

# ESD ASSOCIATION REGIONAL TUTORIALS

## May 19-21, 2015

Teradyne Conference Center 600 Riverpark Drive • North Reading, MA  
Lunch and refreshments provided

- **FC100: ESD Basics for the Program Manager (ESD Prog Mgr Cert Course)**
- **FC101: How To's of In-Plant ESD Auditing and Evaluation Measurements (ESD Prog Mgr Cert Course)**
- **ESD Models and Test Methods (New Course)**
- **FC150: Hands-on ESD Measurements & Instruments-Uses and Pitfalls (ESDA Symposium Course)**

*Learn from top industry professionals who are up to date with ESD Technology.*

*ESDA Certification courses are part of the globally recognized Certified Professional Program Manager Program developed by the ESD Association.*

*Reduce costly ESD related issues in your facility.*

### MAY 19, 2015

#### FC100: ESD Basics for the Program Manager

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

Instructors: Ted Dangelmayer, Dangelmayer Associates LLC; 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. These include charge generation and decay, material properties, and induction. 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 and an overview of ANSI/ESD S20.20 program requirements. This full day course is required for those in-plant auditors and program managers who are working toward professional ESD certification. The presentation includes many 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
- Field effects and voltages
- Role of capacitance in ESD ( $Q=CV$ )
- Overview of key measurements including common pitfalls of some measurements
- Review of ESD failure models
- Understanding and demonstrating electrostatic induction
- Utility and limitations of air ionization
- Basic goals of ESD controls
- Properties of effective ESD control products and materials
- Overview of ANSI/ESD S20.20 ESD program development requirements

**\*\*This class is part of the Program Manager Certification curriculum. More details on the Professional Certification Programs offered by ESDA are on our website at [www.esda.org/certification.html](http://www.esda.org/certification.html).**

Co-sponsored by the Northeast Chapter ESD Association <http://www.nechapter-esda.org>

12/5/2014

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### MAY 20, 2015

## FC101: How To's of In-Plant ESD Auditing and Evaluation Measurements

8:30 a.m. - 4:30 p.m.

Instructors: Ted Dangelmayer, Dangelmayer Associates LLC; Terry Welsher, 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

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### MAY 21, 2015

#### ESD Models and Test Methods

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

Instructors: Terry Welsher, Dangelmayer Associates LLC

The familiar Human-Body Model (HBM) and Charged-Device Model (CDM) are commonly used simplifications of ESD events which have been employed in the electronics industry to characterize the vulnerability of devices to ESD events in production. Standard test methods have been adopted by the electronics industry based on these models. In many cases, HBM withstand thresholds are available on device data sheets. However, IC suppliers generally fail to put CDM withstand voltages on datasheets. These data can be used to set requirements on suppliers, classify components and manage levels of ESD control in production. However, the limits and applicability of these models are not widely understood. Some aspects of the models are arbitrary and in a given failure scenario may not be the best representation of a damaging event. Also other models (or events) are also gaining use and acceptance in the industry such as the Charged-Board Event (CBE) and Cable Discharge Event (CDE). Other models such as the so-called Machine Model (MM) are being phased out. Finally, system designers have been attempting to apply system ESD models such as IEC 61000-4-2 at the device level in ways that do not produce useful results and can be counter-productive. In this webinar, we review the basis for all these models and relationships among them. We will discuss the use of device classifications in designing production control programs and when and how to use (and not use) the various models.

### MAY 21, 2015

#### FC150: Hands-on ESD Measurements & Instruments-Uses and Pitfalls

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

Instructors: 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.

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### About the Instructors



**Ted Dangelmayer** is the president of Dangelmayer Associates, L.L.C. and has assembled an ESD consulting team consisting of the foremost authorities in virtually all ESD areas of both product design and manufacturing. He received the "Outstanding Contributor" award, the ESD Association Founders Award, was President of the ESD Association, Chairman of the ESDA Standards Committee, and General Chairman of the EOS/ESD Symposium. He has published two editions of his book, ESD PROGRAM MANAGEMENT, numerous magazine articles, and technical papers. Ted holds three patents, is iNARTE Certified, and has successfully completed the ESD Association ANSI/ESDA S20.20 Course for Program Managers and Consultants. He is currently President of the Northeast Chapter of the ESD Association and a member of the national ESD Association's Standards Committee and Education Committee.



**Terry L. Welsher** is currently Senior Vice President of Dangelmayer Associates. He began his career in Bell Labs in 1978 where he worked on electrolytic corrosion failure mechanisms in electrical interconnection materials. In 1986 he began directing Bell Laboratories' core expertise in electrostatic discharge (ESD). The newly formed group proceeded to produce a string of groundbreaking contributions to the field and played a key role in advancing industry standards. At his retirement from Lucent Bell Labs in 2001, he was Director of the Quality, Reliability and Test Center of Excellence. Dr. Welsher has served as Chairman of the ESDA Standards Committee and Technical Program and General Chair of the EOS/ESD Symposium. He is currently serving as Senior Vice President of the ESDA. He has also been active in the JEDEC Quality and Reliability Committee and Board of Directors and a member of the iNARTE Board of Directors. Most recently he has led the effort to harmonize and merge JEDEC and ESDA device testing standards. He holds a B.S. in Chemistry from Florida State University and Ph.D. in chemical physics from the University of Texas at Austin. Terry and his wife, Karyl, live in Suwanee, Georgia.



**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. In 2004, Ginger retired from Motorola/Freescale and joined Dangelmayer Associates as Director of Marketing and Program Management. Ms. Hansel earned 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 at Austin.

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

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

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

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

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

Address is (please circle the one that applies) Home or Company

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_ E-mail: \_\_\_\_\_

### Course Selection

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- May 21, 2015 ESD Models and Test Methods • FC150: Hands-on ESD Measurements & Instruments-Uses and Pitfalls

	Registration	
Each Full Day (May 19, or 20, or 21)	\$710	Register online at <a href="http://www.esda.org">www.esda.org</a>
All 3 Days	\$2130	
Discount before March 20th: Each Full Day-members \$ 510 / non-Members \$610 All 3 days -members \$ 1530 / non-Members \$1830		

Cancellation & refund requests will be honored only if received in writing no later than March 20, 2015, and are subject to a \$50 fee. Any other approved dispositions will also be assessed a \$50 fee.

### Payment Information

Payment is required at time of registration. Only checks drawn in U.S. currency on a U.S. bank that is a member of the Federal Reserve will be accepted; make checks payable to ESD Association. Visa®, Mastercard®, and American Express® and Discover® are accepted.

Amount enclosed \$ \_\_\_\_\_  Check  Credit Card

Credit card type: Visa® Mastercard® American Express® Discover®

Credit card number: \_\_\_\_\_ Expiration date: \_\_\_\_\_

Name on card: \_\_\_\_\_ Security code: \_\_\_\_\_

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

### Accommodations

Residence Inn by Marriott Woburn  
300 Presidential Way, Woburn, MA 01801  
(781) 376-4000

Courtyard Boston Woburn  
240 Mishawum Road, Woburn, MA 01801  
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