News and views
for members of the
ESD Association

THRESHOLD™
Volume 17, No. 5 September/October 2001

News bits

2002 Symposium scheduled

The 24th annual EOS/ESD Symposium, sponsored by the ESD Association, is scheduled for the Charlotte Convention Center in Charlotte, North Carolina, October 6-10, 2002. For more information, visit the Association's web site at www.esda.org or contact Association headquarters.

Certification exam set for October 11, 2002

In conjunction with the EOS/ESD Symposium, the ESD Association will sponsor the ESDC professional certification exams on Friday, October 11, 2002 in Charlotte, North Carolina. Watch for additional details on the exams and educational tutorials later in the year.

In this issue

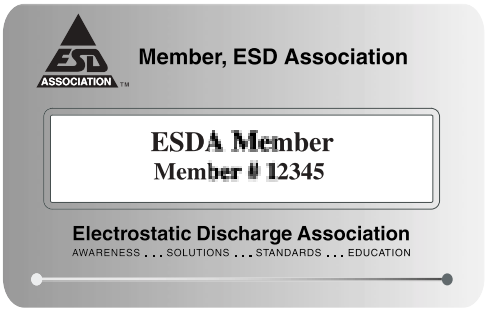
ESDA Web site adds members only and buyers guide sections

If you haven't visited the ESD Association Web site in the past couple of weeks, today's a good time to log on to www.esda.org. When you do, you will find two totally new sections.

Members Only section

First, there's the Members Only section, which can be accessed only by ESD Association members. This new member benefit will include information and services that are available only to ESDA members.

The first two features in the Members Only section are an online version of the ESDA membership roster and back issues of Threshold in pdf format. Additional content planned for the near future include downloadable copies of Standards Technical Reports and selected papers from the EOS/ESD Symposium.



Association member ship cards have been mailed to all ESDA members. Use your membership number on the card to gain initial access to the Members Only section of ESDA web site as well as for other member services.

Online membership roster

The online membership roster is searchable by member name, by company, and by geographic area. Information displayed as the result of a search is the same as that contained in the printed version. Members who have chosen not to have their information printed in the roster will not have their information available online. Members also have an online option to not display their information.

Accessing the Members Only section

The Members Only section appears on the main navigation menu. To access it, you will need your ESDA membership number in order to create your own password for future visits. The first time you visit the Members Only section, you will enter your ESDA membership number, then create your own password and enter an e-mail address. On future visits, you simply enter your password and your e-mail address. Be sure to put your password and e-mail address in a safe place for future reference if you need it.

If you forget your password, you can have it e-mailed to you. The e-mail address you enter on the site is used only to e-mail you your password and to access the site. You also have the option to update your password and e-mail address.

Your ESDA membership number

Don't know your ESDA membership number? It is being sent to you automatically in the mail. You may have even received it by the time you receive this issue of Threshold. All members are being mailed an ESDA membership card (see picture) with their name and ESDA membership number. Keep the card in a safe

continued on page 10

From the Threshold chair

Never been zapped in the Caribbean

Leo G. Henry

"Hip, Hip, Hurrah" I say.

"So what?" you say.

Well, it was a great relief for me not having to fear touching the metallic handle of a hotel door in the Caribbean a few weeks ago. For the last 3-4 years of US travel, I have had to use a pocketknife to discharge the metallic door handles of most hotels before entering the room. This, of course, after being zapped on my first entry because I had not been thinking about being zapped. It does not help that the carpeted floors at these US hotels are not static dissipative and that my shoe soles are probably rubberized. It is doubly annoying because you can get a second shock after entering the room and walking across the carpeted floor and turning on the old fashioned lamp, which, of course, has a metallic switch.

If my count is correct, I have been zapped over the last year more times than there are days in the month of February (leap year). Not to mention the additional numerous zaps when getting out of my Honda Accord and pushing the door shut. OK, I could push the glass, but what if the glass is down on a hot and dry day in California where it almost never rains. Similarly, it almost "never" rains in Antigua (Antique, if you ask Ed Weggeland). Because the island is so small (108 square miles - 16 miles at its longest crossing - and therefore smaller than Fremont, CA), the constant sea breeze, even in the day, keeps the island cooler. The island is still relatively humid compared to larger landmasses, north of the 17-degree latitude line.

So, have I given enough reasons why I have never been zapped in Antigua? Well, consider this: the relative humidity is 70-90% throughout the year (even in cooler December and January). The rain, when it does fall, does so for spurts of 2-3 minutes at a time, then stops, then starts again. Sound like a stop sign, doesn't it? It would appear then that there is not enough time for the charges to accumulate before the rain goddesses neutralize them. Of course, there is the exception during the hurricane season when rain can actually fall for a whole day or even two, then it's gone for a long time.

Well, I was back in Antigua at the end of July for my annual visit to the island

continued on page 10

Threshold

THRESHOLD™ is published six times a year for the members of the ESD Association. The association is a not-for-profit corporation. It strives for the advancement of theory and practice of electrical overstress avoidance and of allied arts and sciences and the maintenance of a high professional standing among its members and others.

Threshold™ Publication Schedule

Issue	Deadlines
November/December	Oct. 1
January/February	Dec. 1
March/April	Feb. 1
May/June	April 1
July/August	June 1
September/October	Aug. 1

ESD Association
7900 Turin Road, Building 3
Rome, NY 13440-2069
Tel: (315) 339-6937
Fax: (315) 339-6793
Email: eosesd@aol.com
http://www.esda.org

Calendar of events

September 2001

Midwest ESD Chapter Meeting: September 5, 2001, ESD and Corrosion Control, Keith Donaldson, Engineered Materials, Inc., Bimbo's Restaurant, Palatine, IL, www.midwestesd.org

ESDA Standards and Committee Meetings: September 7-9, 2001, Doubletree Hotel, Portland, OR, www.esda.org

David F. Barber Sr. Memorial Golf Tournament: September 8, 2001, Langdon Farms Golf Course, Aurora, OR, www.esda.org

EOS/ESD Symposium: September 9-13, 2001, Oregon Convention Center, Portland, OR, www.esda.org

ESDC Certification Exams: September 14, 2001, Portland, OR, www.esda.org

Arizona Chapter Membership Meeting: September 17, 2001, ESD Training, Denny's, www.azesd.org/

Silicon Valley EOS/ESD Society Membership Meeting: September 18, 2001, TBD, Ramada Inn, Sunnyvale, CA, www.esdsiva.org

Texas Chapter Membership Meeting: September 27, 2001, ESD Plant Compliance & Vendor Exposition, LaQuinta Inn, Round Rock, TX, www.centxesdassoc.homestead.com

October 2001

Midwest ESD Chapter Meeting: October 10, 2001, Selecting Static Control Flooring, Donna Robinson-Hahn, Agere Systems, Bimbo's Restaurant, Palatine, IL, www.midwestesd.org

November 2001

Northeast Chapter Membership Meeting: November 7, 2001, How to Comply with S20.20, www.nechapteresda.org

From the president

Unlocking opportunities worldwide

As many of you are aware, the ESD Association is a global focal point for information, education, and standards in static control, both in process control and design of components. I would like to update you on how the ESD Association is doing in the global world of static.

John Kinnear

As you can easily conclude from the IEC article in this issue, the documents that are developed by the ESDA standards committee have become the basis for international standards. Most of the international standards that have been written or are in the committee drafts have their roots in the ESD Association standards. This shows that the work and dedication of the standards committee has a wide reaching effect outside of North America.

The only standard that did not follow the model is the IEC process control standard *61340-5-1* and its companion document *61340-5-2*. Actually, these two documents never became international standards. The two documents are only technical reports due to the fact that the national committees could not agree on the requirements for issuing the document as a standard. However, *ANSI/ESD S20.20* is impacting these documents. The committee has decided to rewrite them using *ANSI/ESD S20.20* as the model. Believe me, this is quite an accomplishment, which again shows that the ESD Association is the leader.

As with standards documents, the companion facility certification program is expanding internationally. There are several additional registrars that want to become certified to perform S20.20 audits. Some have clients not only in North America, but also in Europe and Asia. As this article is being written, training for DNV lead assessors in Singapore and China will have been completed.

The Asian market sees certification as a benefit to doing business. This is a clear leadership position for the Association. Not only does the Association write the standards that become international standards, the certification programs are developed and administered to become worldwide programs.

The Association is also continuing its participation in Cleanrooms/Datastor Asia in Singapore. Several papers were presented at the show again this year and, as you may have seen, *Cleanrooms* magazine did a very positive story on *ANSI/ESD S20.20*.

Although I am writing this prior to this year's Symposium, the international flair has always been a big presence. At least 1/3 of the participates, both authors and attendees, have come from Europe and Asia. This year's economy may have made international, as well as North American, attendance more difficult, but they will be back. Where else in the world can you receive such intense training and technical knowledge in one week on ESD?

"Local Chapters" are also becoming international. There is a chapter forming in Mexico, and may have become one by the time this column appears. Other areas that are forming are chapters in Singapore, Finland and a second one in Mexico.

What is the international future of the Association? Of course the emphasis in standards will continue and our Symposium will continue to draw international participation.

One new idea would be to take our Symposium or similar event international. We may take a small step some day by taking one of our meetings to Canada. As the world becomes smaller and smaller, the ESD Association will continue to lead the world in static.

Association news

Liaison activities promote cooperation, coordination

by
Arnold Steinman, M.S.E.E.
Industry Liaison Chair


Arnold Steinman

To better serve industry and to become better known as a developer of ESD standards, the ESDA is involved in a number of liaison activities with other organizations. This involvement includes:

1. Mutual participation in standards activities and technical projects
2. Attendance at other organizations' technical meetings
3. Mutual participation in technical seminars and tutorials
4. Co-sponsorung technical meetings
5. Exchange of exhibit space at conferences and exhibitions.

Currently the ESDA maintains an active liaison or project cooperation with the following organizations. They are International Disk Drive Equipment and Materials Association (IDEMA - disk drive), Institute of Environmental Sciences and Technology (IEST - contamination control), Semiconductor Equipment and Materials International (SEMI - semiconductors). Each organization has a different focus, but each needs to consider the effects of static charge. The mutual cooperation between the Association and these other organizations helps reduce duplication of effort and helps focus the technical expertise of each.

Individual ESD Association members have taken on the responsibility of maintaining these liaisons and current activities are listed below.

IDEMA

Leo G. Henry (lghenry@ion.com)

- An ESD document, General ESD Handling Practices - ESD-01 is available on the IDEMA website - www.idema.org.
- The organization is putting the final touches on Packaging Practices ESD-02
- The next document will concentrate on tool discharge test method .
- They are considering how to measure ionizer performance in a way that is relevant to MR head production .
- A draft document on HBM Testing of MR heads will be posted on the IDEMA web site. There is follow-up interest in CDM testing.
- IDEMA sponsors an annual ESD conference, coordinating efforts with the Silicon Valley ESD Society.

IEST

Ed Weggeland (weggeland@richmond-technology.com)
Kay Adams (kadams@techwear.com)
Tom Albano (thomas.albano@kodak.com)

- The Association had a booth at ESTECH 2001 in Phoenix, April 22-26, which was maintained by the Arizona chapter and Debbie Weggeland.
- Information about ESDA appeared in the winter issue of the IEST Journal.
- The organization has sponsored a class on Static Control Basics and Ionization.
- ESDA standards have been added to *IEST Compendium of Standards - RD-CC-009.3*.
- ESDA standards are listed listed in *RP-CC-022 Electrostatic Charge in Cleanrooms and Controlled Environments*, and *RP-CC-032 Packaging in Cleanrooms*.

SEMI

Arnie Steinman (asteinman@ion.com)

- An educational ESD seminar was planned for SEMICON West 2001 in San Francisco.
- ESD Task Force updated *E43-0301 - Electrostatic Measurements on Objects and Surfaces*.
- SEMI website wants to add information about our standards and a include a hotlink from their Web site to the ESDA Web site.
- SEMI is working to include electrostatic issues in the 2001 International Technology Roadmap for Semiconductors.
- Based on survey results, future activities include an ESD control guide for facilities and standards review for ESD issues.

Other activities

Other ESDA liaison activities include contact and communication with the following organizations:

- U.S. Display Consortium (USDC) - Don Boehm (don@novxcorp.com)
- Surface Mount Technology Association (SMTA) – Leo G. Henry
- Semiconductor Manufacturing Technology Consortium (SEMATECH) - Leo G. Henry, Charvaka Duvvury (duvvury@spdc.ti.com)
- Institute for Interconnect and Packaging Electronic Circuits (IPC) – Ron Gibson (rgibson@celestica.com)
- *Cleanrooms* Conferences – presentations on auditing and S20.20 in the U.S. and Asia
- Japan – Exchange of best papers with the Reliability Center of Japan (RCJ) ESD Symposium
- Mexico – Forming a chapter in Guadalajara and presenting on auditing and S20.20 at the Mexitronica trade show
- Singapore – Forming a chapter and planning an ESD Conference including tutorials, papers, and training sessions

For more information on ESDA liaison activities, please contact the members above or Arnie Steinman of the ESDA Technical Liaison Committee (TLC).

Standards news

Updating IEC standards activity

by John Kinnear
US Delegate to the IEC

Several ESD Association members participated in the June meeting of the International Electrotechnical Commission IEC TC 101 – Electrostatics in Warsaw, Poland. Following is a brief update of the activities from this meeting.

Working Group 1
Test methods to measure ability of materials and products to dissipate static electric charge

This working group reviewed comments from the national committees on the committee draft document. The first document from this committee will be a compilation of how to measure charge dissipation by using several methods and guidelines. The document will be published after it has been translated into French and forwarded as a First Draft International Standard (FDIS).

Working Group 3
Methods of test for the characterization of the electrostatic behavior of floor covering and installed floors.

This working group is preparing a document for committee draft (CD) for installed floors with a person (systems test). The test methods that were reviewed were *ESD STM 97.1*, *ESD STM 97.2* and the ISO standard. The document will be based on the ESD Association standards.

Working Group 5
Protection of electronic devices against static electricity.

This working group consists of several committees.

WG 5.1 Process Control: This committee has produced the two documents, *IEC 61340-5-1* and *61340-5-2*. These two documents are Technical Reports Type 2 and will not become full standards. The committee reviewed *ANSI/ESD S20.20* and plans to use this document as the basis for the next document, which the committee hopes will become a full standard. The committee has also expressed an interest in using the ESD handbook as the basis for the companion document for this standard.

WG 5.3 Packaging: This committee held its first meeting. The committee determined that the document will contain tests to determine how to classify packaging materials for use in static control.

WG 5.2 Garments: The committee has used *ESD STM 2.1* as the basis for its document. This committee is currently working on producing a committee draft.

Working Group 6
Test methods for simulation of electrostatic discharge events

The main role of the committee is to define the waveforms that will be used to test and characterize unpowered devices or components. This committee is basing its documents on *ESD STM 5.1, 5.2* and *5.3.1*.

Joint Working Group 7
Electrostatic properties of flexible intermediate bulk containers (FIBCs) - Test methods and requirements.

This committee, a liaison partner with ISO/TC122/SC3, is defining a test method for measuring potential discharges caused by the loading, unloading and shipping of loose materials in flexible intermediate bulk containers. These containers are large and can produce large discharges. The committee has reviewed one method, but another one has been proposed from the German National Committee. The results of the new test will be given as the next meeting.

2002 EOS/ESD Symposium issues call for papers

This year's EOS/ESD Symposium is barely history, but it's time to think about next year. It's time to think about presenting a paper. It's time to finish up the research, formulate your conclusions, and share your work with the rest of the international ESD community.

The ESD Association is formally requesting abstracts for technical papers covering the effects of electrostatic discharge (ESD), electrical overstress (EOS), and static electricity for presentation at its 24th Annual EOS/ESD Symposium October 6-10, 2002 in Charlotte, NC.

Papers for the EOS/ESD Symposium should deal with work in the following areas: *Component, System or Factory Level EOS/ESD; EOS/ESD Materials Technology; Magnetic Recording Heads; ESD Standards; Electrostatic Considerations*; or other related ESD/EOS topic areas.

Paper submittals should include data and analysis that advance state-of-the-art knowledge, enhance or review general knowledge, or address new topics. The technical program committee especially encourages new areas and fields relevant to EOS and ESD at the Symposium.

The deadline for submission of abstracts and paper summaries is Monday, January 14, 2002. Submissions must include a 50-word abstract and a 4-page (maximum) summary of the work. The final submission deadline for the finished paper is Monday, June 3, 2002. Final papers will be limited to a maximum of 10 pages.

Persons interested in submitting a paper should obtain copies of the Symposium call for papers from the Association headquarters. The call for papers also may be downloaded from the Association's Web Site at http://www.esda.org.

Association news

Where are the "Good Ol' Boys?"

by
Ed Weggeland
Vice President

Who runs the ESD Association?

From time to time I hear reference to "the good ol' boys" by some of our ESDA members, usually during conversations covering how our Association and its activities are run. It's a common misconception among many associations that they are run by a closed group of individuals – "The Good Ol' Boys".

Ed Weggeland

The groups that run the ESD Association are all volunteers, 12 of whom are elected by the membership to the board of directors, which appoints activity group managers.

The "Board" is comprised of 12 elected members, with one or two special presidential appointees with specific project orientation, with advice and consent of the directors.

The directors each year elect your Association officers, president, senior vice president, and vice president, who also form the executive committee, along with the past president. With the advice and consent of the board, the executive committee appoints a treasurer and secretary, who may or may not be a sitting director. To become an elected officer and a member of the ExCom, an individual must be either a sitting director or have been an elected director in the past.

The ExCom and board of directors (BoD) meet 4 times a year, Once each during our regular meeting series and once in our annual meeting held at Association headquarters in Rome NY (December, when it is cold and wet and sometimes a travel challenge).

What do all these folks do when they meet? They don't sit around smoking cigars and drinking brandy. It is not a men's only club since women fill key posts and many members are not "old".

The *ExCom* is responsible for making decisions that affect the operation of the Association between meetings of the BoD as well as making recommendations to the BoD during planned meetings covering:

- Selection of activity managers
- Headquarters day to day operations (managed by the Senior Vice President)
- Headquarters staff performance evaluations
- Initiation of strategic plan development
- Meeting site selections and considerations
- Organizational structure to meet current and long term needs.

The *board of directors'* major functions are*:*

- Accept the assignment to chair a standing committee or take responsibility for tasks or projects as requested by the president.
- Attend all BoD meetings prepared to present and receive activity reports and to vote on any issues raised during the meetings.
- Be responsible for ensuring committees or projects meet their objectives and commitments, *standards, Symposium, finance, membership, education (ACE) certification, consultants & contractors.*

- Provide support to all Association committees and activities.

Several *standing committees* are responsible for specific activities or function. Our typical standing committees are:

- Symposium – future Symposium planning
- Standards – Development of industry standards
- ACE (Education) – National Tutorials & Seminars, Academic Liaison.
- Certification – Professional and Facility certification programs
- Member Services – Local Chapters, Awards, Volunteer Recognition
- Marketing – Threshold – Web Site
- Nominations – recommends slates for election to BoD
- Industry Liaison – cross association activity and support

So what leads someone to think there is a "Good Ol' Boy's" club or network? Is it because

- Some groups or committees meet from 7 am until after midnight – doing their work and delivering their assignments and objectives?
- Board members, officers, committee chairs, and volunteers are highly visible, doing their jobs?
- Some groups stay in their working areas to get their jobs done?
- Some work in "suites" or meeting rooms that provide the opportunity to spread out work assignments and not have to pack up to move over 6 to 7 days of meeting activities?
- From time to time, a meeting is "closed" – because a personnel topic that relates to our Association employees must be discussed, or a contractor's proposal must be negotiated before a BoD report? Most meetings are open
- Of wanting to be part of the process?

My active experience is that our colleagues who meet and do work for the Association are well adjusted, honest, ethical people with sincere intentions to work long and hard for the benefit of the Association, the membership and the industry. They are committed. They are doers.

Over the years, I've watched the makeup of the board, executive committee, officers, committee chairs and committees change regularly. There are term limitations. Individuals change jobs or responsibilities and are no longer involved with ESD. Sometimes employers no longer provide the time and financial support necessary for someone to participate on a committee or be a board member.

Many times, over the past 20 + years, while in various meetings, I have either witnessed or taken part in spirited discussions, debates and challenges – to adjudicate or reconcile issues to the benefit of us all. Many times, meeting attendees take strong advocate positions, standing firm to be sure that we all are doing the "right thing".

So, if you really want to see the decision-making processes taking place – Attend our meetings, work rooms, suites or lobby chair circles. Take part, volunteer your selfless participation – it's all open to you – from 7 am until after midnight, every day at each and every meeting series, come rain, sleet, snow or sunshine.

But, don't look around for the Good Ol' Boys. They don't exist.

S20.20—more registrars, more auditors

With an increase in the number of registrars interested in performing *ESD/ANSI S20.20* audits and a corresponding increase in the number of auditors trained to do the auditing, facility certification to S20.20 is about to take some major steps forward. That's the viewpoint of Ron Gibson, standards committee chair.

"One of the key factors in a company's decision to become audited and certified to S20.20, particularly overseas, is the local availability of personnel to perform the audit," observes Ron. "The Association just completed training 16 DNV auditors in Asia, where facility certification is becoming of prime importance. There are now S20.20 trained auditors in Singapore, Malaysia, Thailand, Honk Kong, China, and Taiwan. This will provide significant opportunities for Asian facilities to become certified, expanding the international influence of S20.20"

Similar activity is occurring among North American registrars, as well as electronics manufacturers. "We have two additional U.S. registrars, BSI and QMI, involved in becoming certified to conduct S20.20 audits. By the time this article appears, one or both of them may have completed the process." In addition, several manufacturers have audits scheduled or recently completed, with additional inquiries coming in to Association headquarters regularly.

Although the process sometimes seems slow, "It is evident that interest in S20.20 certification is accelerating and becoming of increasing importance to the industry," concludes Ron.

Mr. Static

Insulators and Paschen's Law?

How do you measure or estimate if you can get a spark from a charged body? First of all you have to specify what kind of body you're talking about, insulator or conductor, although strictly speaking sparks only occur between well-rounded conductors. Most discharges, not just those from insulators, are either corona or brush discharges.

Niels Jonassen

In all cases, the condition for starting a discharge is determined by a critical quantity, the **breakdown field strength**, E_b. If the breakdown field strength is exceeded at a point, or rather a (small) volume, the field is able to accelerate an electron to such a high velocity and energy that the electron may ionize a gas molecule.

The breakdown field strength depends upon the nature of the gas, the gas pressure and upon the shape and radius of curvature of the "electrodes".In air at atmospheric pressure, the breakdown field strength between plane electrodes is around 3 MV×m^{-1}.

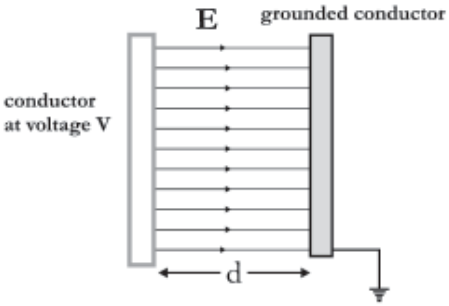


Figure 1

Figure 1 shows two parallel conductors, one of them grounded, the other one at a voltage V.

If the distance between the conductors is d, the field is (almost) homogeneous with the field strength in the interspace

$$E=V/D$$

If for instance V = 3000 volt a discharge (spark) will occur between the plates at a distance

$$d=V/E=3000/3x10^6=10^{-3}m=1mm$$

If the electrodes are not parallel the conditions become more complicated.

Figure 2 shows the same conductor at the same voltage V. In this case, the grounded conductor at the distance d is, for instance, a small sphere. The sphere will "distort" the field, i.e. make it non-homogeneous. In all points of the space between the two electrodes we have with the highest values

$$E>V/D$$

at the surface at the front of the sphere.

In this case a discharge will start when the grounded electrode is further from the

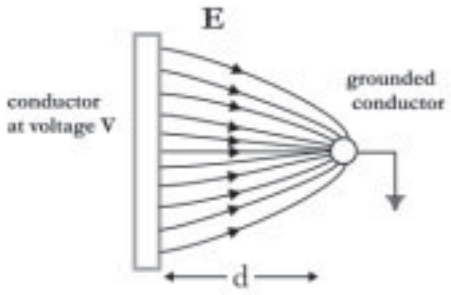


Figure 2

charged conductor than the calculated 1 mm. It should be pointed out though that the breakdown field strength in front of the small sphere (or for that matter of any pointed or sharply rounded electrode) may easily be up to ten times higher than the quoted 3 MV×m^{-1}.

But let's turn back to the parallel electrodes of Figure 1. If we change the voltage to 300 volts, we find that we reach the breakdown field strength of 3 MV×m^{-1} at a distance of 10^{-4} m = 0.1 mm. But experience show that no discharge occurs at 300 V and 0.1 mm.

This fact is explained by Figure 3.

It shows the **breakdown voltage**, V_b, for parallel metal electrodes as a function of the product of the electrode distance, d, and the atmo-spheric pressure, p_o.

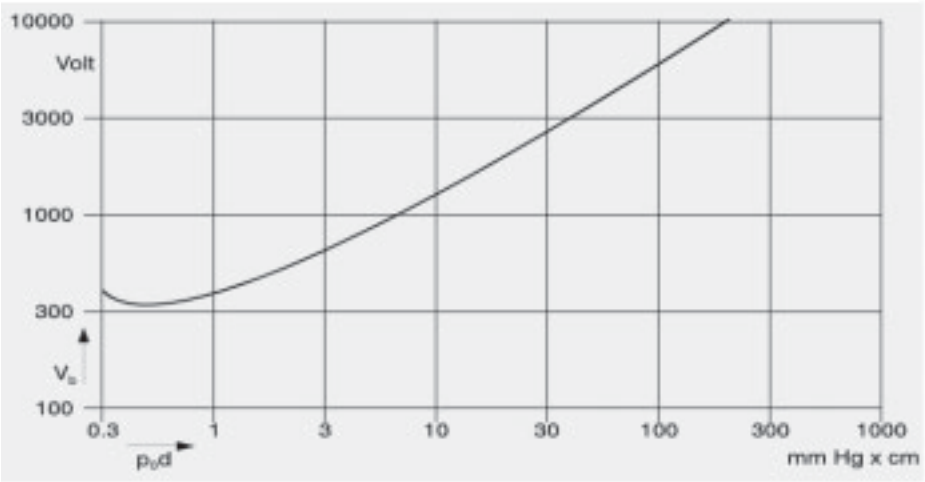


Figure 3

A closer analysis of the curve shows that the lowest voltage at which a discharge may start is about 330-340 V. At atmospheric pressure, this will occur at a distance of about 5-6 µm at a breakdown field strength of about 6×10^7 V×m^{-1}. The above relationship is called *Paschen's curve*. It's a graphical illustration (in this case for atmospheric air) of *Paschen's law* (1889) which states that the breakdown voltage between parallel metal electrodes does not depend on the gas pressure and the electrode distance separately, but only on their product.

The subject of *Paschen's law* is a very intriguing one, but for the present purpose, i.e. in ESD-connections, it suffices to say that the law predicts **that you don't get discharges between two conductors at voltage differences lower than approximately 300 V.**

So what about insulators ?

Can you point a non-contacting voltmeter towards a free insulator disk, read a surface voltage of some kV and conclude you've got a risk for a discharge ?

The answer is **No**.

Mind you, you **may** have a risk, but you can't relate that to any (surface) voltage, but possibly to a field strength.

Let's look at Figure 4.

We have a free insulator disk faced by a parallel grounded conductor at a distance **d**. The disc is charged with a surface density **σ** on one of the sides or distributed over both sides.

In this situation the field between the charged disk and the grounded plane is

$$E = \sigma/\varepsilon_o$$

Let's suppose $\sigma = 10^{-6}$ C×m^{-2}. The field is then

$$E = 1.1\times10^5 \text{ V}\times\text{m}^{-1}$$

If now d = 0.1 m we have a **surface voltage**

$$V_s = 1.1\times10^5\times0.1 = 11000 \text{ V}$$

Will we get a discharge ? No, because we haven't exceeded the breakdown field strength.

Now let's suppose we go down to a distance of 1 mm. Then the surface voltage is

$$V_s = 1.1\times10^5\times0.001 = 110 \text{ V}$$

In other words, the closer we get to the charged surface the lower is the surface voltage.

Of course if the approaching grounded conductor is not a plane surface we will here, as with conductors (Figure 2), get a distorted higher field strength and possibly start a discharge when the breakdown field strength is exceeded.

But the discharge- or risk condition is not given by any voltage, but by a field strength.

The important difference between a charged conductor and a charged insulator is that with a conductor the voltage is given and the field strength gets **higher** the closer you (or the meter) get. With a charged insulator the charge (and for a given geometry) the field is fixed and the measured surface voltage of the insulator is an elusive quantity, which depends on where you place your meter, and which often will get **lower** the closer you get to the charged surface.

Obviously this is a rather general statement, and of course there are some preconditions and some exceptions to the rule. We assume the capacitance of the conductors considered to be in the normal working range, say > 50-100 pF.

And if the insulators **you** are working with are exclusively **webs, electrets and other cases of thin insulative sheets backed by a grounded conductor,** you can, with some caution, treat them like conductors.

Mind you, the *Paschen's law*'s 300 volt cannot be used, even in these cases.

And if you are dealing with **"ordinary" insulators, like plastic bags, tote boxes and whatever**, forget about *Paschen's law*, forget about voltage limits for discharges from insulators.

They don't apply.

You can not estimate the discharge possibility by measuring a surface voltage of an insulator.

The advice is: ***measure the field strength***, and compare it to the breakdown field strength.

Niels Jonassen

Mr. Static

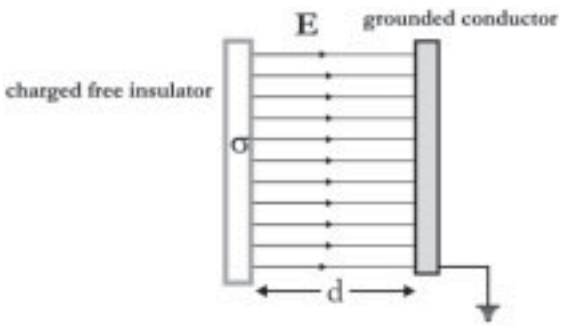


Figure 4

Association news

ESDA educates in Singapore

For the second consecutive year, the ESD Association brought ESD information and technology to Southeast Asia in conjunction with the CleanRooms/Data Storage Conference in Singapore.

As part of the July 25th conference technical program, the Association presented two half-day seminars to attentive audiences each numbering 61 attendees. Association senior vice president Steve Halperin opened the ESD program with a presentation on ESD Audits and Meassurements, focusing on measurement techniques for determining the cause of ESD problems and performing program audits.

The afternoon session was devoted to Implementing ANSI/ESD S20.20 with Association president John Kinnear covering the "dos and don'ts" for developing a program based on S20.20. The new tutorial was prepared by standards committee chair Ron Gibson and also emphasized creating awareness of the specifics of S20.20.

The Singapore effort is part of the Association's global commitment to ESD information and training.

continued from page 2

From the Threshold chair

for Carnival/Carnaval (you choose). This time, I deliberately asked several people in downtown St. John's (the capital) if they had ever experienced the tiny tingling feeling (Caribbean for "shock") whenever they touched (with their bare fingers) metallic objects like automobile door handles or the musical steel drums or pans. I received all negative answers, as expected, and some very quizzical looks.

I even asked some of the tourists at the Mango Hotel (where we stayed for 2-3 days). Since metal keys instead of the plastic cards are still being used, the probability of discharge, in theory, is higher. However, the neutralizing factor is that most hotels are located near the beach where the air is constantly, consistently moist. I could not even do the "shoe rubbing on carpet" exercise because the most floors are either wooden or tiled. Carpeting is rare in the Caribbean. Even the railings on the veranda, if metallic, are painted (Dissipative paint? I don't think so), so that also reduces the probability of a discharge occurring.

So here is my question: have any of you ever been zapped at a US Hotel that is located at a beach? Oh, by the way, I left my California wet suit here in the US, since even night swimming in the Caribbean is a "warm" experience, and during the day I mostly swam and stayed away from lying on the beach in the sun. (In Antigua, we call that foolish; you know it as cancerous).

So with no ESD in the Caribbean, why don't the IC manufacturers move their assembly plants to Paradise? OK, Antigua, or Barbados or Trinidad, or Martinique and Guadeloupe (for those with a French connection). At least the devices will get to the PC board and to the ESD carrying box safely. One drawback though, the salty atmosphere would attack the leads and traces before you had time to utter the words "rust and corrosion".

Still, nothing beats the combination of heat, blue-green seawater, white or pink sand, swimming (night and day) and no sharks. The fable is that the first large sharks to enter the Caribbean waters were all fed extremely hot Caribbean pepper when they opened their mouths. The news spread like hot fire, so they never came back. Don't believe me? Ever heard of a shark attack in the Caribbean? The Bahamas do not count; that's American territory and too close to Miami.

Until next issue, Be Happy

LeoG

continued from page 4

ESDA Web site

place for future reference. You will need your membership number to access the Members Only section the first time and you may need the number for other future transactions with the Association as well.

Buyers Guide

If your are looking for a source for a particular ESD control product or service, your first resource should be the new Buyers Guide on the ESDA Web site. You can search the Buyers Guide by product or service, by company name, or be geographic area. When you've identified a source for a particular product or service, you will have the appropriate contact information for the source: address, phone, fax, e-mail, and a link to the company's web site.

All listings in the Buyers Guide are paid listings and the information has been provided by the company itself. The ESD Association does not endorse any of the companies or products or services and is not responsible for the accuracy of the information provided by the companies.

The Buyers Guide is accessed from the main navigation menu. Unlike the Members Only section, you do not need to be an ESD Association member to access the Buyer's Guide.

Companies interested in being listed in the Buyers Guide can download the appropriate forms from the Buyers Guide section of the web site or can contact Association headquarters for additional information. The cost of a listing is $300 for a full year.

The Members Only section and the Buyers Guide are just some of the continuing enhancements to the ESD Association web site. Be sure to visit often for new information and services.

Institutional Listings

Desco Charleswater East
90 Hudson Rd., Canton, MA 02021-1407
Tel: 781-821-8370 Fax: 781-575-0172 www.charleswater.com
Manufacturer of ESD control products including wrist straps, mats, floor finish, Micastat laminate, shielding bags, & much, much more

ACL Staticide
1960 E. Devon Avenue, Elk Grove Village, IL 60007
Tel: 847-981-9212 Fax: 847-981-9278
www.aclstaticide.com
Cleanroom products, topical antistats, floor finishes and coatings, static detection meters, monitors, computer cleaning products

Mustang Enterprises, Inc.
P.O. Box 176, North Prairie, WI 53153
Tel: 414-392-5317 Fax: 414-392-5319
www.protectastor.com
ESD Protective Cabinets, Portable Storage Units

Flexco
1401 E. 6th St., Tuscumbia, AL 35674
Tel: 800-633-3151 Fax: 800-346-9075
www.flexcofloors.com
Manufacturer of ESD control conductive and static dissipative solid vinyl tile

ESD Systems.com
19 Brigham St. Unit 9, Marlboro, MA 01752
Tel: 508-485-7390 Fax: 508-480-0257 www.esdsystems.com
A full line of ESD control products: wrist straps/foot grounders/mats/ ionizers/floor finish/shielding bags/smocks/ testers & more

Wolfgang Warmbier
Untere Giesswiesen 21, D-78247 Hilzingen, Germany
Tel: 49-7731-86880 Fax: 49-7731-868832
www.warmbier.com
ISO 9002 Certified for advice, supply and manufacturing of static control materials and systems

Bijl/Barneveld
Hermesweg 28, NL-3771 ND Barneveld, Holland
Tel: 31-342-490147 Fax: 31-342-416845
Europe's small but most reputable distributor of ESD Control Products. ISO 9002 certified.

C & M Consulting
ESD Control Program Consultants
www.esdconsultants.com Tel: 512-282-9039
Facility Audits • Training • Technical troubleshooting
"A Quality System Approach to ESD Control Programs"

Monroe Electronics
100 Housel Avenue, Lyndonville, NY 14098
Tel: 716-765-2254 Fax: 716-765-9330
www.monroe-electronics.com
Full line manufacturer of static measurement equipment

Carmelstat
P.O.B. 1468, Haifa 31014, Israel
Tel: 972-4-846-6016 Fax: 972-4-846-6958 www.carmelstat.com
Manufacturer of ESD thermoplastic compounds for shipping, storage, and inplant handling products

Static Solutions, Inc.
331 Boston Post Rd. E., Marlboro, MA 01752
Tel: 508-480-0700 Fax: 508-485-3353 www.staticsolutions.com
World Wide Mfg. of Industry First ESD-Clean Room Products
Monitors/Testers/Coatings, Industry First Products

PSSI (Plug-in Storage Systems, Inc.)
284-A Racebrook Road, PO Box 928, Orange, CT 06477
Tel: 800-231-5952 Fax: 800-532-2999 Email: info@pluginstorage.com
Protective storage cabinets, carrying cases, carts, work benches and seating for handling ESD-sensitive circuit boards and electronic devices.

HMS Compounds, Inc.
P.0. Box 388, Mansfield, TX 76063
Tel: 817-468-3099 Fax: 817-468-3122
www.hmscompounds.com
Manufacturers of Conductive and Static Dissipative Thermoplastic Sheet and Roll Stock for ESD Protection

PRF USA, INC.
P.O. Box 6505, Carlstadt, NJ 07072
Tel: 201-804-5565 Fax: 201-804-5567
www.esdrubber.com
Static Dissipative/ESD Control Rubber Flooring
Static Dissipative Floor Mats and Table Mats

Polyonics
867 Rt. 12, Westmoreland, NH 03467
Tel: 603-352-1415 Fax: 603-352-1936 Toll Free: 888-POLYONX
Manufacturers of high temperature and static dissipative tape, tag, and label materials

ALX Technical
30 MacIntosh Blvd., Suite 5, Concord, Ontario L4K 4P1 Canada
Tel: 905-761-0370 Fax: 905-761-0371
info@alxtechnical.com www.alxtechnical.com
Manufactures of ESD and ESD Cleanroom Paper, ESDNotes™ adhesive backed paper and ESD Labels

rubberbands.net
P.O. Box 75267 Colorado Springs, CO 80970
Tel/Fax: 719-683-2419 www.rubberbands.net
Electronic Grade Rubber Bands, mfd. in the USA, vacuum-sealed Antistatic, dissipative, conductive with distributors worldwide

Polyflor Static Control Flooring
365 Walt Sanders Memorial Drive, Newnan, GA 30265
Tel: 800-852-8292 Fax: 770-252-4894 Email: Fhill@lowandbonar.com
www.Polyflor.com
Worldwide manufacturer and distributor of ESD control conductive and dissipative vinyl floors available in both sheet and tile.

VPI Mirrex Corp
1389 School House Road, Delaware City, DE 19706
Tel: 302-836-5950 Fax: 302-836-7571
www.vpicorp.com
Manufacturer of ESD thermoplastic materials for the display and protection of static sensitive components.

Saint-Gobain Advanced Ceramics
1225 Aeroplaza Drive, Colorado Springs, CO 80916
Tel: 719-637-8734 Fax: 719-380-5591 Email: JB.Lafon@saint-gobain.com
Manufacturer of Cerastat™ ESD ceramics products to customers prints: tools, fixtures, wear parts for data storage and other electronic industries

Minimum rates are $600.00 for six consecutive issues. Larger contributions will be most welcome. No agency fee is granted for soliciting such contributions. Inquiries, or contributions made payable to the ESD Association, plus instructions on how you wish your Institutional Listing to appear, should be sent to: ESD Association, 7900 Turin Rd., Building 3, Rome, NY 13440-2069 Tel: (315) 339-6937, Fax: (315) 339-6793, email: eosesd@aol.com http://www.esda.org

Institutional Listings

Howell Packaging, Division of F.M. Howell & Company
P.O. Box 286, Elmira, NY 14902
Tel: 607-734-6291 Fax: 607-734-8667
Designers & Manufacturers of ESD Protective Packaging, Paperboard & Thermoformed Plastic, In-House Testing

Julie Industries, Inc.
355 Middlesex Avenue, Wilmington, MA 01887-0783
Tel: 978-988-8802 Fax: 978-988-8803
Email: questions@julieindustries.com
StaticSmart™ products including carpet, rubber & polymeric flooring, personnel grounding products & materials, ESD workstations and chairs

Desco Charleswater West
3651 Walnut Avenue, Chino, CA 91710
Tel: 909-627-8178 Fax: 909-627-7449 www.desco.com
Manufacturer of ESD control products including wrist straps, mats, foot grounders, ionizers, shielding bags, floor finish & more

ITW Electronic Component Packaging Systems
2001 E. Randol Mill Road, Suite 117, Arlington, Texas 76011
Tel: 817-277-5004 Fax: 817-277-3453
Static Dissipative & Conductive Shipping & Handling Tubes, Carrier Tape & Reels, JEDEC Carrier Trays,Thermoformed Packaging

Conductive Containers, Inc.
4500 Quebec Ave. North, New Hope, MN 55428
Tel: 1-800-FARADAY Fax: 612-537-1738 www.corstat.com
Manufacturer of CORSTAT and ESD protective plastic materials for shipping, storage and inplant handling

Aesops, Inc.
636 S. Glenwood Place, P.O. Box 4119, Dalton, GA 30721
Tel: 800-235-8817 Fax: 706-278-6562 www.aesops.com
A full line manufacturer of static control products.
Special sizes or shapes... No problem. Buy only what you need.

Vermason Ltd.
Birds Hill, Letchworth, SG6 1HX, England
Tel: +44 1462 672005 Fax: +44 1462 670440 sales@vermason.co.uk
DurAstatic E9* bins, boxes, racks, inserts and trays are permanently static dissipative, anti-static, coloured, non-sloughing and re-cyclable. For more information, www.vermason.co.uk or e9@vermason.co.uk

3M
Electronic Handling & Protection Division
Tel: 1-800-328-1368 www.3M.com/EHPD
Manufacturer of static control permanent flooring, wrist/heel straps, static shielding bags & containers, & testing/monitoring equipment

Richmond Technology/BayStat – An ITW Company
1897 Colton Ave, Redlands, CA 92374
Tel: 800-829-2942 Fax: 909-794-4003
Email: sales@richmond-technology.com
ESD films and bags, shielding, DryPack®, CleanPackaging, grounding, wrist straps, heel grounders, work surfaces, floor mats, & monitors.

Work Surfaces Corporation
1-800-553-5015 (USA)
Tel: 626-836-3749 Fax: 626-836-8979 www.worksurfaces.com
Brass terminus flush mount grounding systems,
wrist strap receptacles--bus bars

Brick Container Corporation Protektive Pak®
P.O. Box 548, La Mirada, CA 90637-0548
Tel: 714-994-4140 Fax: 714-994-1377 www.brickcontainer.com
Impregnated ESD Corrugated Stock Boxes, Crates, & Foam

Technical Coating International, Inc.
150 Backhoe Road, Leland, NC 28451
Tel: 910-371-0860 Fax: 910-371-0929 www.tciinc.com
Manufacturer of ESD Films, Foil Laminates, and Specialty Structures (Barrier, Opaque, Transparent, & Recyclable)

VPI
3123 S. 9th St. PO Box 451, Sheboygan, WI 53082-0451
Tel: 800-874-4240 Fax: 920-458-1368 Email: floor@vpicorp.com
www.vpiflooring.com
Manufacturer of ESD Control Vinyl Floor Tile

UTP/ United Technical Products, Inc.
111 Morse Street, Norwood, MA 02062
Tel: 781-255-1155 Fax: 781-255-1166 www.utp.com
ESD Carpet Tile • ESD Vinyl Tile • ESD Flex Floor™ •
ESD Polymeric Flooring

Trek Incorporated
11601 Maple Ridge Road, Medina, NY 14103
Tel: 1-716-798-3140 Fax: 1-716-798-3106
Manufacturer of instrumentation for measuring surface voltage, ionizer performance, and surface resistivity

Kenflex Corporation
460 NE Hemlock, Suite A, Redmond, OR 97756
Tel: 541-923-4765 Fax: 541-923-4190 kenflex@coinet.com
Manufactures FLEXCELL®, FLEXSTAND®, FLEXTOTE®
circuit board transport and protection units, also on web.

ESD Association
7900 Turin Road
Building 3
Rome, NY 13440-2069

RETURN SERVICE REQUESTED

NON-PROFIT ORG
AUTOCR
U.S. POSTAGE PAID
Rome, NY
Permit No. 189