The **P**roduct **S**afety **E**ngineering **N**ewsletter

Vol. 3, No. 2 June 2007

What's Inside

President's Message

Message from the President:

Hello Product Safety Engineering Society Members,

We thank our members who have submitted articles to the PSES newsletter and for the volunteers that have diligently been putting newsletter together. We take pride in providing a high quality newsletter to you the members by you the members. Please provide feedback both positive and negative on what you think. Also consider submitting technical articles in your areas of expertise for publication.

The Product Safety Engineering Society continues to grow. Overall IEEE membership is growing slightly with membership greater than 300,000. There is some discussion of more aggressive membership growth of up to 500,000 people in the next 5–10 years.

Henry Benitez

PSES is integrating with the other 40 or so IEEE Societies and Councils at the Technical Activities Board level. The PSES Board of Directors has become more familiar with IEEE process and expectations. We are excited about expanding the breadth of our PSES-sponsored conferences. We plan to sponsor conferences outside the United States in coming years. This year's conference is in

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The **Product Safety Engineering Newsletter**

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http://www.ieee-pses.org/emc-pstc.html
http://www.ieee-pses.org/newsletters.html
http://www.ieee-pses.org/pses.html

Longmont, CO on October 22–23, 2007. Austin, TX is the venue for 2008. Canada is being considered as a venue for 2009. We are open to suggestions from our membership, so please provide additional preferred sites to hold our conferences.

Enjoy the newsletter and consider contributing articles yourself for publication in your areas of interest.

Sincerely,

Henry Benitez
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Technically Speaking

by Richard Nute
June, 2007

Safety Critical Components

Here are several definitions of a safety-critical component:

1. A component which affects the safety of the equipment. All components in primary circuitry are safety critical. Other components which protect the equipment under normal and fault conditions, such as thermal switches, optocouplers, etc. are also safety critical. (http://www.i-spec.com/IEC_60950/glossary.html)

2. Electrical Safety Critical Parts are those electrical components or assemblies used in a power or safety circuit, whose proper operation is critical to the safe performance of the system or circuit including but not limited to the following:
   1) All electrical components acting as a protective device to interrupt current in an abnormal condition such as circuit breakers, circuit protectors, fuses, overload or thermal relays.
   2) All components and wiring for the EMO system including power supply, EMO contactor or interrupting device and pushbuttons.
   3) All hardware or firmware components and wiring for safety interlock circuits.
   4) All devices that are in an area that is classified as a Hazardous Location must have the appropriate rating for the area such as Class I Division I or Class I Division 2 unless listed as intrinsically safe.
   5) Those components that upon evaluation present a risk of fire or shock in their use or application and are risk ranked per SEMI S10 with a medium or higher ranking.

   (https://supplier.intel.com/static/EHS/3prtycriticaleleccomp.pdf)

3. "Where failure of components and assemblies could result in a risk of electric shock, fire, personal injury," or affect "Prevention and Control of Unintended Releases" of HPMs, those components and assemblies ARE SAFETY CRITICAL. They "should be certified by an accredited testing laboratory and used in accordance with the manufacturer's specifications, or otherwise evaluated to the applicable standard(s)". (http://dom.semi.org/web/wFiles.nsf/Lookup/Safety_critical_component/$file/Safety_critical_component.pdf)

These three definitions are quite different. The common thread is that, somehow or other, the safety-critical component affects the safety of the equipment. Let's examine these definitions in detail.

The first definition states that all components in the primary circuit are critical components. I would agree that all primary circuit components are *candidates* for safety-critical components, but not necessarily *are* safety-critical components. For example, the resistors used in the control circuits of a switching-mode power supply are not likely to be identified as safety-critical components. I'll discuss why further in this article.

The first definition also identifies "components which protect the equipment under normal and fault conditions" as safety-critical components. Well, I would agree for components that protect a person, but not for components that protect the equipment. From a safety point of view, I don't care whether the equipment self-destructs as long as in doing so, it is not likely to injure a person.

The second definition states that a safety-critical component is one "whose proper operation is critical to the safe performance of the system or circuit." The definition gives some examples such as fuses, emergency off (EMO) components, interlock components, and components that "present a risk of fire or shock in their use or application." I agree that these examples are indeed safety-critical components. Note that this definition requires the *proper operation* of a safety-critical component. I'll discuss this further in this article.

The third definition seems to contradict the second definition. This defines a safety-critical component as one whose *failure* leads to "a risk of electric shock, fire, personal injury." Furthermore, such components should be *certified*, but does not say anything about what the component should be certified for.

We can see that the term "safety-critical component" has several meanings, some seemingly contradictory, and none of which is really satisfactory.

Let's first look at whether a safety-critical component is one whose proper operation maintains safety or one

whose failure leads to a risk of injury. Indeed, these are not contradictory, but are complementary.
I'll explain later.

If the failure of a component leads to a likelihood of injury, then the component must be designed such that it is not subject to failure for the lifetime of the equipment. Such a component would be a safety-critical component. And, in many cases, it would need to be certified to safety requirements applicable to the particular component, which ultimately means the component is not likely to fail when subjected to the rigors of use. An example of such a component would be a Y2 capacitor.

Alternatively, if the failure of a component leads to a likelihood of injury, then a second component or safety scheme must be installed so as to mitigate the consequences of failure of the first component. This second component or safety scheme is a safety-critical component.

Let's look at some examples. Consider a system of basic insulation and supplementary insulation. Failure of basic insulation could lead to an electric shock injury. However, the supplementary insulation mitigates the failure of the basic insulation, so the supplementary insulation is a safety-critical component.

But, what about the basic insulation? Clearly, we have always considered basic insulation as a safety-critical component. Why? If the failure of basic insulation is mitigated by supplementary insulation, then what is the justification for basic insulation being designated as a safety-critical component?

If the supplementary insulation did not exist, then the basic insulation provides protection against electric shock. In other words, under normal operating conditions, basic insulation provides protection against electric shock. So, basic insulation is a safety-critical component.

We have two kinds of safety-critical components. The first kind is one that provides safety under normal operating conditions and may be subject to failure. The second kind is one that provides safety under single-fault conditions.

With these principles in mind, let's take another look at the first definition of safety-critical component. It said that all components in the primary circuit are safety-critical components. I said primary components are *candidates* for safety-critical components.

Okay, which components in the primary circuit provide protection against electric shock? Consider that protection against electric shock, first and foremost, is provided by insulation; such insulation has the name "basic insulation." So, with respect to electric shock from the primary circuit, we must identify all of the basic insulations. These would include the insulation of the appliance coupler, the insulation of the primary wires, some portions of the insulation of the printed wiring board, and, of course, the transformer primary-secondary insulation. All of these basic insulations provide safety under normal operating conditions and are safety-critical components of the first kind.

These same basic insulations are expected to fail. Consequently, the equipment must include the second kind of safety-critical component – the kind that provides safety under single-fault conditions (failure of basic insulation).

We've already mentioned that supplementary insulation is the second kind of safety-critical component. Another second kind of safety-critical component is protective earthing. If basic insulation should fail, then the earthing scheme will carry the fault current back to the neutral conductor and the installation overcurrent device should then open the circuit. So, the earthing scheme is a safety-critical component. But, the earthing scheme is comprised of a number of components such as wires, terminals, and fasteners. Each of these components of the earthing scheme is a safety-critical component.

So, now we have normal-condition safety-critical components and fault-condition safety-critical components.

Let's return to the primary circuit components. Assume a switching-mode power supply. If one of the input rectifiers should fail short, the input fuse will open. So, a fault opens the fuse. This means the fuse is a fault-condition safety-critical component.

The question is: What hazard does the operation of the fuse prevent? Putting this another way, if the fuse was not in the circuit, what would be the result of a short-circuit of one of the input rectifiers? Assuming a bridge rectifier, then short-circuiting of one rectifier would result in at least one other rectifier in the bridge to be across the power line, resulting in rapid and severe overheating. And, maybe, a fire.

As a general rule, a fuse provides protection against fire. (A fuse *may* provide protection against other hazards, but such other protections are not being discussed here.)

So, what is the normal-condition safety-critical

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component that provides protection against fire?

First, note that equipment fire does not occur under normal conditions. Equipment fire only occurs in the event of a fault.

We can examine this in the same way in which we examined basic insulation and found it to be a safety-critical component. If we don't have a fault-condition safety-critical component (fuse), and if a fault condition should occur, what is the component that would overheat and cause a fire?

In the bridge rectifier, the component that overheats is not the one that is shorted, but one of the other rectifiers. So, that rectifier becomes a normal-condition safety-critical component because under normal conditions it does not overheat and cause a fire.

Now we ask: Aren't all components normal-condition safety-critical components because under normal conditions they do not overheat and cause a fire?

The answer is no. If we now consider the control circuits of a switching-mode power supply, we can introduce faults which do not cause overheating. Components that do not overheat and cause a fire under fault conditions are NOT safety-critical components. If a component does not overheat and cause a fire under fault conditions, then a fault-condition safety-critical component (e.g., fuse) is not required.

Often, the bulk capacitor of a switching-mode power supply is identified as a safety-critical component. Applying our rule, what happens if there was no fuse and if the capacitor is shorted? The bridge rectifier quickly overheats and may cause a fire. So, the bridge rectifier must be provided with protection against overheating, which is provided by the fuse. So, the bridge rectifier is the normal-condition safety-critical component, and the fuse is the fault-condition safety-critical component. The capacitor is NOT a safety-critical component.

Indeed, components that are faulted are rarely safety-critical components. If the equipment remains safe in the event of a component fault, then we have shown that that component is not critical to safety, even in the event of a fault.

So, we have two kinds of safety-critical components. The first kind is a component that provides safety under normal operating conditions. The second kind is a component that provides safety under single-fault conditions.

I don't like the term "safety-critical component." First, it is abstract. Second, it doesn't have a consistent definition. Third, the word "component" seems to exclude insulation and earthing systems, both of which are safety-critical.

Consider basic insulation and supplementary insulation. Basic insulation provides protection under normal operating conditions. Supplementary insulation provides protection in the event of a fault of basic insulation, i.e., under single-fault conditions.

We could carry this theme over to safety-critical components. We could name the two kinds of safety-critical components as "basic safety-critical component" and "supplementary safety-critical component." A bit of a mouthful, but it gets the point across.

Instead of "safety-critical component," I like the word "safeguard." Immediately, it conjures up some physical thing, so it is not abstract. I define "safeguard" as a device or scheme that provides protection against a hazard.

Now, we can have a "basic safeguard" that provides protection under normal conditions, and we can have a "supplementary safeguard" which provides protection under single-fault conditions.

*****

If you have any comments or questions about this article, please send to Richard Nute, richn@ieee.org.

If you have a question about product safety, and would like to see the answer published here, please send the question to Richard Nute, richn@ieee.org

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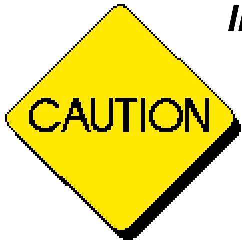

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The Product Safety Engineering Newsletter is published quarterly during the last month of each calendar quarter. The following deadlines are necessary in order to meet that schedule.

Closing dates for submitted articles:

1Q issue: February 1
2Q issue: May 1
3Q issue: August 1
4Q issue: November 1

Closing dates for news items:

1Q issue: February 15
2Q issue: May 15
3Q issue: August 15
4Q issue: November 15

Closing dates for advertising:

1Q issue: February 15
2Q issue: May 15
3Q issue: August 15
4Q issue: November 15

eDJ Publication Schedule

The eDJ is published as a special section of the PSEN.
Contact Mike Sherman for details.

We need papers, news, articles, etc. for the Newsletter,

eDJ

and Symposium.

Symposium Author's Schedule:

Intent to present and topic (e-mail) April 29, 2007
Draft e-paper June 1, 2007
Notification of Acceptance July 6, 2007
Complete e-paper August 17, 2007

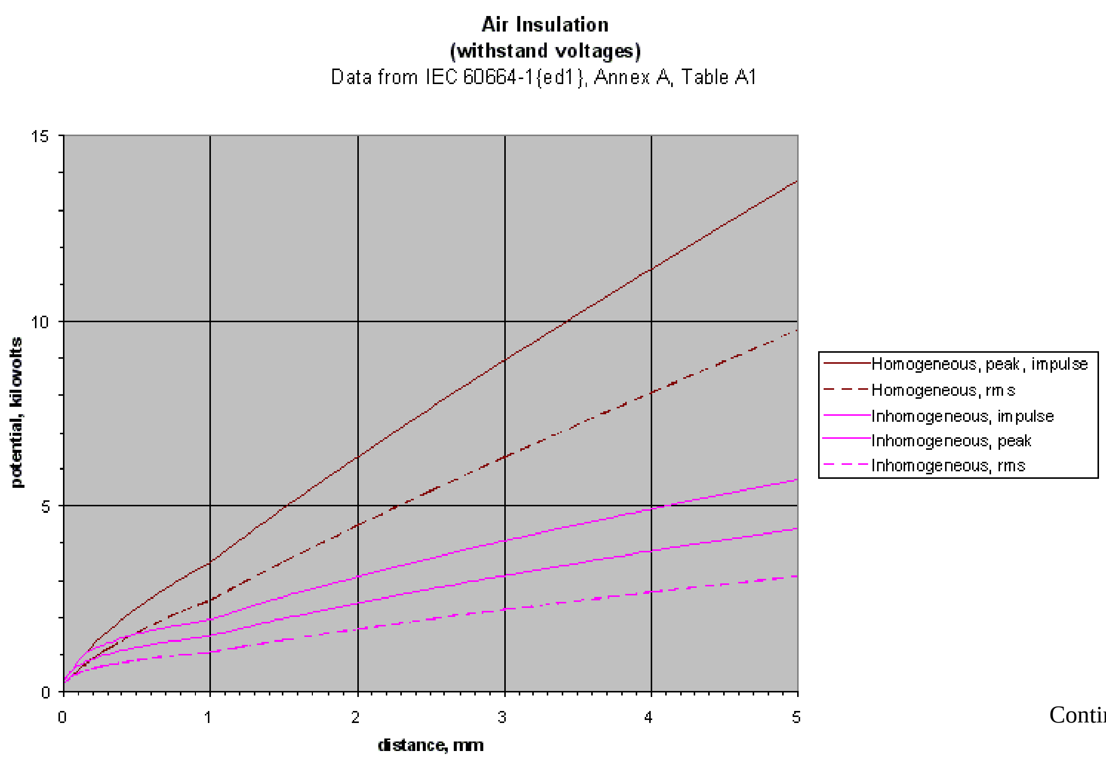
Effect of Thin Solid Insulating Material When Verifying Clearances by Electric Strength Test

by Lal Bahra

Various standards prescribe clearance requirements usually in the form of tables. The prescribed clearances in the tables are an indirect measure of the electric strength of air insulation. By definition, a clearance is a shortest distance between two conductive parts through air. Clearance is designed to withstand the maximum peak voltage that this shortest distance will see including any transient overvoltages. If the voltage goes above this voltage, there is a possibility that the clearance may breakdown. Therefore, the tables for clearances usually have a built-in margin.

Another way of determining the electric strength of air insulation is by actually conducting an electric strength test. The electric strength test voltage is determined by taking into account the maximum peak voltage that will appear across a clearance including transients and repetitive peaks. If a thin solid insulating material such as a coating over a trace or a terminal in series with the clearance then the electric strength test can still be used to test the electric strength of air insulation.

Table A.1 in IEC 60664-1 gives the maximum withstand voltage for a certain clearance in terms of peak impulse voltage, ac voltage and dc voltage. From the data in the table, it is apparent that the withstand voltage is directly proportional to the clearance distance. As the distance increases, the withstand voltage also goes up. The chart below shows the relationship of the withstand voltage to clearance distance.



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It is clear from the above that electric strength test that is based on the maximum peak voltage the clearance will see can be used to verify the required clearance. The electric strength test voltage may have a margin added to insure a similar margin as provided by the tables.

The new hazard-based safety standard that is being developed by TC108 of IEC is going to offer this alternative approach of verifying the clearances by electric strength test.

In a majority of the times, the distance between two conductive parts is through air but in some instances there may be a coated trace or a coated terminal which adds a solid insulating material in series with the clearance. There was some skepticism if electric strength test method of verifying clearances is a suitable approach or not when a thin solid insulating material is added in series with a clearance. The reason for this skepticism is that insulating materials have higher dielectric constant compared to air and in general they can withstand a higher electric strength per unit distance than air. If the insulating material is solid insulating material or thin sheets of insulation (other than enamel) then the criteria for accepting solid insulation applies as given in the applicable standard. Enamel is usually not accepted as an insulating material but that may change in the future as TC 96 (IEC technical committee responsible for basic safety of transformers) is developing requirements for a special grade of enamels as insulating materials that may be acceptable at par with other solid insulating materials.

Enamel on a winding wire or coating on a terminal or a trace may withstand 3 kV or more and since enamel is not accepted as an insulating material, question arises if the electric strength will adequately verify the required clearance (this criteria does not apply if enamel or coating serves as solid insulation. It applies only when enamel or coating is a thin solid insulation in series with the clearance).

If an electric strength test voltage is applied between two conductors having a clearance in series a solid insulating material such as enamel or coating, then the voltage divides inversely proportional to the dielectric constant of the solid insulating material and air. The dielectric constant of air is 1. The solid insulating material usually has a higher dielectric constant. Materials commonly used as enamel or as coatings are polyurethane, polyester, polyester-imide, polyamide-imide, etc. Using the maximum thickness commonly used for enamel, the voltage drops across the air gap and the insulating material can easily be calculated.

For further information on types of enamels and their thicknesses, please see:
www.enameledwire.com/EnameledWireCatalogue.PDF
For dielectric constant data, please see:
www.clippercontrols.com/info/dielectric_constants.html

The calculations are shown for enamels made from two materials, Polyester and Polyamide. The maximum thickness of 0.04 mm for enamel (as described at the website given above) is used to calculate the voltage drops as shown in the table given below. For all practical purposes, almost all the voltage drop is across the air. The graph at the end of this paper shows the voltage drop across air clearance versus a certain thickness of the insulating material. The voltage across air starts to fall rapidly when the distance through air falls below the mains transient overvoltage. Therefore, as long as the drop across the air part of the clearance distance is 2500 V or more, we can safely say that given the margin in electric strength test voltage used for testing the clearance, the air part of the clearance is tested appropriately for the peak voltage it actually sees. This will be the case in majority of devices [unless the designed clearance is unduly low (clearance is not designed properly to begin with)]. The clearance will still be sufficient if enamel is not present (in case the enamel gets damaged).

Calculations for voltage drops across air gap during the electric strength test

Enamel Material: Most commonly used material is Polyester resin or polyester, 0.04 mm thick

Dielectric constant for Polyester: 5 (can vary slightly from website to website)

$$V_{PSI} = \left(\frac{V_P}{\left(T_{SI}/K_{SI} + T_A/K_A\right)} \right) \left(\frac{T_{SI}}{K_{SI}} \right)$$

Dielectric constant for air: 1

Supply voltage: 230 V having a mains transient overvoltage of 2500 V peak (see IEC 60664-1)

$$V_{PA} = \left(\frac{V_P}{\left(T_{SI}/K_{SI} + T_A/K_A\right)} \right) \left(\frac{T_A}{K_A} \right)$$

Required Withstand voltage = $V_P = V_{PSI} + V_A$

Formula used for calculation (voltage divides inversely proportional to the dielectric constant):

and

Where

V_P is the max peak test voltage

V_{PSI} is the max peak voltage that will appear across the solid insulating material

V_{PA} is the max peak voltage that will appear across air

T_{SI} is the thickness of the solid insulating material

K_{SI} is the dielectric constant of the solid insulating material

T_A is the clearance or distance through air

K_A is the dielectric constant of air which is equal to 1

For Example, for a 230 V system, the mains transient = 2500 V.

Therefore, the withstand voltage (without margin) = 2500 (thickness of enamel/5 + air gap/1) x clearance = 2500 (0.04 / 5 + 2 / 1 for 2 mm air gap) = 2500 (0.008 + 2) = (10 V across enamel + 2490 V across the air gap).

Test voltage: 2950 V peak impulse (from IEC 60664-1) taking margin into account.

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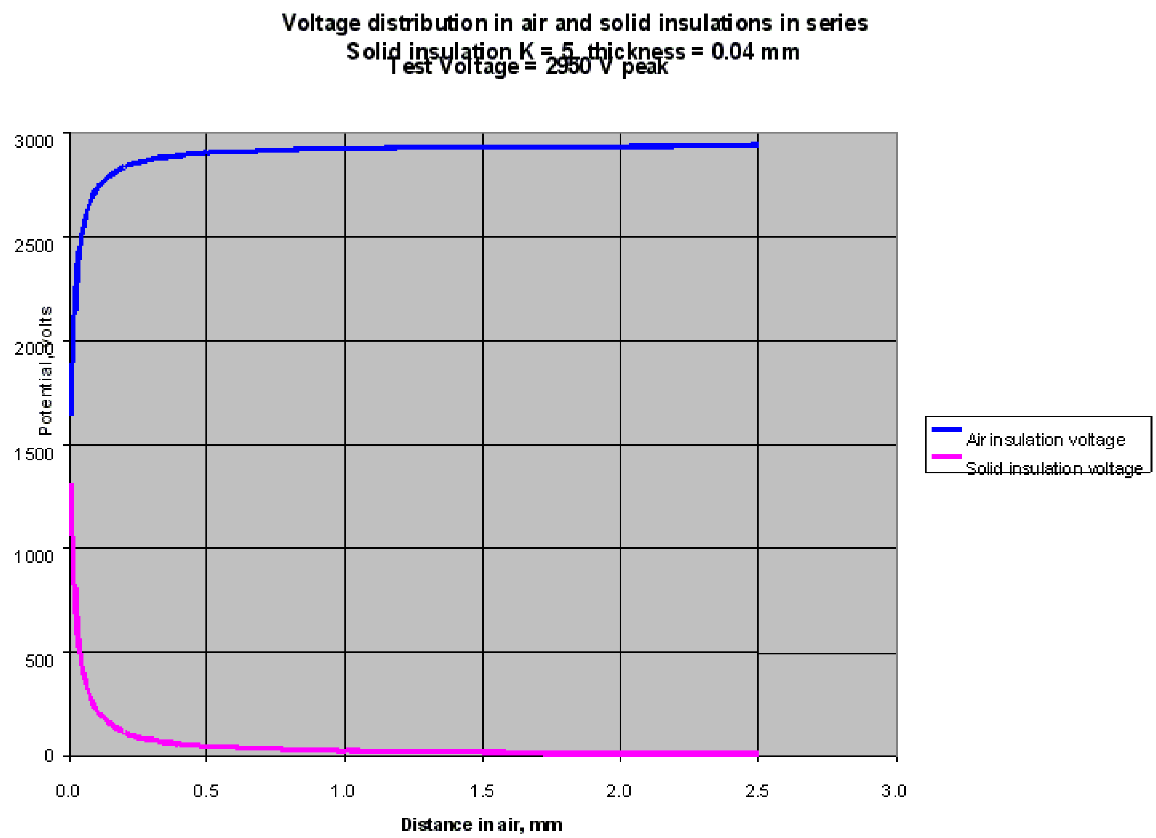
Table for calculations

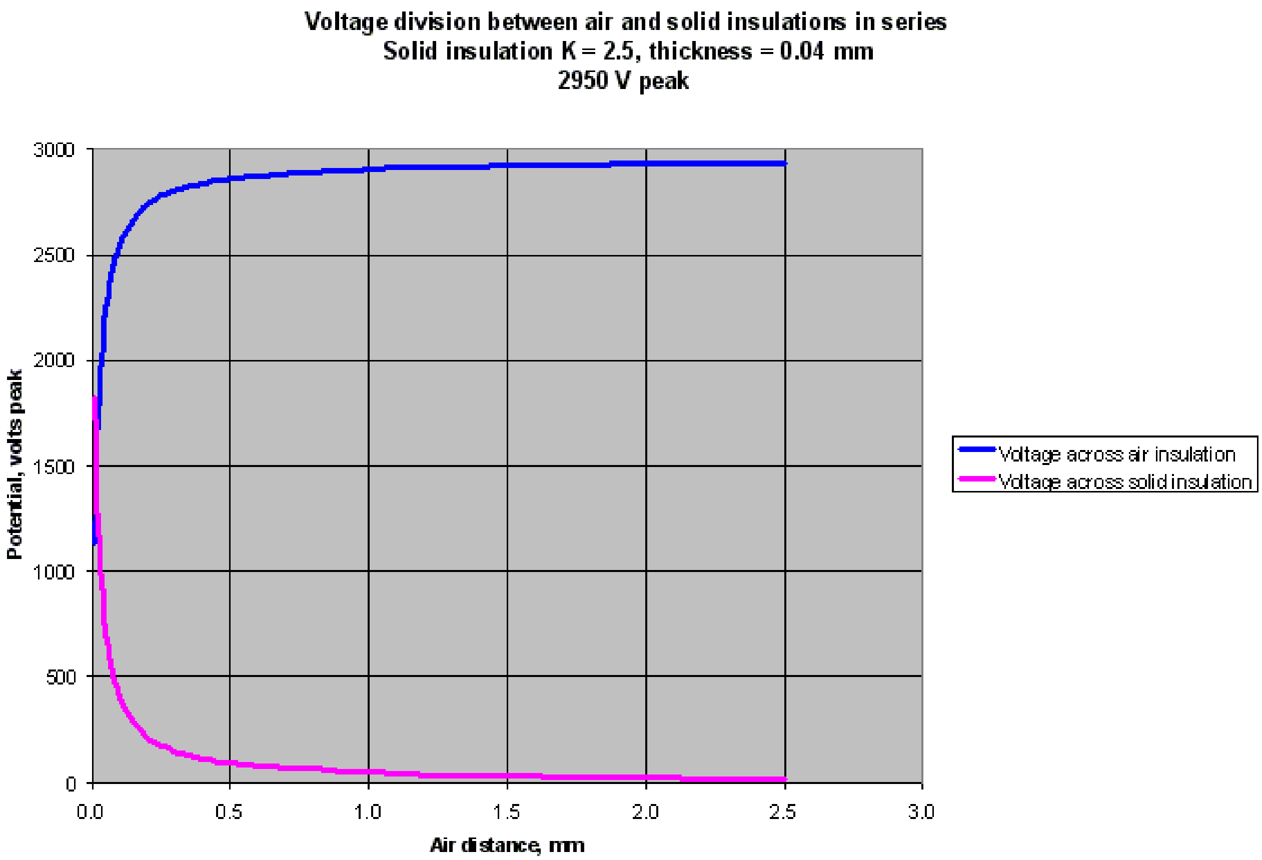
Enamel thickness mm	Air gap mm	Transient on 240 V system	Transient Voltage across Air gap if tested with 2500 V	Test Voltage across enamel if tested with 2500 V	Peak impulse test voltage for 2500 V peak transient	Test Voltage across Air gap when tested with 2950 V	Test Voltage across enamel when tested with 2950 V
Material: Polyester, dielectric constant = 5							
0,04	2	2500	2490	10	2950	2938	12
0,04	1	2500	2480	20	2950	2926	24
0,04	0,6	2500	2467	33	2950	2911	39
0,04	0,4	2500	2451	49	2950	2942	58
0,04	0,2	2500	2404	96	2950	2836	114
0,04	0,1	2500	2315	185	2950	2731	219
Material: Polyamide, dielectric constant = 2.5							
0,04	2	2500	2480	20	2950	2927	23
0,04	1	2500	2460	40	2950	2904	46
0,04	0,6	2500	2435	65	2950	2874	76
0,04	0,4	2500	2410	96	2950	2836	114
0,04	0,2	2500	2315	185	2950	2731	219
0,04	0,1	2500	2155	345	2950	2543	407
For 2500 V peak impulse (the mains transient for 230 V supply), the test voltage is 2950 V peak impulse (accounting for safety margin). The test voltage is higher than the actual transient voltage level (see IEC60664-1). The test voltage in the above two cases does not go below 2500 V for up to 0.1 mm air gap when tested with 2950 V peak impulse. The voltage drop across air gaps of less than 0.1 mm distance will fall very rapidly.							

Conclusion

If enamel or coating is not part of the clearance, the electric strength test is sufficient to verify a clearance. If enamel or coating is in series with a clearance that is being verified by the electric strength test, the voltage drop across the enamel or coating is negligible (for a reasonably designed clearance). However, if enamel or coating forms solid insulation between two conductive parts, that is not the subject of this paper. Requirements for solid insulation will apply in that case.

The following graphs show the voltage distribution across air and the insulating material.





Lal Bahra is a P.Eng. at Dell Inc.

2007 CSA/RIA Robot Safety Conference Report

by Doug Nix

Each year in March the Robotic Industries Association and the Canadian Standards Association get together to host the Robot Safety Conference in Toronto. This conference is an important event for robot system integrators and robot users, including members of Joint Health and Safety Committees in plants where robots are used.

This year the program started with a pre-conference training day on Monday, 25 March. The program for that day included sessions on CSA's Z460 *Control of Hazardous Energy – Lockout and other means*, the Essentials of Conducting a Pre-Start Health and Safety Review, Understanding the CSA Z434 robot standard, An Introduction to Risk Assessment and Control Reliability, Basic Safety Circuit Design, and finally a Risk Assessment Exercise.

Tuesday was the first full day of the conference, with presentations from CSA and RIA on future developments in the robot safety standard, case studies on a variety of topics and a session on safeguarding selection just before lunch.

The most significant items were the announcement by CSA of the launch of the new CSA Z462 standard, and the launch of the new CSA risk assessment standard committee.

CSA Z462 is an adoption of the NFPA 70E *Standard for Electrical Safety in the Workplace*, which covers arc flash hazard protection. This is a very significant standard. Hundreds of electrical workers are injured by arc flash every year. In the last edition of the *Canadian Electrical Code*, NFPA 70E is directly referenced. This standard includes requirements for labeling of electrical panels and defines the types of personal protective equipment required for work on live electrical equipment. Many large companies are already adopting this standard, and more will soon follow.

The striking of a CSA Technical Committee to develop a CSA risk assessment standard is also important. At the moment, the only "Canadian" risk assessment methodology is found in CSA Z434 and CSA Z432. This method has been adopted from RIA's R15.06-99 *Robot Safety Standard*. This will be an important standard to watch in coming months.

RIA announced the release of a new Technical Report, ANSI RIA R15.106 2006, *Teaching Multiple Robots*. This report provides some important guidance on approaches to system design related to the specific hazards that are created when multiple robots are implemented in close quarters. If you design systems using multiple robots, you need to get a copy of this report.

CSA and RIA announced the planned adoption of ISO 10218, the international standard on robot safety. The plan is to adopt the ISO standard following the release of the next edition. This means that the North American standards as we know them today will disappear and be replaced by the international document, possibly with a few National Deviations. This will allow robot manufacturers to build a "world robot" product that can be deployed anywhere in the world. It also means that robot system integrators can take advantage of common global requirements, designing systems in the same way regardless of the final installation destination.

The afternoon continued with more case studies, including a session by Tom Doyle of Industrial Safety Integration on the cost effects of system downtime due to injury events. The afternoon wrapped up with a demonstration by a number of the presenters on stopping performance measurement and the determination of safe distance for light curtains, area scanners and similar equipment.

The final day of the conference included an overview of control circuitry followed by case studies. Doug Nix presented on the newest edition of ISO 13849-1, *Safety of Machinery – Safety Related Parts of Control Systems, Part 1: General Principles for Design*. This is a significant update to this important standard. The new version introduces the concept of Performance Levels (PLs) and provides a means to determine the PL required for an application based on the risk assessment. Using component data, the performance of a safety circuit design can be analyzed and then modified to provide the reliability required by the risk assessment. The standard maintains the well-known reliability categories (B, 1-4) and improves on their application. This standard is certain to have wide-reaching effect on international, EU and North American standards. If part of your work involves the design of safety related controls, you need to know and apply this standard in your daily work.

The morning wrapped up with a panel discussion with the attendees, giving the conference goers the chance to ask the presenters some of the tough questions that they haven't been able to get answered.

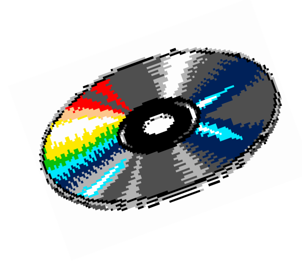
The afternoon was filled with three all-afternoon sessions: a Z432 workshop, Using Risk Assessment in Safeguarding Automated Systems and Advanced Safety Circuit Design. Gil Dominguez of Rimrock Automation chaired the Advanced Safety Circuit Design session. Also speaking was Ron Roepke from Pilz Automation and Ian Brough of SICK Optic. The session provided attendees with an in-depth look at some robot-specific circuit designs, including the implementation of a safety-PLC application. Gil expanded on Doug's earlier presentation by walking the attendees through some of the ISO 13849-1 calculations necessary to determine the Performance Level of an example circuit.

The conference also included a trade show, with the exhibition hall open during lunch and into the evening on Tuesday. One of the most exciting new products being displayed was the new vision-based area safeguarding system from Pilz. This system uses three cameras mounted in a small housing to develop a 3-D image of the safeguarded space. Like a conventional area scanner, warning and stop zones can be set, but these zones can now be defined in 3-D. The system has not been officially released yet, but will be in the next few months. Contact your Pilz representative for more information.

For those new to robot applications, or new to the design requirements for robot installations, this was an excellent conference. For more information, go to the CSA Learning Centre web site, https://learningcentre.csa.ca/lc_site/beg.asp and search for "robot."

Doug Nix, A.Sc.T., is a member of the Product Safety Engineering Society in the Waterloo Region, Canada.

2004 / 2005 / 2006 IEEE-PSE Symposium



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News and Notes

Society

Introducing Our New Mentor

Here is a little about Bob Rassa, the new mentor from the Technical Advisory Board to the PSES.

Bob is presently the Director of System Supportability at Raytheon's Space and Airborne Systems (formerly Hughes Aircraft), in El Segundo, California, where he is responsible for enhancing the supportability of Raytheon defense products and DoD weapon systems, and in assisting Raytheon corporate-wide in the implementation of CMMI (Capability Maturity Model Integration) and other systems engineering improvements. He has a 40-year career involving Supportability, Integrated Logistics Support, Automated Test, Systems Engineering and Program Management within Industry.

Bob's BSEE is from the University of California. He has published numerous papers and delivered presentations, most on radar systems, logistics, program management, and systems engineering.

Bob has more than 30 years of experience as an IEEE volunteer, having joined IEEE in 1976. He achieved Senior Member in 1993 and was elected to the grade of Fellow in 2004. Bob initiated the now-annual Panel of Conference Organizers (POCO), first held in July 2006 in Montreal, QE, Canada and scheduled for July 2007 in Vancouver, BC, Canada. This 2-day activity provides IEEE Conference organizers, Society/Council Conference Vice-Presidents, and Region Conference Chairs with all the basic information they need in the performance of their jobs.

Bob's hobbies are photography (digital and film), automobile racing and autocrossing; automobile collecting; snow skiing (downhill); water skiing; roller blading; biking; motorcycling; automobile rallying; automobile Concourse d'Elegance; sports cars; automobile mechanics; automobile restoration; journalism; and 4H.

WHO-IS-IN-WHAT

"WHO-IS-IN-WHAT" project

The value of networking with others who do the same work is widely recognized. Therefore, the *PSEN* recently conducted a networking experiment.

In this department of the previous issue of *PSEN*, we published a survey of PSES members to learn what product-safety-related committees, panels, IEC National Committees, National Committee Advisory Groups, trade association technical or standards committees, and such our members belong to. The survey resulted in one response, so the "WHO-IS-IN-WHAT" project has been abandoned.

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If you do not see your name in the list and are a new member, please email j.bacher@ieee.org with the details.

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