal / conductive chairs)

Currently published documents

- ESD TR18.0-01-14 ESDA Technical Report for ESD Electronic Design Automation Checks
- ESD TR18.0-02-20 ESDA Technical Report for Latch-Up Electronic Design Automation

- Bi-weekly virtual meetings
- Currently WG18 has been working on:
 - New version of ESD TR18.0-01 – main activity for WG18
 - Planned to submit new version to TAS by August 2024
- Future activity:
 - Contribution on EDA verification flow item in heterogeneous/3D integration document

WG 18 – EDA – ONGOING ACTIVITIES

- New ESD TR18.0-01 version covers all verification types
 - Introduction – entire verification Flow UNDER FINALIZATION
 - Schematic-based static topological FINALIZED
 - Layout-based FINALIZED
 - Package FINALIZED
 - System UNDER FINALIZATION
 - Spice FINALIZED
 - TCAD UNDER FINALIZATION
- EDA INTERACTIVE WORKSHOP AT THE EOS/ESD Symposium 2024
 - Presentation by WG18 in form of overview/advertisement of the TR content
 - It will follow the structure of the report with interactive pauses between the chapters

WG 19 – High Reliability

Currently published documents

- ESD TR19.0-01-22 - Development of an Electrostatic Discharge Control Program for High-Reliability Electrical and Electronic Parts, Assemblies, and Equipment (Excluding Electrically Initiated Explosive Devices)

Summary of discussions/activities/document reviews during the most recent WG meeting.

- WG19 was reactivated to consider writing a Standard Practice document. This document will provide more best practice guidance for implementing and maintaining a high-reliability ESD control program.
- For the SP document, ESD TR19 was used as the beginning template.
- The work statement was approved by TAS and added to the document.
- It was discussed that the guiding principle in a high-reliability ESD control program is risk-mitigation. Risk is mitigated by various methods including redundancy, properly defining and upgrading process capability, etc.
- The document will be divided into two general areas:
 1. Process Risk Assessment and alignment of the process with the sensitivity of the devices being handled.
 2. Verification and validation of processes and controls. Most of these concerns are addressed in the organization's quality management systems.

WG 22 – ESD Parameters

Currently published documents

- TR22 0-01-14 Relevant ESD Foundry Parameters for Seamless ESD Design and Verification Flow
- TR22 0-02-18 Relevant ESD Parameters for Seamless ESD Design and Verification Flow – Part 2 – ESD Parameters from IP providers

Summary of discussions/activities/document reviews during the most recent WG meeting.

- Working on updates to TR22 0-01-2x (2nd revision of TR22 0-01-14) following TAS review of comments
 - About 300 comments from TAS. Highlights of the comments and updates to the document, reviewed in the VM meeting
 - Response to TAS on certain comments reviewed; 'No change' items reviewed and agreed. WG discussion on additional selected items not completed and an additional VM may be scheduled before the Sep. f2f WG meeting.
 - Target is to conclude and review the updated 'draft' following TAS comments and modification and present in Sep. f2f WG meeting.
- Kickoff of 2nd revision of TR22-02-18
 - Suggested updates and new subjects discussed again
 - 'Chapter teams' and leaders discussed

Currently published documents

- ESD TR26.0-01-23 – Behavioral IC Modeling to Perform System Level ESD Simulations – General Description and Trends
- ESD TR26.0-02-24 – Quasistatic Model Definition – Building Model

Summary of discussions/activities/document reviews during the most recent WG meeting.

- Presentation of current measurement status for TR26.02 revised
 - CAN application
 - USB3 application
- Presentation of some USB3 modeling
- Finding volunteers to contribute to TR26.02 revised

Currently published documents

- ANSI/ESD SP27.1-2018 For the Recommended Information Flow for Potential EOS Issues between Automotive OEM, Tier 1, and Semiconductor Manufacturers.

Summary of discussions/activities/document reviews during the most recent WG meeting.

- Alignment on direction of SP27.1.
 - Reaffirm current revision due to bandwidth constraints.
 - Begin work on draft revision of SP27.1 to better harmonize with VDA equivalent (i.e., simplify to two levels).
 - Reach out to ESDA Automotive Committee to engage with industry, specifically USCAR, for re-engagement on SP27.1 direction and approval – or we will remove them from the document.
- WIP TR27.1 update and request for support to complete the document.

Published Documents

- None

Summary of discussions/activities/document reviews during the most recent WG meeting:

- TR28 was reviewed for formatting – some sections were moved around to read better.
- Figures were reviewed, and a list was made of needed changes.
- Plans are to update the document and submit it to the working group for review so that TAS can get the document by September.

Currently published documents

- ESD TR29.0-01-24 - Guidance for Control of Electrostatic Hazards in Healthcare Facilities

Summary of discussions/activities/document reviews during the most recent WG meeting.

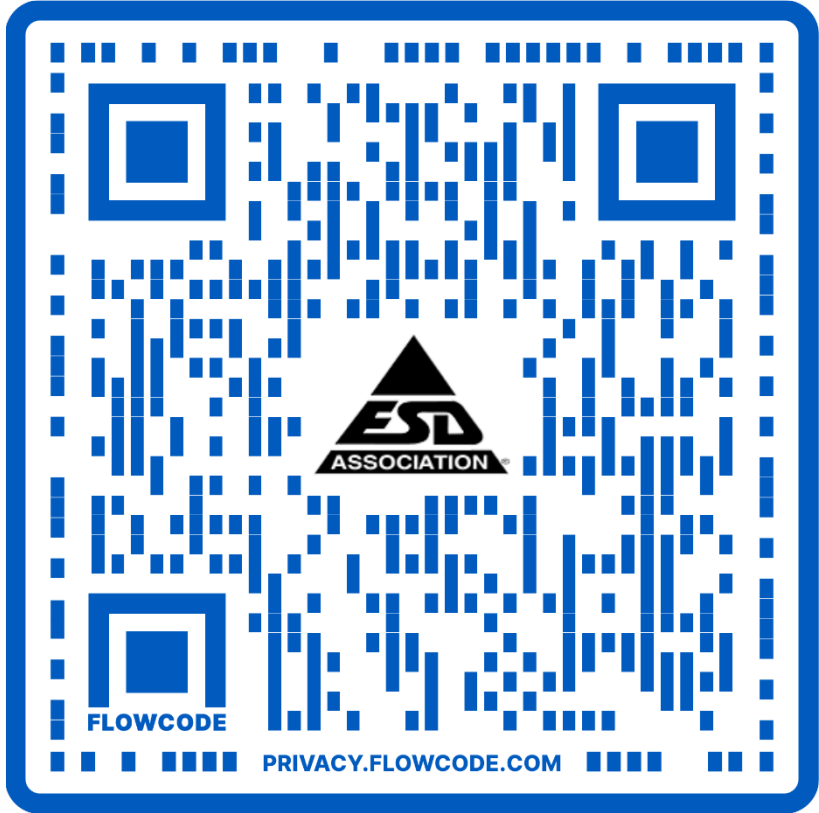
- New technical report was published

Currently published documents

- ANSI/ESD STM97.1-2015 - Footwear/Flooring System – Resistance Measurement in Combination with a Person
- ANSI/ESD STM97.2-2016 - Footwear/Flooring System – Voltage Measurement in Combination with a Person

Summary of discussions/activities/document reviews during the most recent WG meeting.

- The WG spent the two-hour meeting focused on the review of an updated WIP97.1 document.
- Significant updates have been completed – a new section to address new footwear has been added along with a new Annex focused on verification of the setup before testing begins.
- Review completed in the meeting and WIP97.1 will be sent to the WG for a final review with updates from the meeting.



Our next meeting is during the meeting series on September 10-14, 2024, in Reno, NV. The full meeting schedule is available on the website under Events or by scanning the QR code.