The Product Safety Newsletter

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What's Inside

Chairman's Message

1994 EMC Symposium

Very shortly you will receive the advance program notice for the 1994 EMC Society Symposium to be held in Chicago this August. There are three events in particular that you need to be aware of for your planning. For the first time, there will be a formal paper session devoted at least in part to product safety. On Tuesday morning, August 23, "Product Safety and Spectrum Management" will be a featured session. Additionally, the poster session will also include a paper on safety. It's not coincidental that all featured papers deal with biological effects of exposure to various electromagnetic phenomena. Special thanks are due the TC-8 paper reviewers, Dan Weinberg, Mike Harris, Murlin Marks and Dave Dini for their timely and insightful analyses.

Additionally, the TC-8 Annual Meeting will take place on Thursday afternoon, August 25, from 5 to 7 PM. This meeting is an opportunity to review our activities and progress against our goals and to reassess and recast our future goals. All are welcome to attend and participate.

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Product Safety Newsletter

The Product Safety Newsletter is published bimonthly by the Product Safety Technical Committee of the IEEE EMC Society. No part of this newsletter may be reproduced without written permission of the authors. All rights to the articles remain with the authors.

Opinions expressed in this newsletter are those of the authors and do not necessarily represent the opinions of the Technical Committee or its members. Indeed, there may be and often are substantial disagreements with some of the opinions expressed by the authors.

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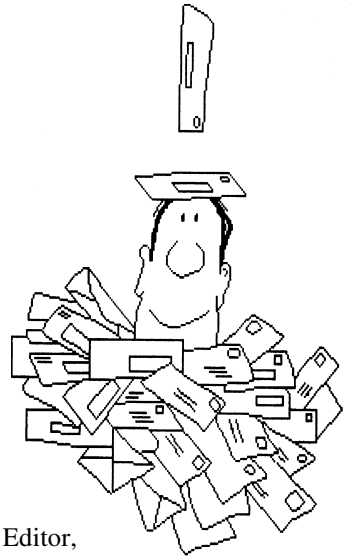
Letters to the Editor



Dear Editor,

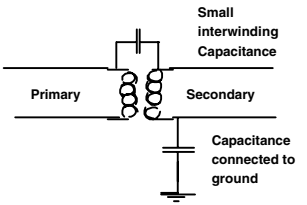
In the Technically Speaking column by Rich Nute, entitled "Working Voltage, Electric Strength and Spacings" (July-August-September 1993), the author states "...secondary dc circuits are examples of this kind of circuit. It is an abnormal condition that secondary dc circuits have transient overvoltage". The author implies that secondary circuits are free from transients except under abnormal operating conditions.

Secondary circuits which are isolated from the mains by an earthed metal screen or circuits which have one side of the secondary connected to earth, are examples of the circuits mentioned in the above paragraph. However, a floating secondary circuit (not isolated by an earthed metal screen) is subjected to full mains transients.

First of all, due to induction effect, some transients do get through to the secondary, depending upon the turns ratio and the core material.

Secondly, the transformer has a small interwinding capacitance. The transients, being very narrow high rise-time pulses, are transmitted to the secondary without any appreciable reduction in value. This is a normal condition.

However if a large capacitance (compared to the interwinding capacitance of the transformer) is connected from the secondary to earth, then the large capacitance acts as a low impedance path for the transients. For such a case transients in the secondary would have been reduced. This is the reason for having the Condition No. 5 to Table 5 of IEC Publication 950 (Secondary Edition).



Best Regards and Thanks,
Lal Bahra, P. Eng.
Engineering Project Manager
Engineering and Quality Assurance
Certification Division
Canadian Standards Association

[Note: See the Technically Speaking column in this issue for a discussion of transmission of transient voltages through transformers and power supplies into secondary circuits. -Ed.] ❑

In Memorium: A Friend and Colleague Passes On

by Richard Pescatore

It is with deep personal regret and sadness that I inform you of the unexpected and untimely death of Mike De Martini, Managing Engineer at Underwriters Laboratories Inc. (UL) in Santa Clara, California.

Mike passed away suddenly and without warning, apparently of heart failure, while at home on the evening of January 15.

Mike spent his entire career in the field of product safety, having worked at UL since 1969. His dedication and personal efforts were evident through his involvement with the profession at various levels.

In addition to his work within UL, Mike was active in the International Electrotechnical Commission (IEC), the IEEE Product Safety Technical Committee (PSTC) and the National Fire Protection Association (NFPA). He served in various positions of leadership at UL, in the IEC and the NFPA. He supported the goals of the PSTC by participation as a technical speaker.

Mike will be remembered for his dedication to product safety, both nationally and internationally. His progressive approach to the discipline was welcome as he applied his formal engineering training and his creativity to problem resolution and the setting of standards. On several occasions, Mike shared his feelings of personal commitment to the betterment of mankind. He viewed his work as his contribution to society.

In addition to his dedication to the profession, Mike's leadership abilities have been recognized and acknowledged by his colleagues and co-workers alike. His integrity, fairness, compassion, understanding, caring, respect for others and winning attitude were appreciated by all. One co-worker characterized Mike as "the absolute best boss - a true leader with a vision."

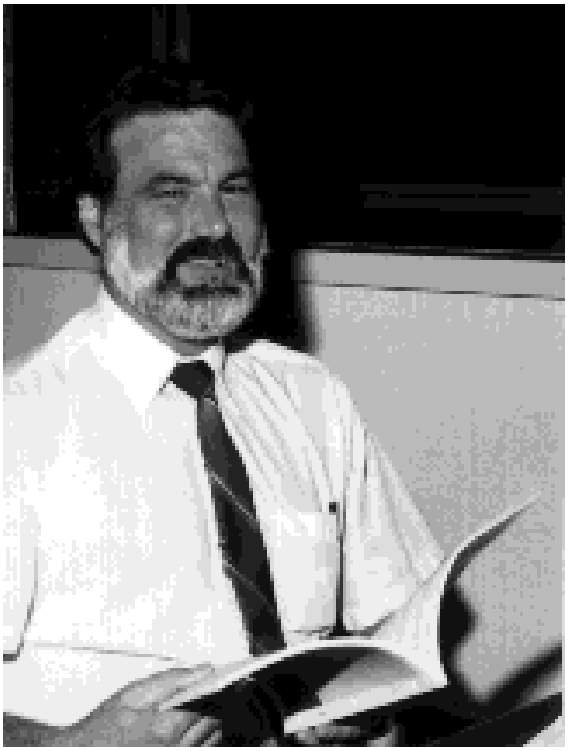
Mike is survived by his mother, daughter, two sisters, and fiancee.

Those of us who knew Mike have lost a great friend and colleague. He will be missed not only by his loved ones, but also by those of us who were proud to have known him, to have been his friend and to have worked with him all these many years. o

1969 - BSEE Univ of Santa Clara
1969 - Assist Engr, UL, Sec B
1970 - Proj Engr,UL, Sec B
1976 - Senior Proj Engr, UL, Sec A
1977 - Registered Professional Engineer
1980 - MBA Univ of Santa Clara
1981 - 1985 grew Sec B from 19 to 49 persons
1989 - Managing Engineer, Electrical Dept
1992 - Managing Engineer, Engr. Services

Developed and Published UL 114/UL478
Developed draft harmonizing UL 478/IEC 950
Introduced USA requirements into IEC 950
Developed and published UL 1950

Michael James DeMartini
1947-1994



[The following is extracted from UL's Feb. '94 issue of CONNECTION and is reprinted here with permission- Ed.]

UL has lost a highly respected employee and a totally dedicated professional in Michael James DeMartini, 46, who died from apparent heart failure on January 15.

Mike was Managing Engineer of Engineering Services, Department 313, and would have celebrated 25 years with UL in July.

A native Californian, Mike was father of Tracey DeMartini of San Jose, and son of Eleanor DeMartini of San Anselmo and the late James DeMartini. He also leaves two sisters, Judith Morris of Point Reyes and Ginny DeMartini of Hayward, and his fiancee, Louise Roy, of Hollister.

On January 20 more than 200 relatives, friends, coworkers, and associates attended memorial services for Mike at Transfiguration Church in San Jose. The large attendance indicated the high regard people in UL and his associates outside the company had for him.

Mike earned his BSEE and MBA degrees from the University of Santa Clara. He was a Registered Professional Engineer in the State of California (Safety Engineering) and a member of numerous engineering committees.

Among his professional achievements was the UL Professional Engineer's award he received in 1983. He won this recognition for his work in development and publication of a combined Standard, UL 478, fifth edition, which comprehended older office appliances and equipment with newer information processing equipment.

The award also acknowledged his significant contribution in harmonizing UL 478 with IEC 950, an international standard for information technology equipment. Subsequently, Mike was instrumental in the further harmonization of UL 478 with IEC 950 into a document now known as UL 1950.

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European Economic Area (EEA) Agreement - Looking Ahead!

by Rainer Gehrmann,
Hewlett-Packard GmbH

The long negotiated agreement between the European Community (EC) and the European Free Trade Association (EFTA) was finally signed on 17 December 1993.

The agreement was originally planned to come into force on 1 January 1993, but was delayed by one year. The delay was due to the referendum in Switzerland, which voted against the EEA (and which consequently is NOT part of the EEA), and more recently by parliamentary elections in Spain and Portugal. It has now been in effect since 1 January 1994.

The agreement aims at establishing a uniform European wide economic area allowing free movement of goods, capital, people and services.

Beyond the more general implications of such an agreement, I would like to draw your attention to the implementation and consequences in the field of product regulations.

The harmonization process within the EC will be extended to the signatory EFTA countries, which means that local product standards shall be harmonized with European Standards (ENs) and local laws shall be harmonized with European requirements and directives. Product conformity assessment procedures including testing shall be harmonized with the EC, as well as market supervision and product surveillance methods.

Significant changes will take effect, not ALL on 1 January 1994, but according to a timetable, which partly is already aligned with the transition periods of European directives and standards.

- Existing pre-sales and border “product” control will disappear and be replaced by methods focusing on market surveillance and “process” control.

- Conformity testing and verification done in accordance with the European schemes will be sufficient with proof of conformance by CE marking and declaration of conformity.

Without going into details of changes on a country-by-country level, I would like to highlight just a few open issues.

- In some areas where mandatory testing was required in the past, but not regulated from the EC, this must cease. However, laboratories involved in such testing in the past have launched awareness campaigns, and market pressure may exist to obtain

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Technically Speaking

by Richard Nute

TRANSIENTS IN SECONDARY CIRCUITS

In the July-August-September issue of *The Product Safety Newsletter*, I discussed "working voltage," and its relevance to the safety of the equipment. Included in that discussion was a discussion of transient overvoltages.

I said that primary circuits normally have transient overvoltages, but that "Equipment secondary dc circuits are examples of "...circuits that have virtually no transient overvoltages."

I further stated, "It is an abnormal condition that secondary dc circuits have transient overvoltages."

One reader said that such statements are only true for secondary circuits separated from primary by an earthed metal screen, or for secondary circuits having one pole connected to earth.

He further said that a floating secondary circuit is subject to full mains transients.

In this issue, I'll examine how transformers behave when subjected to transient overvoltage, both magnetically and capacitively.

I'll also examine the functions of rectification and capacitive smoothing when subjected to transient overvoltage.

And, I'll describe some transient overvoltage tests on a 40-watt transformer, a 20-watt unregulated dc power supply, and on two 50-watt switching-mode power supplies.

Let's first examine how transformers behave, magnetically, in the presence of transient overvoltages.

Power transformers are designed to transform power at 50 or 60 Hertz or both.

Transformers operate as transformers when the flux is within the limits of the design. Flux increases with input voltage. Flux increases with frequency. If the flux increases too much, the core will saturate, and there will be no magnetic coupling from primary to secondary.

Transient overvoltages are comprised of high voltages and high frequencies. The transient voltages often are greater than the rated transformer input voltage. The frequencies contained in the transient are much greater than the rated transformer frequency, usually in the hundreds of kilohertz to low megahertz range.

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News and Notes

by Dave Edmunds
fax: (716) 422-6449

CANADIAN/US ITE SAFETY STANDARD

The PRE-RELEASE DRAFT of the Canadian/US Bi-National standard for the safety of Information Technology Equipment is now being reviewed. This standard will become THE safety standard for ITE equipment in both Canada and the US. The standard will apply to all IT and telecommunications equipment and replaces the four standards currently in use today (CSA 225 & 950, UL 1459 and 1950). It is therefore important to those companies involved with IT and telecom equipment. The document presently is 263 pages long and includes requirements for connection to telecommunications circuits and for connection to centralized DC power sources. The FIRST RELEASE DRAFT for general industry review and comment will become available sometime after the IAC meeting in mid-March, 1994.
Submitted by John McBain

[Rich Pescatore, PSTC Vice-Chairman, is a member of the bi-national committee and may be able to provide more information. - Ed.]

UL ANNOUNCED QUEBEC RECOGNITION OF UL MARK

Underwriters Laboratories Inc. (UL) announced that the Regie du Baument du Quebec has officially recognized the UL Mark for Canada for all product sectors, including gas and electrical, giving UL provincial acceptance throughout Canada.

The appropriate legislative act regarding building and construction on Quebec has been amended, as published in the December 15, 1993 issue of the Gazette Officielle du Quebec, to recognize UL and the UL Mark for Canada.

According to a press release dated December 15, 1993, UL says UL's acceptance in Quebec makes it the first certification organization outside of Canada accredited by the Standards Council of Canada (SCC) to secure complete approval for Canada.

UL was also the first certification organization outside of Canada to be granted Certification Organization (CO) and Testing Organization (TO) accreditation's by the SCC.

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Northbrook, Illinois, USA
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Executive Liaison Canadian Affairs

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Earth Grounding

by Paul W. Hill & Associates

[We are grateful to the author for providing another installment condensed from his book "Product Safeness As A Design Parameter", 2nd Edition, 1990. The text is a registered copyright of Paul W. Hill & Associates, Inc., and is reproduced with permission. Details about the purchase of the book may be obtained by calling (407) 368 2538 - Ed.]

Earth grounding circuits are critical in the prevention of electric shock. Earth ground is the second level of protection in Class I devices should the basic insulation fail. Due to its importance in the prevention of electric shock safety standards have stringent requirements for safety earth ground circuits. Safety earth ground in this discussion always concerns the ground circuit provided for safety reasons in Class I equipment. It is the earth ground conductor identified as the **green** or **green/yellow** conductor. This material does not address functional grounds which are required only for proper operation of the equipment. Functional grounds are not required to satisfy impedance, current carrying capacity, special color coding or other requirements of safety earth grounds.

Each safety earth ground must satisfy the electrical and mechanical characteristics of sections 1 through 7 if it is to comply with recognized electrical safety standards and certification requirements.

Dedicated Safety Circuit

The safety earth ground terminal must be a dedicated termination point and should not provide termination for other conductors. This avoids the need to disturb the safety earth ground connection once is has been established and tested. All power-on servicing must be done with the safety earth ground connected, unless the servicing requires removal of the unit from its enclosure. In such cases an equivalent safety earth ground must be used for all for power-on bench testing.

Should there be both safety earth grounds and functional grounds in the same area in equipment, each type should have separate termination points. While standards may permit both safety earth ground and functional earth ground conductors to be terminated on the same binding post or terminal, it is not considered good design practice to do so.

Safety earth ground terminations should not be subject to disruption or exposed to the risk of not being replaced once disconnected for servicing or relocation of the equipment. Once disrupted the safety earth termination is difficult to maintain to the strict electrical properties established at the point of

Continued on page 12

Area Activities

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COMMUNICATION

You will notice I have included my voice phone number and a new e-mail address. Communication and the NII, or National Information Infrastructure, are the buzzwords of the day. At least they are according to Vice President Al Gore. It is also key to our professional lives. Without a facsimile machine, telephone and e-Mail my job would be much more tedious. In fact, if I was to take a time study, I would most likely find that 80 to 90% of my job involved communication.

Either receiving or transmitting, the volume of information is great. Communication must also be timely, to be of value. A meeting notice, no matter how informative is of no use if it arrives after the event. Communication is also key to the life of our groups. With this in mind I would like to encourage anyone who has items of interest associated with the local group activities to contact me.

CENTRAL TEXAS

The January 26th meeting of the Product Safety Technical Committee of Central Texas featured an updates on the "EC Product Safety Directive" by Mr. R. Krumme of TÜV. The meeting was held at ROLM Corp., 2205 Grand Avenue Parkway in Austin Texas. The Social and refreshments started at 6:30 with the meeting at 7:00 pm. For details of future meetings contact Vic Baldwin at ROLM phone 512-990-6342, fax 512-990-6145.

NORTHEAST PRODUCT SAFETY SOCIETY - (non-IEEE)

The January 26th meeting featured a talk by Mr. Stuart Chappel of Voltech on the IEC 555 standard. The February 23rd meeting will feature a presentation by Mr. Carl Lindquist of SAN-O on fuse design, and on March 23, Mr. Joe Guerriero of Associated Research will discuss Hipot Testing Theory.

The meetings of the Northeast Product Safety Society are held at 7:30 pm, with time for social from 7-7:30 pm. To get further details on location contact Dave Lorusso Committee Secretary at Tel: 508-435-5067.

The January Northeast Product Safety Society Newsletter featured an interesting article on "Regulatory Design Guidelines for Using Lithium Batteries" by

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EMC Symposium 1994

Fees are as follows: $30 for IEEE Member; $35 for Non-IEEE Member; $10 for Students. Exhibits Only Admission is Free. Colloquium Record: $15 at the Colloquium or FREE to advanced registrants.

Make check payable to IEEE SCV EMC '94. Mail to IEEE SCV EMC '94, PO Box 2102, Cupertino, CA 95015-2102. Advance registration for IEEE SCV EMC 94 ends March 15.

For further details, contact: David Hanttula, Chairman, (415) 390-1071 or Ghery Pettit, Registration, (408) 285-2528.

Tuesday, March 29		
7:00 - 8:45	Registration	Registration
8:45 - 9:00	Welcome	Welcome
9:00 - 9:30	1A Compliance Overview	1B Fundamental EMC
9:30 - 9:45	Break	Break
9:45 - 10:45	2A Managing Compliance	2B Fundamental EMC
10:45 - 11:00	Break	Break
11:00 - 12:00	3A Demo Shielding	3B Fundamental EMC
12:00 - 1:15	Lunch	Lunch
1:15 - 2:15	4A CE/RE Emiss. Measrmnt	4B Filtering
2:15 - 2:30	Break	Break
2:30 - 3:30	5A Compliance Stds	5B PCB Layout
3:30 - 3:45	Break	Break
3:45 - 4:45	6A Compliance Stds	6B Demo Freq Resp.
Wednesday, March 30		
7:00 - 8:30	Registration	Registration
8:30 - 9:30	1C Safety	1D EMC Trouble Shooting
9:30 - 9:45	Break	Break
9:45 - 10:45	2C Safety	2D EMC Trouble Shooting
10:45 - 11:00	Break	Break
11:00 - 12:00	3C Safety	3D Demo Trouble Shooting
12:00 - 1:15	Lunch	Lunch
1:15 - 2:15	4C Safety	4D Demo Immunity
2:15 - 2:30	Break	Break
2:30 - 3:30	5C Telecom	5D Immunity
3:30 - 3:45	Break	Break
3:45 - 4:45	EMC Panel Discussion Q&A	6D Immunity ❑

manufacture.

Good servicing practice is to retest the safety earth ground circuits for continuity and impedance after any disturbance of the earth ground wiring or terminations. Instructions for these tests should be included in the equipment installation and service manuals.

The point at which the safety earth ground is terminated must be identified by an easily recognized permanent marking or symbol. Some standards permit the word **GROUND** or the letter **G**, or the abbreviation **GND** to identify the termination point. The most widely accepted identification of the safety earth ground is the conventional ground symbol within a circle, symbol number 5019 of IEC Publication 417. The safety earth grounding symbol, abbreviation or color coding must be explained in the installation instructions and service manuals.

Low Impedance

All electrical safety standards fix the maximum impedance in the safety earth ground at 0.1 Ohm (one tenth of an Ohm). The impedance measurement is between any accessible part likely to assume hazardous conditions and the safety earth ground point of the equipment indicated by the safety earth ground symbol.

Fault Clearing Capacity

The main purpose of the safety earth ground is to conduct a fault current to earth until the fault is removed or reduced to a safe level. These currents may flow in a faulted circuit for some period of time before the fault current is removed or reduced to a safe level. The conductors in the earth ground circuit must be capable of sustaining such currents for the duration of the fault.

The likely fault currents, identified by abnormal operation and fault testing, dictates the earth ground conductor size. It is clear that the earth ground conductors can not be smaller than that required to handle the currents expected in the safety earth ground circuit. Some product safety standards require that safety earth ground circuits be capable of conducting from 10 A (ten amperes) to 25 A (twenty-five amperes) for a period of one minute. Some test and certification agencies may require such a test as part of the manufacturing process.

Reliability

Due to the critical function of the safety earth ground circuit it must be in place and remain at low impedance levels during the operational life of the equipment. No components, switches, or fuses are permitted in this circuit because of the possible risk of discontinuity in the circuit, such as a blown fuse or open switch. Components such as coils or resistors would increase the circuit impedance of safety earth ground circuits.

Connections and terminations in the safety earth ground circuit must not be subject to electro-chemical or other corrosive actions. Corrosion at connections increase the impedance of the circuit and possibly electrical discontinuity at such points. Safety earth ground circuits with several connections, splices, daisy chaining, and other possible discontinuity points should be avoided. Good design practice is to have safety earth ground circuits as electrically uniform and continuous as possible.

Connect and Disconnect

For all connect and disconnect operations, the earth ground conductor must be the first to make electrical contact and the last to break electrical contact. Earth ground conductors must be terminated such that

should a stress be placed on it causing it to disconnect, the earth ground conductor must be the last to break electrical contact. The earth ground pin of a plug is made longer than the phase or neutral pins to satisfy this "make first, break last" safety requirement.

Conductive Coatings

Conductive coatings or films applied by spraying, dipping, painting or plating materials on to non-conductive surfaces must not be relied upon to be a conductive link in the safety earth ground circuit. Under fault conditions conductive films and coatings tend to quickly burn away the film at the point of contact with the fault current. This non-conducting point is now a discontinuity in the safety earth ground circuit.

Ungrounded Accessible Parts

Accessible conductive parts not electrically connected to the earth ground circuit must be identified in installation instructions and service manuals. They must also be marked with a warning sign or label to alert individuals that the part is not earth grounded and to test for the presence of hazardous potentials before touching.

Production Tests

Most all safety standards require each unit of equipment produced to be tested for continuity and low impedance as part of the manufacturing process. These tests are made on the completely assembled unit, even if all subassemblies have been previously tested. Some standards also require the current carrying test of the safety earth ground circuit as part of the manufacturing process. All safety earth ground tests conducted as a formal part of the manufacturing process and a record of the test results maintained. These tests can be grouped or combined, including the dielectric strength test into one production test station. The test sequence should be arranged to avoid damaging units which are repairable should the earth ground circuit be defective. The test sequence is:

1. Low voltage continuity and impedance test, if acceptable then,
2. Dielectric strength test, if acceptable then,
3. Current carrying capacity test.

If certain components in the equipment could be damaged during test 2) or 3), the parts should be removed, disconnected or shorted. If removal, disconnection or shorting is not practical DC test potentials should be used. The equivalent DC test potentials are given in the safety standard.

For high speed testing, or testing of more than one unit at a time, care must be taken that the test potentials applied reach the required level and hold at that level for the time period specified by the standard. At multiple unit test stations a single source of the test potential applied simultaneously to more than one unit should be avoided. This is advisable because the impedance of two or more completed units is not likely to be closely matched. In such cases one unit is over stressed and the other under tested.

Good test practice suggests that each unit under test have its own test potential source. All earth ground tests, at single or multiple unit test stations, should have test potential vs time profiles made periodically to assure the full test potential is applied for the required minimum time period.

Manufacturing test records should include calibration of safety earth ground test equipment. Good engineering practice is to specify the frequency of test equipment calibration, record adjustments or any repairs made to the test equipment, specify the format in which the test data will be recorded and the length of time test records are to be maintained. ❑

Because the core is optimized for the power line frequency, it is very lossy at higher frequencies. In fact, the core is so lossy in the presence of transient frequencies, the device ceases to be a transformer.

Due to the high frequencies, the core saturates at relatively low transient voltages. (In fact, at high frequencies, the core will saturate at voltages much lower than the rated input voltage of the transformer.) When the core saturates, there is no magnetic coupling primary-to-secondary. With no magnetic coupling, there is no coupling of the transient voltage to the secondary winding.

Likewise, due to the high voltage of the transient, the core will saturate. When the core saturates, there is no coupling of the transient voltage to the secondary winding.

So, transformers simply do not operate as transformers in the presence of transient overvoltages. There is no output of the transient from the transformer due to the operation of the device as a transformer.

Next, let's examine the effect of capacitance between input and output windings of a transformer when the transformer is subjected to transient overvoltages.

Two conductors separated by an insulator constitute a capacitor. In an isolating transformer, the input and output windings are separated by an insulator, and therefore constitute a capacitor.

Similarly, there is capacitance from each winding to the core.

Recall that transformers are wound with insulated wire. Each turn of a winding is fully insulated from adjacent turns.

At any particular point between two windings, a single turn is adjacent to one or more single turns in another winding. Each set of two single turns in different windings constitute the plates of one of the many capacitances that exist between the two windings.

In between the individual turns constituting one plate of a capacitor are a number of other turns of the winding. These turns constitute inductances and do not contribute to the interwinding capacitance. So, the distributed capacitors are connected by means of inductors.

At high frequencies, the various capacitances are distributed throughout each individual winding. The various incremental capacitances are connected by means of the turns of the winding. The turns constitute inductances. So, the distributed capacitors are connected by means of inductors as well as by the capacitance between layers of a single winding.

Series inductors attenuate high frequencies. Shunt capacitors attenuate high frequencies. Series capacitors couple high frequency to the adjacent winding. This results in a very complex high-frequency circuit.

Since the series capacitors between windings are just one part of the complex high-frequency circuit, very little transient overvoltage energy is transmitted to the secondary windings. Most of the energy is dissipated within the primary winding, or from the primary winding to ground.

At the high frequencies found in a transient overvoltage situation, the interwinding capacitance cannot be represented as a single capacitor from primary to secondary. Likewise, the capacitance from a winding to the core or to the earth cannot be represented as a single capacitor.

So, while there is capacitance from primary to secondary, there are also inductors in series with those capacitances, and there are capacitances from primary to core and primary to ground, all of which serve to highly attenuate the energy coupled to the secondary windings.

Now, let's examine rectification and capacitive smoothing of the secondary output voltage when subjected to transient overvoltages.

The action of a full-wave rectifier is such that no matter the polarity of the input voltage, only one polarity is present at the output. This means that transient overvoltages (exceeding the peak-to-peak mains voltage), regardless of polarity or phase position with respect to the ac input voltage, will appear at the output of the rectifier (assuming the rectifier diode has sufficient frequency response to turn on during the transient).

The energy in the transient is then stored in the smoothing capacitor and should raise the capacitor voltage depending on the value of transient voltage, the duration it is above the voltage on the capacitor, and the available current.

Since the transient voltage is attenuated by the transformer, and since the time is very short, and since current is small due to the inductance of the transformer, the voltage increase on the smoothing capacitor is almost imperceptible.

The same action takes place in the off-line rectifier-capacitor circuits of switching-mode power supplies. The input EMI filter attenuates the transient overvoltage. The off-line rectifier usually is slow, and may not turn on during the transient overvoltage event. If it does turn on, or is late in the event, only a small amount of the energy is dumped into the capacitor and there is negligible voltage change.

Off-line rectifiers have lots of capacitance across the junction, but that capacitance is very small compared to the bulk capacitor. In a series circuit of two capacitors, the voltage division is inversely proportional to the value of capacitance. Therefore, there is a small proportion of the transient overvoltage across the large capacitor (the bulk capacitor) and a large proportion across the small capacitor (the rectifier).

Primary and secondary dc circuits have negligible transient overvoltages due to transient overvoltages on the power line.

To confirm these hypotheses, I tested a 40-watt transformer, a 20-watt transformer-rectifier with smoothing capacitor, and two 50-watt switching-mode power supplies.

The two 60-Hertz transformers were of triple-flange bobbin construction. The switching-mode power supplies use reinforced insulation between primary and secondary.

I injected 1.2 x 50 microsecond transient voltages onto the power line for each device. I monitored the output with a scope (through an isolating amplifier to eliminate any affects of connecting the circuit to ground through the scope).

I started with 500 volts, line-to-neutral, and worked up to 2.0 or 2.5 kilovolts. I also applied the pulse line-to-ground.

With 1.5 kilovolts input to the transformer, the transient output was about 70 volts. The transient output voltage remained about 70 volts regardless whether the pulse was applied line-to-neutral or line-to-ground, and regardless whether the output was grounded or floating.

With up to 2.5 kilovolts applied to both the transformer-rectifier and the switching-mode power sup-

plies, there was no more than 1 volt change for no more than 2 milliseconds in the nominal 30-volt and 25-volt outputs, respectively.

CONCLUSIONS

Transient overvoltages are not magnetically coupled to the output windings of 50-60 Hertz transformers.

Transient overvoltages are capacitively coupled from primary to other transformer windings. The magnitude of the transient across the output winding is a function of the capacitance between the windings, the capacitances of all windings to the core, and the capacitances of all windings to ground.

Since the transformer output transient overvoltage is capacitively coupled and not magnetically coupled, the value of the output transient voltage is dependent on transformer insulation construction, and independent of the output winding voltage.

At least for triple-flange bobbin construction, the magnitude of the transient across the output winding is largely independent of whether the output winding is grounded.

The magnitude of a capacitively-coupled transient across the output winding of a triple-flange bobbin-constructed transformer is largely independent of whether the transient is applied pole-to-pole or pole-to-ground.

Rectification and capacitive smoothing of an ac waveform containing a transient overvoltage virtually eliminates the transient from appearing on the dc voltage.

For the evaluation of insulation (spacings) in primary and secondary dc circuits, the value of "working voltage" determines both clearance distances and creepage distances, whereas in primary ac circuits the value of transient overvoltage determines clearance distances and the value of working voltage determines creepage distances.

ACKNOWLEDGMENT

Thanks to Tinny Srinivasen, Western Transformers, Portland, Oregon, who provided me with the technical details of transformer operation in the presence transient overvoltages.

Thanks also to Daven Tester, Nick Manwell, and Kevin Cyrus, all of Hewlett-Packard, for help in testing the hardware. ❑

Dave Lorusso is back! Please send any safety related articles to:

Dave Lorusso, EMC Corporation, 171 South Street, Hopkinton, MA 01748
508-435-1000, x2130 (phone) or
508-435-5222 (fax)

A new PSTC group is forming in Colorado! If you would like further information, please contact:

Andrew Doering
TÜV Product Service
5541 Central Ave.
Boulder, CO 80301
303-449-4165

such marks on a voluntary basis.

- Alternative control schemes are not yet established and problems during a transition period can be expected.

- In areas where harmonized standards are missing (e.g. Common Technical Regulations [CTRs] for telecom), national schemes will continue to exist, and the EEA won't change anything.

Here are a few predictions of what you might expect:

- EC directives that already have existed for years will be implemented as soon as practicable, sometimes on 1 January 1994. Where new directives have implementations pending, or during the transition times specified by directives, these will be implemented according to the transition end dates.

- Systems or equipment with different requirements usually will not be harmonized at the lowest level, but the more stringent rules will be combined.

- The effects will not be visible in all countries and according to the same timetable but gradually over the next four years. Some positive changes already went into effect a couple of months ago, in anticipation of this event (e.g. dropping laser certifications in Sweden).

The danger of increasing bureaucracy concentrated at the European level exists, but the "rethinking" process fueled by the discussion on the Maastricht Treaty has taken off and led to consensus that the decision-making mechanisms must be both tightened up and democratized. At the moment enthusiasm prevails, and I hope it will last. o

Finally, on Friday morning, there will be a safety workshop on ANSI C95.1 safe exposure values. The focus will be on philosophy and technical considerations behind published requirements for EM field exposure, particularly that associated with various types of intentional transmitting devices.

"WHAT'S THE RISK?"

On a somewhat related topic, it should be noted that much of the Symposium's product safety focus is not associated with how to design to or get approvals to standards. Rather, the focus is on whether the presumptions and ultimately the standards we use actually are adequate. As I've shared with you before, I don't think we are as aggressive as we should be in assessing the adequacy of the requirements we've adopted and the assumptions that support them. This newsletter has carried, and will continue to carry, articles that deal with the technical as well as the environmental and human factors aspects of product safety that challenge current practice. I'd like to see this effort stepped up.

There is a danger in defaulting to the recommendations of other specialized disciplines and passively permitting systems of requirements to be developed that don't properly reflect responsible application of sound risk-sensitive safety practice. To address this, we must become familiar with what is going on in these disciplines and interact constructively with them. We also must be well-versed in dealing with risk assessment and prioritization to be of value to decision-making processes, whether within businesses, in standards developing bodies or elsewhere. ❑

Dave Lorusso. For information about this article please contact the Northeast Product Safety Society c/o Dave Lorusso, 21 Highwood Drive, Franklin, MA 02038.

1994 Administrative Committee Officers -
President, Tony Nikolassy of T-Tech Engineering
Vice President, Werner Paster of Euroconsult
Treasurer, Michael Rains of Foxboro Co.
Secretary, Dave Lorusso of EMC Corp.

There were several openings listed in the newsletter. Please contact Dave Lorusso for details and phone numbers.

Thank you everyone on the NPSS administrative committee and Dave Lorusso for a very informative newsletter.

SANTA CLARA VALLEY GROUP

*The January meeting featured our first field trip. We met about 50 miles away from Silicon Valley in San Francisco at the headquarters of Dolby Laboratories Inc. While the tour of Dolby Labs did not directly relate to Product Safety, we did have a good time and learned quite a few things. Approximately 35 people turned out for the tour. We had dinner before the tour at about 6 and finished the meeting at about 9.

There were at least 3 impressive features about Dolby:
1) Their innovative sound reduction techniques (and hardware!) are everywhere around us from use in personal cassette players to television to movies to FM broadcast stations and more.
2) The company was immensely successful with its audio cassette noise reduction but continued to innovate in other fields involving sound recording and reproduction.
3) They have implemented a system of quality control that includes initial test of products and field inspections. They even have sound consultants that visit movie studios to advise on sound recording/ reproduction.

We viewed film clips in Dolby's state-of-the-art in-house movie theater. We saw and heard examples of films using everything from pre-Dolby sound to the latest innovation, Dolby Stereo Digital (VERY impressive). The latest development uses a printed optical multi-digital sound track BETWEEN the sprocket holes of conventional film.

Dolby manufactures their professional equipment themselves and licences other manufacturers to make consumer equipment using Dolby technologies.

If you would like further information about Dolby Laboratories, please contact Joe Hull at
(415) 558 0213.

* The February meeting will be on Wednesday the 23rd instead of the usual Tuesday night. Dinner and Social will be at Carlos Murphy's at 5:00 pm. The meeting will start at 7:15 pm at Apple Computer in Cupertino. Contact Murlin Marks (UL) at 408-985-2400 x2353 for details and dinner reservations.

* The speaker will be Mr. Gene Panger of TÜV - Product Service. Mr. Panger is Director of Sales with TÜV Product Service. His responsibilities include monitoring European Conformity Assessment developments in a variety of areas including medical products, telecommunications, and scientific equipment. The topic will be "FDA and Notified Bodies: Comparing the Roles."

* Mr. Panger will discuss how the coming Medical

Device Directive will join the existing Active Implantable Medical Device and the pending In Vitro Diagnostic directives in transforming the way medical products are approved in Europe. Notified Bodies play a central role in Europe's evolving scheme for medical products. How will this role differ from that of the FDA here in the U.S.? How will they be similar, and where are the areas of overlap?

* This presentation will address similarities and differences between the FDA and Notified Bodies in the following areas: structure, philosophical backdrop, role of accreditation, documentation, standards utilization, quality systems, and inspections.

* March Meeting - The March meeting will be on Wednesday the 16th instead of the usual Tuesday night. Check in for the Social will be at 5:30 pm, with dinner at 6:00 pm. Location: Wyndham Garden Hotel, 1300 Chesapeak Terrace, Sunnyvale. To get directions and reservations for dinner, contact Murlin Marks at (UL) 408-985-2400 x2353.

* This will be a combined meeting of the Product Safety Technical Committee and the Systems Safety Society. The topic is Software Safety/Reliability.

* Speaker - Dr. Norman Schneidewind. Dr. Schneidewind is professor of information sciences at the Naval Postgraduate School where he teaches and performs research in software engineering and computer networks. He is the developer of the Schneidewind software reliability model used by IBM-Houston to assist in the prediction of software reliability of the NASA Space Shuttle. This model is recommended by the American Institute of Aeronautics and Astronautics, the American National Standards Institute and others.

* April Meeting - The April meeting will be on Tuesday the 26th. Check in for the Social will be at 5:00 pm, with dinner at 5:30 pm. Location: Apple Computer, Valley Green 6. For directions and reservations for dinner contact Murlin Marks (UL) (408) 985-2400 x2353.

* This will be a presentation on Follow-Up Services by representatives from (we hope) Underwriters Laboratories, Canadian Standards Association and TÜV.

Orange County/Southern California Group

* March Meeting - Date: Tuesday the 1st. Time 6:00 pm. Location: QSC Audio, 1675 Macarthur Blvd., Costa Mesa, CA. Program: "On Going Compliance - Safety & EMC" - Dan Modi of Compatible Electronics.

* April Meeting - Date: Tuesday the 5th. Program: "February CBEMA Meeting"- by Ercell Bryant of Compatible Electronics.

* May Meeting - Date: Tuesday night the 3rd. Program: "ISO 9000 as applied to Product Safety, EMI and RFI" - by Gilbert Walter of Safety & Compliance Eng. For details contact Ercell Bryant Tel: (714) 589-0700

Colorado Group

Andy Doering has been busy lately...he and his wife, Kim, welcomed their first child, Madeline Elizabeth, born on December 14.

Andy says there have been 2 meetings so far with a total attendence of 32 people. As we go to press, a third meeting is scheduled to set the ground rules and direction of the group. Meetings are on second Tuesday of the month. Contact Andy Doering (303) 449 4165 for more details. o

Mike DeMartini
Continued From page 5

In addition, he successfully managed Section B through a period of rapid growth, from 19 persons in April 1981 to 49 persons in July 1985. He later managed the Electrical Department 313 and, most recently, Engineering Services Department 313.

Electrical Engineer **Kevin Ravo** was Mike's trainee when Kevin first joined UL 17 years ago, and the two had been fast friends and close professional associates ever since. "Mike wouldn't have wanted to have a big fuss made over him. If he had wanted to be remembered for anything in particular, it would probably have been for his commitment and his vision, a vision of how much we could all accomplish working together," Kevin said.

"Everything he did supported that vision. He was especially adept at getting others to understand and share his vision. He was a true leader, absolutely respected everyone and, in turn, was respected by all."

"Mike lived life to the fullest and enjoyed being with family and friends, good food, good wine and playing golf. At the time of his death, Kevin said, "he was probably at the happiest time in his life. He had accomplished what he set out to do. Perhaps, he was just ready to move on."

Bob Miller, our OIC, remembers Mike "as a complete professional, a man of ideas and ideals and, most importantly, a thoroughly decent human being. "He was highly respected for his capabilities and character, and his patient willingness to lead, teach, and help those who depended on him for his support.

"All in all, he was a very good person who will be missed by all who knew him well or just a little bit," Bob stated. ❑

News and Notes
Continued From page 8

Ottawa, Ontario, Canada

UL IS OFFERING THE FOLLOWING COURSES IN 1994:
The ISO 9000 Seminar (Cost: $ 795):
Internal Auditing to ISO 9000 (Cost: $ 845)
Preparing Quality Manuals & Procedures for ISO 9000 (Cost: $ 795)
Applying ISO 9001 to Software - Using the ISO 9000-3 Guidelines (Cost: $ 375)
For further information, please contact Joan Soslowitz at UL Melville (N.Y.), (516) 271-6200, ext. 22824.

Globalability: The Key to International Compliance (Cost: $ 995)
UL 1950: Workshop on Information Technology Equipment (Cost: $895)
Specifying Plastics for Electronic and Electrical Products (Cost: $ 895)
For further information on the above, please contact Brenda Sorrenson at UL Northbrook (Ill) at (708) 272-8800, ext. 43481.

EMCS SYMPOSIUM MEETINGS 1994 - 2000
August 22-26, 1994, Palmer House Hotel - Chicago, IL, contact Bob Hofman (708) 979-3627

August 21-25, 1995, Marriott Marquis Hotel -Atlanta GA, contact John Rohbaugh (404) 894-8235

August 19-23, 1996, Doubletree Hotel-Santa Clara Convention Center, Santa Clara, CA, contact David Hanttula (415) 335-1071

August 18-22, 1997, Austin Convention Center, Hyatt Hotel,Austin, TX, contact John Osburn (512)835-4684

August 9-14, 1998, Radisson Hotel Denver, Contact TBD

August, 1999 (TBD)

August, 2000, Washington DC, contact Bill Duff (703) 914-8450
from *IEEE EMC Society Newsletter*, Fall 1993

SECURITY TECHNOLOGY MEETING
The 28th annual IEEE International Carnahan Conference on Security Technology is scheduled for October 10-12 1994 in Albuquerque NM, Contact Dr.Estelle Zannes at 505-277-4422 or FAX 505 277-4206 for details.

FAX BIRTHDAY
December 6, was the birthday of Professor Adolphe Fax the inventor of the Fax machine.

NAMEPLATES & LABELS
Appliance magazine December issue's "Buyers Guide to Decorative , Trim, and Nameplates" had an article Titled "How to Select the Correct Agency Recognization Rating & Nameplate Label", on pages BG2 to BGF-07.

ELECTRIC /MAGNETIC FIELDS
The December issue of *Professional Safety* has a article titled "Should Electric and Magnetic Fields be Regulated ?" by Rob Thomas. This is brief overview of the research and list the state laws applicable to power transmission and fields.

FORTHCOMING GENERAL MEETING OF IEC
The list of IEC General Meeting for next several years are : 58th General Meeting Sept 3-17 1994 Nice, France in conjunction with ISO General Assembly 59th General Meeting October 16-28 1995 Durbin South Africa 60th General Meeting Date Fall 1996 (firm dates are TBD) in Dresden Germany 1997 several countries are considering offered invitation - 1) New Delhi, India 2) Vancouver Canada in conjunction with ISO General Assembly and 3) Japan.

TC PLENARY MEETING
74 (ITE) September 12-16 1994 in Niece,
TC 76 (laser) October 14-16 1994 in Kista Sweden

THE ROLE OF CSA
An article authored by John E. Kean President of CSA appear in the *ASTM Standardization News* January 1994 issue. This article reviews the history and development of CSA and a looks at its future.

IEC LASER DOCUMENT
The 1993 revision to IEC 825 has been issued and is available ANSI for $199.00 plus shipping and handling. This revision is a complete republication of IEC 825. IEC 825 -1, "Safety of Laser Products - Part 1 Equipment Classification, Requirements and User Guide". With the issuing of this document, IEC 825, "Electrical Safety of Laser Equipment and Installation", has been withdrawn.

A major change is that LEDs are now considered as laser with the same AEL. An new standard, IEC 825-2, Safety of Laser Products - Part 2: "Safety of Optical Fiber Communication System" has also been issued and is available from the same source as above; US price is $59.00 plus shipping and handling. ❑

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We are grateful for the assistance given by these firms and invite application for Institutional Listings from other firms interested in the product safety field. An Institutional Listing recognizes contributions to support publication of the Product Safety Newsletter of the IEEE EMC Society Product Safety Technical Committee. Please direct inquiries to:

Ervin Gomez at (408) 553-7684 (phone) or (408) 553-7694 (fax)

The Product Safety Newsletter

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Employment Wanted

As a free service to our readers, the Product Safety Newsletter will periodically list Regulatory Compliance professionals who are available for employment. Those with employment opportunities are encouraged to contact the following individuals directly.

Seeking employment as a Regulatory Engineer:

Wayne L. Glover
Tampa, Florida
(813) 887 2534

Naftali Shani
Brampton, Ontario
(905) 846 0930

Bogdan M. Matoga
Hollister, CA
(408) 636 8182