

# EOS/ESD Association Regional Tutorials

Co-Sponsored by Systech Technology and Trading JSC

**November 14-16, 2017**

**Saigon Prince Hotel**

**Ho Chi Minh City, Vietnam**

**NOVEMBER 14, 2017**

## **ESD Basics**

**8:30 a.m. - 12:00 p.m.**

*Instructor: Terry Welscher, Dangelmayer Associates LLC*

This tutorial provides the foundation material for understanding electrostatics and ESD and their role in the manufacturing and handling of ESD sensitive devices. The fundamental properties of charge, electric fields, voltage, capacitance, and current are discussed with a view towards understanding key electrostatic phenomena and electrical processes. An overview of device failure mechanisms is presented, including how these models impact ESD control programs. Finally, the course provides an overview of ESD control procedures during handling and manufacturing. The presentation includes in-class demonstrations, videos, and animated slides.

Some sample topics covered in this course are:

- Definitions and relationships among important electrical and mechanical properties
- Causes of charge generation and decay
- Electric fields and voltages
- Role of capacitance in ESD ( $Q=CV$ )
- Review of ESD failure models (CDM and HBM)
- Understanding and demonstrating electrostatic induction
- Utility and limitations of air ionization
- Properties of effective ESD control products and materials

## **ESD Control Workstations: Set-up, Practical Considerations & Measurements (FC155)**

**1:00 p.m. - 4:30 p.m.**

*Instructor: Ginger Hansel, Dangelmayer Associates LLC*

The complexity of properly installing workstations is often underestimated, On the 'surface' it appears to be a simple installation of an ESD static dissipative mat or ESD hard laminate. However, there are important issues learned from years of experience that impact cost, durability, ESD performance, maintenance and complain verification. A good ESD control workstation is the cornerstone of ESD Program Management (EPM). Workstations used in processing ESD susceptible items are intended to maintain a near zero potential by providing ground paths for basic components of the workstation and a connection point for personnel grounding apparatus. The workstation should provide protection from CDM (Charged Device Model) ESD as well as HBM (Human Body Model). This practical tutorial will teach you how to set-up an effective ESD controlled workstation that accomplishes these goals. It will cover selection and qualification of the required materials and how to install them correctly. Other workstation issues will be discussed including: application of ionization, garment grounding, ESD chairs, handling containers, tools and compliance verification consistent with ESD TR53.

**Setting the Global Standards for Static Control!**

EOS/ESD Association, Inc. 7900 Turin Rd., Bldg. 3 Rome, NY 13440-2069, USA

PH +1-315-339-6937 • Email: [info@esda.org](mailto:info@esda.org) • [www.esda.org](http://www.esda.org)



# EOS/ESD Association Regional Tutorials Ho Chi Minh City, Vietnam, November 14-16, 2017

**NOVEMBER 15, 2017**

## **How To's of In-Plant ESD Auditing and Evaluation Measurements (FC101)**

**8:30 a.m. - 4:30 p.m. Certification: PrM**

*Instructors: Terry Welsher, Ginger Hansel, Dangelmayer Associates LLC*

This program reviews the evaluation and periodic verification (audit) measurement procedures for the technical requirements specified in the ANSI/ESD S20.20 ESD program development standard. Detailed explanation of instruments, fixtures, and accessories function and usage are provided. Then, the details of "How to" measure are explained and demonstrated. Measurements include those listed in Table 1: Grounding/Equipotential Bonding Requirements; Table 2: Personnel Grounding Requirements; and Table 3: EPA/ESD Control Items. These recommended measurement procedures confirm the proper operation and use of ESD control products and materials selected as part of a facility's S20.20 ESD control program.

Some sample topics covered in this course are:

- ANSI/ESD S20.20 Technical Control Requirements
- Program Manager's Approach to Instrumentation and Applications
- Testing Ground Circuits and Assessing Connections
- Essential Resistance Measurement Procedures and Concerns
- Electrostatic Field and Voltage Measurements
- Personnel Grounding Considerations vs. ESD Control Points
- Product Installation Baseline Measurements
- Evaluation, Acceptance, and Audit Procedures for: Ground Systems, Floors, Worksurfaces, Equipment, Personnel Grounding, Garments, Materials, Production Aids, Packaging, and Ionization Devices
- Electrostatic Analysis Measurements including Worksurface Suppression, Footwear/Flooring, and Ionization Decay

*This class qualifies for Program Manager Certification. Details at [www.esda.org/certification/](http://www.esda.org/certification/).*

**NOVEMBER 16, 2017**

## **Hands-on ESD Measurements & Instruments-Uses and Pitfalls (FC150)**

**8:30 a.m. - 12:00 p.m.**

*Instructor: Ginger Hansel, Dangelmayer Associates LLC*

Accurate data is the foundation of effective ESD program management. This hands-on tutorial will explain and demonstrate the proper use of ESD test equipment such as static locators, resistance meters, charge plate monitors, and event detectors. We will examine pitfalls of using these common instruments that can result in an incorrect representation of the ESD risk. For example, static locators can give misleading readings if the effects of voltage suppression are not taken into account. We will also discuss the effective use of ionization since ionizers that are not measured, maintained, and located correctly may contribute ESD hazards to the work area. Each student will participate in class exercises to perform these tests. The hands-on experience is the best way to understand the seriousness of the pitfalls and the benefits to taking the proper precautions. What you learn will help you avoid frequent auditing problems and improve your compliance verification program.

## **ESD Controls for CDM and Ultra-Sensitive Devices and Circuit Boards (FC361)**

**1:00 p.m. - 4:30 p.m.**

*Instructor: Terry Welsher, Dangelmayer Associates LLC*

Advanced ESD Controls and Auditing Measurements for Charged-Device Model (CDM) and ultra-sensitive (Class 0) devices and circuit boards are not well known and there are many technical and strategic pitfalls that must be avoided. This tutorial presents practices which address these issues. The CDM and similar events such as Charge-Board Event (CBE) and Cable Discharge Event (CDE) will be described. Industry definitions (threshold levels) for Class 0 will be described and the history of their use reviewed. Students will learn the additional controls and measurements that are needed for CDM and Class 0 devices; how to avoid common pitfalls; and how to use data successfully. Advanced measurements will be described including event detection and high speed current measurements. Students will learn when each measurement type is useful. Compelling case studies will illustrate these techniques and the success they produce. Examples of SOPs (Special Operating Procedures) developed for specific applications will also be discussed.

This tutorial is highly interactive with live demonstrations, in-plant photographs, and video clips. Students are encouraged to ask questions and actively participate in the discussions. References to technical literature on CDM and ultra-sensitive devices will be included.

**Setting the Global Standards for Static Control!**

EOS/ESD Association, Inc. 7900 Turin Rd., Bldg. 3 Rome, NY 13440-2069, USA  
PH +1-315-339-6937 • Email: [info@esda.org](mailto:info@esda.org) • [www.esda.org](http://www.esda.org)



# EOS/ESD Association Regional Tutorials

## Ho Chi Minh City, Vietnam, November 14-16, 2017

### ABOUT THE INSTRUCTORS



Ginger Hansel joined Motorola's Semiconductor Products Sector in 1981 as a Test Process/Equipment Engineer to analyze and improve manufacturing operations. She founded and led the manufacturing ESD control team that trained, audited, qualified materials, and established innovative solutions throughout the semiconductor sector. Under her leadership, the team reduced a 40% failure rate in one test operation to almost zero through the targeted introduction of specific ESD control materials and ESD Awareness training. Ginger brought ESD awareness to her other roles as Engineering Section Leader, Technical Training Manager, QA Engineer, Business Metrics Engineer, Data and Document Control Manager, Program Manager and Technical Product Marketing Manager. Ginger retired from Motorola/Freescale in 2004 and became Director of Marketing and Program Management with the ESD consulting group, Dangelmayer Associates.

She has published numerous magazine articles and technical papers on effective ESD control programs and awareness training; examples include "The Production Operator: Weak Link or Warrior in the ESD Battle" and "Cost Effective Failure Analysis Method for Detecting Failure Site Associated with Extremely Small Leakage". She has taught seminars, workshops and webinars around the country and abroad. For over 35 years, Ginger has held leadership positions in the EOS/ESD Association such as President, Board of Directors, Chair of the Education Business Unit and has served on the Steering, Technical Program, Standards, and other committees. She is currently the Senior Vice President of the Association and Chair of the Services Business Unit Group.

Ginger initiated the NARTE ESD Certification in 1992 and is a certified ESD Control Engineer. She is currently on the Board of Directors for the Texas ESD Association. Ms. Hansel received a BS in Natural Sciences (Psychology) and a BS in Electrical Engineering Technology, both from the University of Houston. She received her MBA (Executive Option II program) from the University of Texas.



Dr. Terry L. Welsher retired from Lucent Technologies-Bell Laboratories Engineering Research Center in 2001, as the director of the quality, test, & reliability department. He began his career in Bell Labs in 1978; where he worked on electrical conduction mechanisms in insulating polymers and electrolytic corrosion failure mechanisms in electrical interconnection materials. In 1984, he was appointed distinguished member of technical staff for his work in these fields. In 1986, he was promoted to technical manager to re-constitute the Bell Laboratories core expertise in electrostatic discharge (ESD). The newly formed group proceeded to produce a string of ground-breaking contributions to the field and played a key role in advancing industry standards. In 1994, he broadened his group's activities to all aspects of hardware reliability for Lucent Technologies with special emphasis in environmental stress testing (EST) and product reliability prediction and planning. In 1997, he was promoted to director of the quality, test & reliability center of excellence where he directed the development and deployment of product quality, test and reliability assurance practices for Lucent Technologies business units. This work included design for testability of integrated circuits, board

and system level test and diagnosis and special techniques for testing of RF and optoelectronic systems and components. After leaving Lucent, he became reliability director for LaserSharp Corporation, an optical fiber laser amplifier company, where he was responsible for product quality, reliability, and compliance. Since 2004, he has been senior vice president of Dangelmayer Associates, LLC, an EOS/ESD consulting firm.

Dr. Welsher was chairman of the ESD Association standards committee 1988-1989. He was technical program chair in 1991, vice general chair in 1992, and general chair in 1993 of the EOS/ESD Symposium. He served as member of the Symposium board of directors 1993-1995. He has also been active in quality standards and road mapping activities with Sematech, the EOS/ESD Association, and the JEDEC 14 quality and reliability committee. He served on the board of directors of JEDEC 1999-2001. He is currently co-chair of the joint JEDEC/ESDA HBM and CDM ESD working groups, president of the EOS/ESD Association, and a member of the advisory board of iNARTE, a telecommunications technical certification organization. Recently, he has led the effort to harmonize and merge JEDEC and ESDA device testing standards. He holds a BS in chemistry from Florida State University and a PhD in chemical physics from the University of Texas at Austin. He is author or co-author of fifty papers in solid state physics, applied mathematics, organic chemistry, electronics reliability, and electrostatic discharge.

**Setting the Global Standards for Static Control!**

EOS/ESD Association, Inc. 7900 Turin Rd., Bldg. 3 Rome, NY 13440-2069, USA  
PH +1-315-339-6937 • Email: [info@esda.org](mailto:info@esda.org) • [www.esda.org](http://www.esda.org)



# REGISTRATION

## EOS/ESD Association Regional Tutorials

Co-Sponsored by System Technology and Trading JSC

November 14-16, 2017

Saigon Prince Hotel, Ho Chi Minh City, Vietnam

**Register Online at [www.esda.org/events/calendar/](http://www.esda.org/events/calendar/)**

Please Print or Type (Your name and company will appear on badge and/or certificate exactly as written below.)

Last Name: \_\_\_\_\_ First Name: \_\_\_\_\_

Company Name: \_\_\_\_\_

Street: \_\_\_\_\_ City: \_\_\_\_\_

State/Province: \_\_\_\_\_ Country: \_\_\_\_\_ Zip/Postal Code: \_\_\_\_\_

Phone: \_\_\_\_\_ Email: \_\_\_\_\_

**All Three Tutorial Days-November 14-16, 2017 23,471,050 VND / 1020 USD**

Credit card number: \_\_\_\_\_ Security code: \_\_\_\_\_

Name on card: \_\_\_\_\_ Expiration date: \_\_\_\_\_

Cardholder's signature: \_\_\_\_\_

Billing Address \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip/Postal Code: \_\_\_\_\_

**Payment** • Company purchase orders not accepted.

### Registration Information

For credit card payments:

Register online at:

**ESD Association**

<http://www.esda.org/events/calendar/>

Phone: +1 (315) 339-6937

Email: [info@esda.org](mailto:info@esda.org)

### Hotel Information

#### Saigon Prince Hotel

63 Nguyen Hue Boulevard District 1  
Ho Chi Minh City, Vietnam

[www.saigonprincehotel.com](http://www.saigonprincehotel.com)  
[info@saigonprincehotel.com](mailto:info@saigonprincehotel.com)  
84 8 3822 2999

### For other forms of payment Contact:

**Dao Duy Luan**

[luandd@systech.com.vn](mailto:luandd@systech.com.vn)

Systech Technology and Trading JSC

Head Office: 5th Floor, Viglacera Office Building

No.1 Thanglong Avenue, Metri, Tuliem, Hanoi, Vietnam

Phone: +84-4-3557-9556

Fax: +84-4-3557-9541

**Register  
online at  
[www.esda.org](http://www.esda.org)**

**Setting the Global Standards for Static Control!**

EOS/ESD Association, Inc. 7900 Turin Rd., Bldg. 3 Rome, NY 13440-2069, USA

PH +1-315-339-6937 • Email: [info@esda.org](mailto:info@esda.org) • [www.esda.org](http://www.esda.org)

