The Product Safety Newsletter

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What's Inside

Chairman's Message

There are two events occurring in several months that deserve our attention now: the annual International EMC Symposium in August and the election of new central committee officers.

1993 International Symposium

The Product Safety Technical Committee (TC-8) has two events of special interest at the Dallas Symposium the week of August 9. On Thursday afternoon, immediately following the last technical sessions, we will have our annual meeting. This is an excellent opportunity for each of you to have a voice in the direction of the Committee as a whole. We scheduled it late in the week because of the second important event at the Symposium, our product safety workshop, to be held Friday morning. Murlin Marks is heading up this effort and if the advance program is any indication, it's going to be an excellent workshop. Plan on attending both events when you're in Dallas.

New Leaders

This term is going by very quickly and it's time to begin the process of selecting new central committee

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The Product Safety Newsletter

The Product Safety Newsletter is published bimonthly by the Product Safety Technical Committee of the IEEE EMC Society.

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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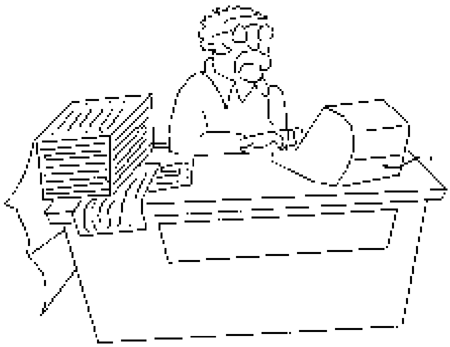
News and Notes



by Dave Edmunds
News and Notes Editor

Product Safety Workshop Update
Once again the Product Safety Technical Committee (TC-8) of the EMC Society is sponsoring a workshop at the International EMC Symposium, held this year in Dallas, Texas. The workshop is scheduled for Friday morning from 8:00 until 11:45 on August 13. The following program is presently blocked out:

1. Product Stewardship - Barbara Hill, IBM. Environmentally friendly design. Define and discuss larger product safety considerations than traditionally utilized.

2. Snapshot of Harmonization - Panel led by Bob Hunter, Austin TX. Panel: Scott Barrows, International Compliance Corporation, plus 1-2 TBD. The latest global specs and considerations.

3. Failure Analysis Forensics - Brian Claes, TC-8 Chairman. A structured approach to analyzing failures and accidents.

4. Casualty Hazard Analysis - Bob Florczyk, Underwriters Laboratories. Discuss UL's casualty hazard evaluation methodology. Moving parts, sharp edges, pinch points, etc.

5. Product Safety Techniques for the EMC Professional - Mark Montrose. Product safety applied engineering. Tips and considerations with application rather than theory in mind.

The session will be chaired by Murlin Marks, Underwriters Laboratories, who may be contacted at 408-985-2400. Hope to see you there!

Revision of Laser Standard
A second amendment to IEC 825 Laser Safety is under the voting procedure with a cutoff date of May 31, 1993. This amendment increases the AEL for devices operating in the IR spectrum and brings the control measures closer to agreement with the FDA Laser Product Performance Standard. The appendix has a rational that explains the reason for the amendment.

A DIS (Draft International Standard) which will be a part 2 of IEC 825 and is titled "Safety of Optical Fiber Communication Systems" is in the voting process with a close date of May 31, 1993.

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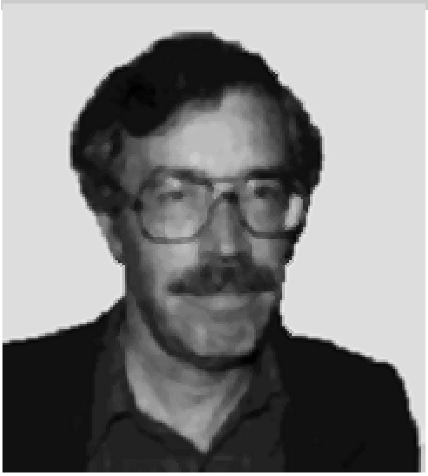
Technically Speaking



by Richard Nute

BODY RESISTANCE — A REVIEW

Underwriters Laboratories did basic research in the field of safety and published the results of that research in a series of "Bulletins of Research." At least 58 bulletins were published relating to fire, explosion, and electric shock.

One of those Bulletins, "Electric Shock as it Pertains to the Electric Fence," is a classic document in the field of product safety. The research was performed from 1936 to 1939 by Baron Whitaker, an Assistant Electrical Engineer at UL. Whitaker ultimately ascended to the presidency of UL.

Whitaker's research still stands today. While similar research has been done in support of modern IEC publications, such research is usually published only in IEC committee papers and is usually highly focused towards the specific standard or report the IEC is attempting to write.

This UL Bulletin of Research on the electric fence contains much information that applies to much more than just the electric fence. This is why it is a classic work.

INTRODUCTION
Whitaker introduces his research by describing the electric fence: "One of the most recent and novel applications of electricity in the rural areas today is the electric fence. Physically, the electric fence differs from the conventional type of barbed-wire or woven-wire fence in that it is of simpler construction (usually having one wire) and does not require the mechanical strength or stability of the older types. Functionally, it is different in that it controls animals by means of fear rather than by strength or by causing pain. The electric fence is composed of two distinct parts, namely, the fence wire, and the electric controller which supplies the electrical energy to the fence wire."

PURPOSE AND CONDITIONS
Whitaker studied electric fence accident reports involving both electric shock injury and electric-shock-caused death. Based on his study, he bounded his research by stating that the electric fence should be safe for a two-year-old child, "...barefooted, standing in a pool of water or mud, and falling across or

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The New ANSI/ISA S82.01

by Richard C. Masek, P.E.

The Instrument Society of America SP82.02 committee recently proposed a significant revision to the ANSI/ISA SP82.01 Standard for Electrical and Electronic Test, Measuring, Controlling and Related Equipment. The significance of this revision is it reflects a substantial effort by Underwriters Laboratories (UL), the Canadian Standards Association (CSA), and the Instrument Society of America (ISA) to harmonize with the International Standard IEC 1010-1.

Although, it is expected that the revision will have a minimal impact on manufacturers, the following is a summary of those revisions that are likely to require changes in the product:

- It will require better instructions to the user in terms of the environment (i.e. limits on condensation and transients) and on the need for safety shut-down switches if there are external moving parts.
- Hydrostatic testing will be extended to include equipment operating on pressures as low as 7-1/2 psig and even lower if failure could result in a hazard.
- Additional markings will be required for fuses and measuring terminals.
- Spacings must withstand a 10 N force.
- Various limits have been imposed if the equipment generates ionizing, laser, UV, or microwave radiation or generates sound or ultrasound.

The IEC 1010-1 Standard was approved in 1990 and was accepted by the United States and 12 other nations. Canada is preparing to obsolete three standards C22.2 No. 142, No. 151, and No. 231 and replace them with a new Canadian standard CSA C22.2 No. 1010.1. It will be necessary to retain C22.2 No. 142 for a short while since it covers the additional requirements for products used in extended environments such as outdoor use and ambient temperatures above 25°C. Underwriters Laboratories is preparing to revise UL 1244 and UL 1262 to harmonize with IEC 1010-1.

The North American approach was to adopt the text of the IEC 1010-1 standard in toto. A National Forward explains the additional requirements or changes to requirements which are necessary in North America. The UL and ISA National Forwards are expected to be essentially identical. At this time there are about 10 differences between the North American and the Canadian documents. The ISA standard will add two informative annexes to provide cross references to relevant CSA standards.

One reason for the National Forward is the use of conduit. Although this wiring method is popular in North America, it is rarely used in other countries. Since it is so rare, the IEC 1010- 1 did not provide the requirements for conduit. A significant portion of the National Forward is to identify conduit requirements.

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Computer Industry Excluded from NFPA Code Revision

By D. Bruce Langmuir, P.E.,
Bose Corporation
Chairman, NCSA Product Safety Group's Loudspeaker Standards Subcommittee

[The following article, originally titled " Computer Industry Stands by while they are excluded from NFPA Air Handling Plenum Code Revision", is being reprinted with permission from the North East Product Safety Committee's NPSS Newsletter *of March, 1993. Our thanks to Tony Nikolassy, Editor of the Newsletter. - Ed.]*

Three and a half year ago the trade association of commercial loudspeakers, the National Sound & Communications Association (NSCA), started working on revising a building code to officially permit installation of discrete products in air-handling plenum spaces. At this time, NSCA repeatedly invited the computer industry to join in and assist in the effort. The computer industry felt there was no need and stood by while the NSCA accomplished their goal. Consequently, with the single exception of loudspeakers and their accessories, all other discrete products, such as computers and their accessories and other electronic products, are still excluded from the code. Continuous products, such as wire and cable, are still included in the code as long as they meet the code requirements and are so tested and listed.

Loudspeakers, loudspeaker assemblies, and their accessories are now permitted to be installed in an air-handling space per a recently revised National Fire Protection Association (NFPA) building code if they have been inspected and are listed as having been tested per a new Underwriters Laboratories Inc. (UL) standard for testing, UL 2043. Previously, lack of these codes and standards caused inconsistent levels of safety, as code officials and local building inspectors had no guidelines by which they could judge acceptability of discrete products when installed in an air-handling plenum. This caused confusion in the field and occasionally resulted in portions of systems having to be removed after they had been installed.

For three and a half years, the NSCA, the Product Safety Group's Loudspeaker Standards Subcommittee has been diligently working to accomplish this goal. Along the way, NSCA funded a $55,000 UL Fact Finding Investigation of Audio Systems for Use in Air Handling Plenum Spaces; a full-scale plenum simulation study. From this study, a new UL test standard, UL 2043, was developed and recently published. This was the foundation of what enabled the NSCA's Product Safety Group to request a change to the relevant NFPA code, NFPA-90A-1989 Installation of Air Conditioning and Ventilating Systems.

At the annual fall meeting of the NFPA in Dallas, Texas, on November 18, 1992, the membership voted unanimously to add a new exception to NFPA-90A-1989. The NFPA membership voting was at the conclusion of four voting/reviewing cycles within NFPA. This exception was requested to the NFPA-90A Committee by the NSCA Product Safety Group's Loudspeaker Standards Subcommittee, which consists of Paul Fidlin (Electro-Voice Inc.), Warren Grote (Atlas/ Soundolier), the late Jack E. Holt

(Dukane Corp.), John Henley (Fourjay Industries Inc.), Melvin Wierenga (ASCOM Inc.) and the subcommittee's Chairperson, Bruce Langmuir (Bose Corp.).

What follows is a quote of Section 2-3.10.1 from the revised National Fire Protection Association standard NFPA-90A-1993 Installation of Air Conditioning and Ventilating Systems, and shows the new addition of Exception No. 2 that was requested by NSCA. The new exception No. 2 is indicated by a vertical line in the left margin; there are no other revisions in the rest of this section.

"2-3.10.1 Ceiling Cavity Plenum. the space between the top of the finished ceiling and the underside of the floor or roof above may be used to supply air into or return and/or exhaust air from the occupied area, provided that:

(a) All materials to the airflow shall be noncombustible or limited combustible and have a smoke developed index no higher than 50.

Exception No. 1: The materials listed hereinafter are permitted in the ceiling cavity plenum if listed as having a maximum peak optical density of 0.5 or less, average optical density of 0.15 or less, and maximum flame spread distance of 5 ft. (1.5 m) or less when tested in accordance with the specified test method:

(1) Electrical wires and cables - NFPA-262
(2) Pneumatic tubing for control systems - UL 1820
(3) Optical-fiber cables - NFPA-262
(4) Fire sprinkler piping - UL 1887

Exception No. 2: The products listed hereinafter shall be permitted in the ceiling cavity plenum if listed as having a maximum peak optical density of 0.5 or less, average optical density of 0.15 or less, and a peak heat release rate of 100 Kilowatts or less, when tested in accordance with the specified test method or standard:

(1) Loudspeakers, loudspeaker assemblies and their accessories - UL 2043.

(b) The integrity of firestopping penetrations shall be maintained.

(c) Light diffusers, other than metal or glass, used in air handling light fixtures shall be listed and marked "Fixture Light Diffusers for Air Handling Fixtures".

(d) The temperature of air delivered to these plenums shall not exceed 250 F (121 C).

(e) Materials used in the construction of a ceiling plenum shall be suitable for continuous exposure to the temperature and humidity conditions of the environment air in the plenum.

(f) Where the plenum is part of a floor-ceiling or roof-ceiling assembly which has been tested or investigated and assigned a fire resistance rating of 1 hour or more, the assembly shall meet the requirements of 3-3.3."

The official effective date of this revised NFPA-90A-1993 version, with the addition of Exception No. 2 as noted above, was February 12, 1993. The new edition of NFPA-90A-1993 is scheduled to be published around March, 1993.

The interpretation of accessories by the NFPA-90A committee is that accessories include power amplifiers used to power loudspeakers and loudspeaker assemblies installed in air-handling plenums. It should be remembered that Loudspeakers, loudspeaker assemblies and their accessories, are the first discrete products to be permitted in air-handling plenums per NFPA90A. The title for the new UL standard for safety, UL 2043, is Fire Test for Heat and Visible Smoke Release for discrete products and their Accessories Installed in Air-Handling Spaces. The NSCA Loudspeaker Standards Subcommittee requested this standard be generically written so other discrete products could potentially be added in the future after being requested of UL and NFPA, reviewed by UL and NFPA, and the standards modified accordingly.

With this new revision of the NFPA-90A code, sound installation contractors can now lead the local inspector to the specific Exception No. 2, which allows listed loudspeaker products and their accessories to be installed in air-handling plenum spaces. While the new edition of NFPA-90A-1993 is scheduled to be published in 1993, unfortunately, not all municipalities and/or states in the USA observe the latest edition of the NFPA-90A and some don't use it at all. In these localities, the sound installation contractors should lead the local inspector to Exception No. 2 before installation is done. In all plenum installation cases, the sound contractors should make sure their products are appropriately listed for air-handling plenum space use. Loudspeakers, loudspeaker assemblies, and their accessories, which are designed and listed as having been tested in accordance with UL 2043 are already available from a few manufacturers and many more are expected over the next 12 months. It is suggested that sound contractors keep a copy of this article until they obtain the revised copy of NFPA-90A-1993.

There is no listing category for UL 2043 because it is a test standard; a procedure for evaluating the fire behavior of any discrete product. Products at UL are to be Listed according to product group standards for safety, such as UL 1480, Speakers for Fire Protective Signaling Systems (for UL Category Control Number UUMW, Fire Protective Signaling Speakers and Control Number UEAY, General Purpose Speakers), UL 1711, Amplifiers for Fire Protective Signaling Systems (for UL Category Control Number UUMW, Fire Protective Signaling Amplifiers only), and UL 813, Commercial Audio Equipment (for UL Category Control Number AZJX, General Purpose Amplifiers). More product standards for safety listings will be revised to include the UL 2043 test.

NSCA and I are very thankful for the assistance of a number of NSCA loudspeaker manufacturers, the UL Fire Protection Department, the UL Burglary Protection and Signaling Department, the NFPA-90A Committee, the NSCA Product Safety Group, and its Loudspeaker Standards Subcommittee.

There is still work going on in this area to find out whether or not there is in reality a problem of limited combustible products installed in air-handling plenum spaces. An investigation with large-scale simulation plenum fire testing, using all products installed in air-handling plenum spaces, is expected to start soon under the direction of the National Fire Protection Research Foundation, an independent branch of the NFPA. The NSCA is staying involved, but the computer industry has not started yet. ❑

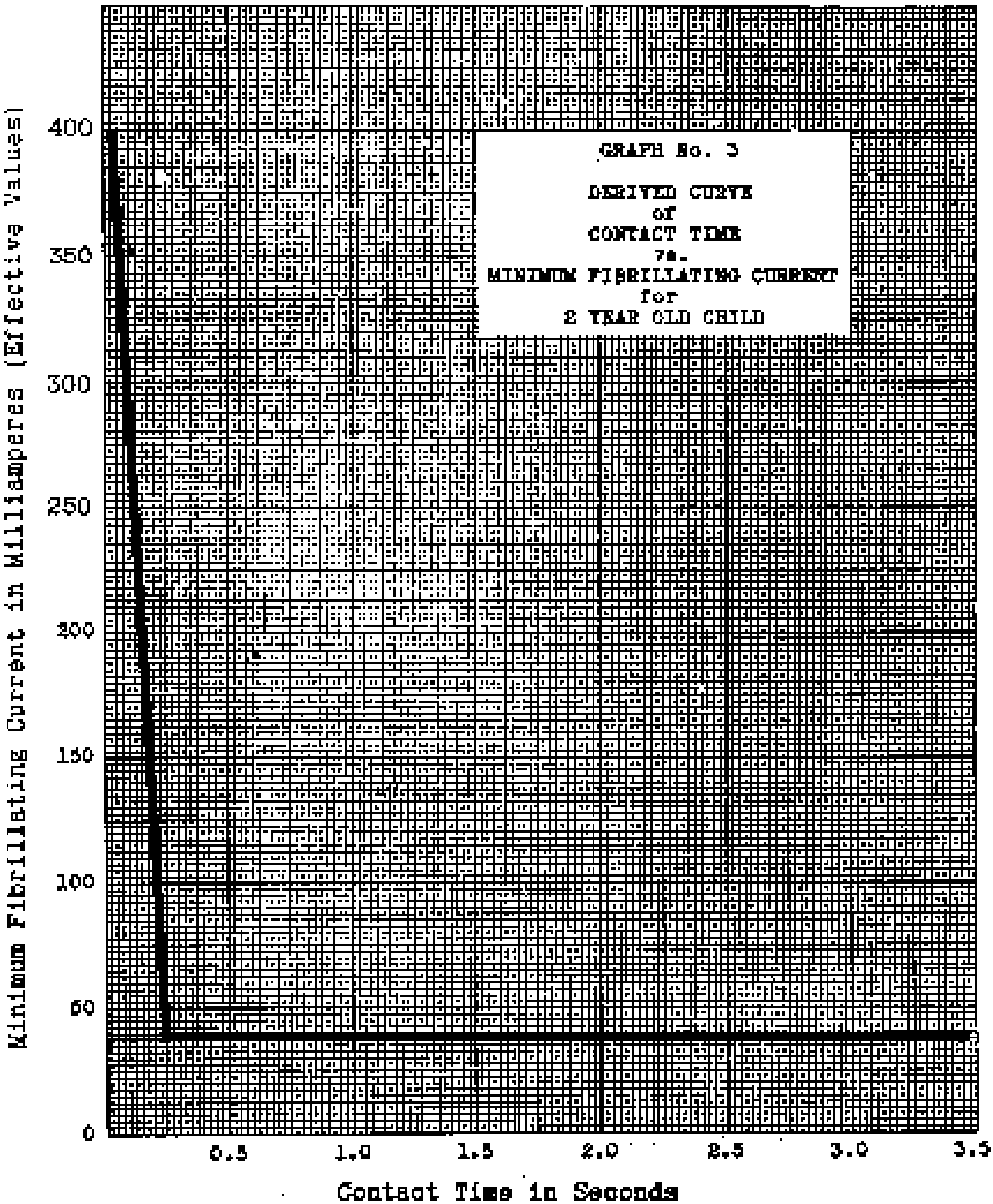

FIG. 3—DERIVED CURVE OF CONTACT TIME VS. MINIMUM FIBRILLATING CURRENT FOR 2-YEAR OLD CHILD.

Technically Speaking
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grasping the wire with two wet or sweaty hands, the wire, so far as the child is aware, being an ordinary non-electrified fence wire."

(Anecdotally, a colleague, whose home is a farm and uses electric fences, reported that these were the conditions under which his wife rescued his daughter!)

Under these conditions, Whitaker wanted to determine the maximum value of current, for both ac and dc, the frequency, and the duration that "can be considered as not being hazardous to human life."

Whitaker undertook to determine values for:

1. Body electrical resistance
2. Safe open-circuit voltage.
3. Effects of dc, interrupted dc, ac, and frequency of ac.
4. The maximum current and duration which will not cause bodily injury.
5. The minimum off time.

THE NATURE OF ELECTRIC SHOCK

Whitaker researched the various causes of death from electric energy. He found five different causes:

1. Paralysis of the respiratory muscles, producing death from asphyxia.
2. Hemorrhage, produced by increasing blood pressure during the passage of electric current.
3. Heart failure, produced by ventricular fibrillation.
4. Respiratory failure, produced by nervous inhibitions or actual damage to the nervous system.
5. Skin and flesh burns, with resultant complications.

Whitaker's research was oriented towards prevention of one or more of these injuries. He was not dealing with prevention of sensation or prevention of reflexive action as we do in today's products. Furthermore, electric fence manufacturers claimed that an effective fence should provide sufficient current to cause muscle contraction, and that the "off" period should be as short as possible.

BODY ELECTRICAL RESISTANCE

Whitaker starts his consideration of body resistance with the statement, "Necessary to the establishment of the safe operating characteristics of electric fence controllers is a consideration of the human body as a conductor of electricity."

Whitaker initiated a series of tests at UL to measure body resistance. Whitaker asserts that "the outer skin... offers the greatest resistance..." and that the high voltage of a fence controller breaks down the skin resistance. But, Whitaker could not apply high voltage, at unlimited current, to his subjects to "break down" the skin resistance. Therefore, Whitaker's experiments included wetting the hands and feet of his subjects with 20% sodium chloride solution.

With constant area, constant pressure, and wet hands, Whitaker found that the body resistance was independent of current, when current was in the range of 1 to 15 milliamperes.

Whitaker's test set-up was comprised of a 12-volt dc source (dry cells), a potentiometer, a voltmeter, and an ammeter. The hand electrodes were No. 10 AWG wires. The foot electrode was a 14-inch square copper plate. The potentiometer was adjusted for 5 milliamperes for adults and 1 milliampere for children. The voltage across the subject was measured, and the resistance calculated.

Whitaker measured 40 adults and 47 children (aged 3 to 15). He found that, for adults, "there are no trends or relationships between the body resistance of individuals and their sex, age, height, or weight." I have provided histograms of Whitaker's various measurements.

From this data, he concluded that "the lowest body resistance which might be reckoned with in connection with the electric fence application would not be less than 500 ohms."

(In a later Bulletin of Research, this same data is used by Karl Geiges to develop the infamous leakage current meter. I will review Geiges' work in a future issue.)

VOLTAGE

Whitaker needed to determine two factors with respect to voltage:

1. If the output current is limited, does the open-circuit voltage would need to be controlled?

2. If the output current is not limited, what is the maximum open-circuit voltage?

Whitaker determined that the maximum safe voltage (from a voltage source where the output current is not limited) would be that voltage that did not cause bodily injury and permitted the individual to free himself from the fence.

Whitaker reports a series of tests, performed on UL staff during 1930, which, incidentally, recorded the voltage that an individual could withstand and still have voluntary control of his muscles. From this data, the minimum voltage was 20 volts rms.

Whitaker also reports of tests by International Harvester Co. where the voltage was connected to a bucket filled with water and to a hand electrode held by the subject. The subject was then asked to retrieve an object immersed in the bucket. International Harvester found that the maximum voltage for retrieving the object was from 12 to 20 volts.

Whitaker concluded that "the open-circuit voltage need not be limited provided the device incorporates inherent current-limiting features."

However, "where no inherent current-limiting features are incorporated in the device, the maximum safe voltage... should not exceed 12. This is based upon the theory that a potential of 12 volts or less will rarely, if ever, cause a breakdown of skin resistance sufficient to permit a current flow through the body of such intensity as to cause lack of muscular control or physical injury to the person."

FREQUENCY

Whitaker reports that "the chief difference in the physical effect of direct, as opposed to alternating current, is that the direct current does not cause contraction of the muscles to the extent associated with alternating current."

Whitaker also notes that Kouwenhoven and d'Arsonval both found that as frequency increases, current must also increase to have the same physiological effect.

Nevertheless, Whitaker concludes that "there is no present warrant for permitting greater values of current... regardless of the frequency employed."

two-year-old child.)

CURRENT

From the same data where Whitaker determined the maximum voltage and from other data, Whitaker determined that the minimum and maximum values at which individuals retain voluntary control of muscles were about 6 milliamperes and 20 milliamperes, respectively.

Whitaker also studied the results of fibrillating current tests on dogs and sheep, as these animals' hearts were considered to have the same response to stimulus as do humans. From the tests on sheep and because sheep have body and heart weights similar to humans, Whitaker determined that minimum fibrillating current is directly proportional to body weight and to heart weight.

Further study of sheep test data showed that fibrillation was a function of the phase of the cardiac cycle at the time the shock occurred, and a function of the duration of the shock. Whitaker found that fibrillation for a 0.1-second duration shock, required 10 times the current as for a 3-second duration shock.

Whitaker then plotted 3-second fibrillation currents for different full-grown animals as a function of body weight and heart weight. Whitaker then assumed that the minimum value of such a curve represented man. Whitaker further assumed that the minimum fibrillating current for different body and heart weights is a constant ratio, provided the shock duration is the same percentage of the heart cycle, and the shock is initiated at the same point in the heart cycle.

Using these assumptions and data, Whitaker determined that the minimum 3-second fibrillating current for 125-pounds body weight is 126 milliamperes, and for 20-pounds body weight is 31 milliamperes. (Twenty pounds is taken as the average weight of a two-year-old child.)

Using these numbers, Whitaker determined the ratio 31:126 for minimum fibrillating currents for body weights of 20 and 125 pounds.

Using this ratio, and accounting for percent of the time for a complete heartbeat, for body weight, and for heart weight, Whitaker was able to construct a "Derived Curve of Contact Time versus Minimum Fibrillating Current for a Two-Year-Old Child." This curve approximated a rectangular hyperbola. See Whitaker's "Graph 3."

Next, Whitaker arbitrarily set the maximum current at 65 milliamperes, the maximum output at 4 milliampere-seconds, and the maximum "on" period at 0.2 seconds. This "Contact Time versus Allowable Current" curve was a factor of 6 less than the minimum fibrillating current curve. See Whitaker's "Graph 4."

Whitaker concluded that (1) the maximum safe continuous current is 5 milliamperes, and (2) the maximum duration of any current should not exceed the 4 milliampere-second curve.

OFF PERIOD

At the time of Whitaker's research, fence controllers supplied successive shocks at about 1-second intervals. Whitaker needed to determine the minimum "off" period which would allow an individual to free himself from the fence.

UL conducted tests where a voltage was suddenly impressed on an individual, and the time to release was recorded. This test was considered an "involuntary" reaction. Whitaker noted that the time to perceive the sensation is inversely proportional to the intensity of the stimulus.

Whitaker also studied other reaction-time tests. Most of this other test data was for "voluntary" reaction to stimuli such as touch, visual, or auditory.
Whitaker also noted that muscular contraction associated with dc tended to throw the victim from the conductor, while the muscular contraction associated with ac tended to be impossible to let go.

Therefore, Whitaker concluded that the "off" period for ac controllers should be 0.90 second, and for dc controllers should be 0.75 second.

FRIGHT

Whitaker also investigated whether the fright generated by inadvertent contact with a "safe" fence might adversely affect the heart or trigger fibrillation. The medical authorities he consulted were unable to predict such an event. One authority even went so far as to say that such a weak shock was not capable of causing either fright or surprise.

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I suggest there are some lessons to be learned from Whitaker's work. First, Whitaker focused on the various injuries caused by electric shock rather than compliance with standards. Of course, there were no standards at that time. Today, when we analyze a new safety situation, we seem to do so with reference to a standard rather than to the injury.

Second, Whitaker made lots of measurements, but only used the minimum, worst-case values found. This sort of pessimism is truly necessary in the field of safety. I think too often we tend to use probability and normal distributions rather than worst-case values.

Third, Whitaker makes lots of assumptions and arbitrary decisions, especially regarding animals representing humans. I suggest that we need to keep in mind that the values presented by Whitaker are not precise. Many other of the values we use in the field of safety are likewise imprecise, but we treat them as if they were precise.

Finally, I find that we don't do such research anymore. A colleague, J. F. Kalbach, coined a term, BOGSAT, meaning "Bunch Of Guys Sitting Around Talking" to describe how a particular curve was once developed. There was no engineering or physical basis for the curve. Purely arbitrary. I would suggest that our safety standards contain too many requirements from the BOGSAT process.

ACKNOWLEDGMENTS

Jim Pierce, ETL Testing Laboratories, dropped a copy of this UL Bulletin on my desk, asking if I had read it. I had seen and read the Bulletin many years ago, so the copy just sat on my desk for many months. Eventually, I picked it up and started reading. I was impressed with the work, and thought I would review it for you.

I also want to acknowledge Henry Jones, a product safety consultant, for his comments on electric fences. Thanks, too, to Tim Kramer of Hewlett-Packard Company for preparing the histograms of body resistance.

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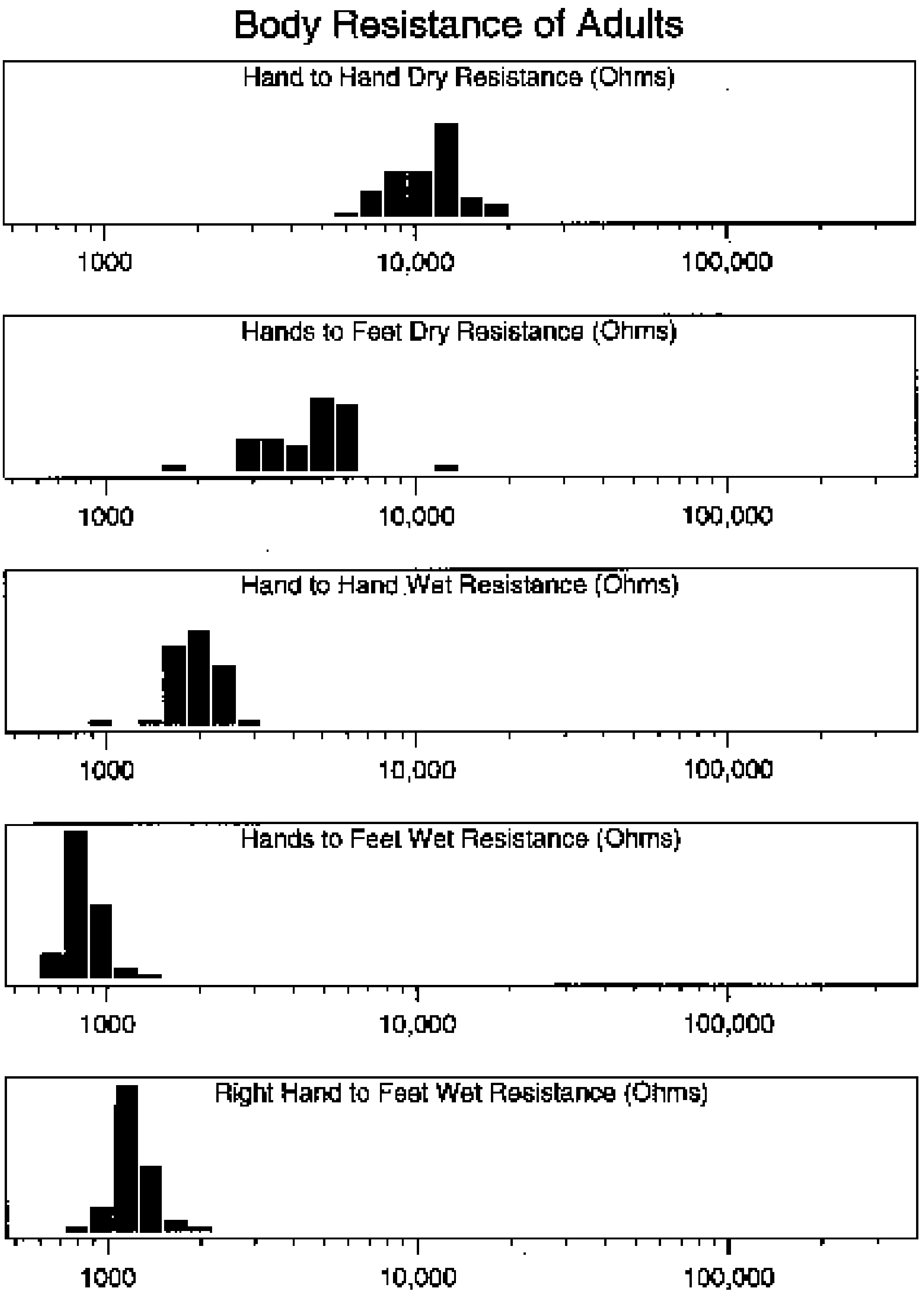
Your comments on this article are welcome. Please address your comments to the *Product Safety Newsletter*, Attention Roger Volgstadt, c/o Tandem Computers Inc., 10300 N. Tantau Avenue, Location 56, Cupertino, California 95014-0708 ❑


Body Resistance of Adults
Hand to Hand Dry Resistance (Ohms)
1000
10,000
100,000
Hands to Feet Dry Resistance (Ohms)
1000
10,000
100,000
Hand to Hand Wet Resistance (Ohms)
1000
10,000
100,000
Hands to Feet Wet Resistance (Ohms)
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Right Hand to Feet Wet Resistance (Ohms)
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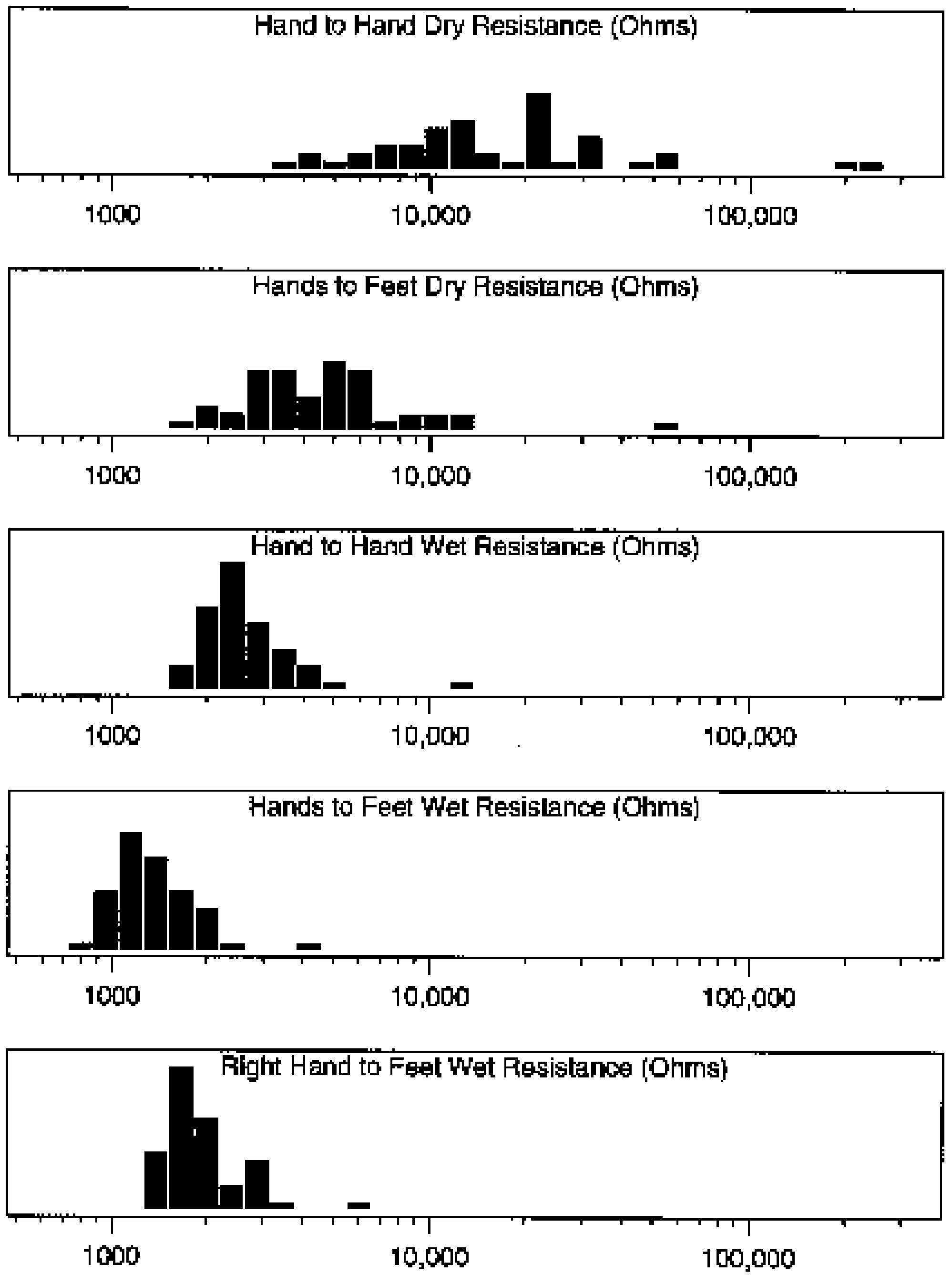
Body Resistance of Children



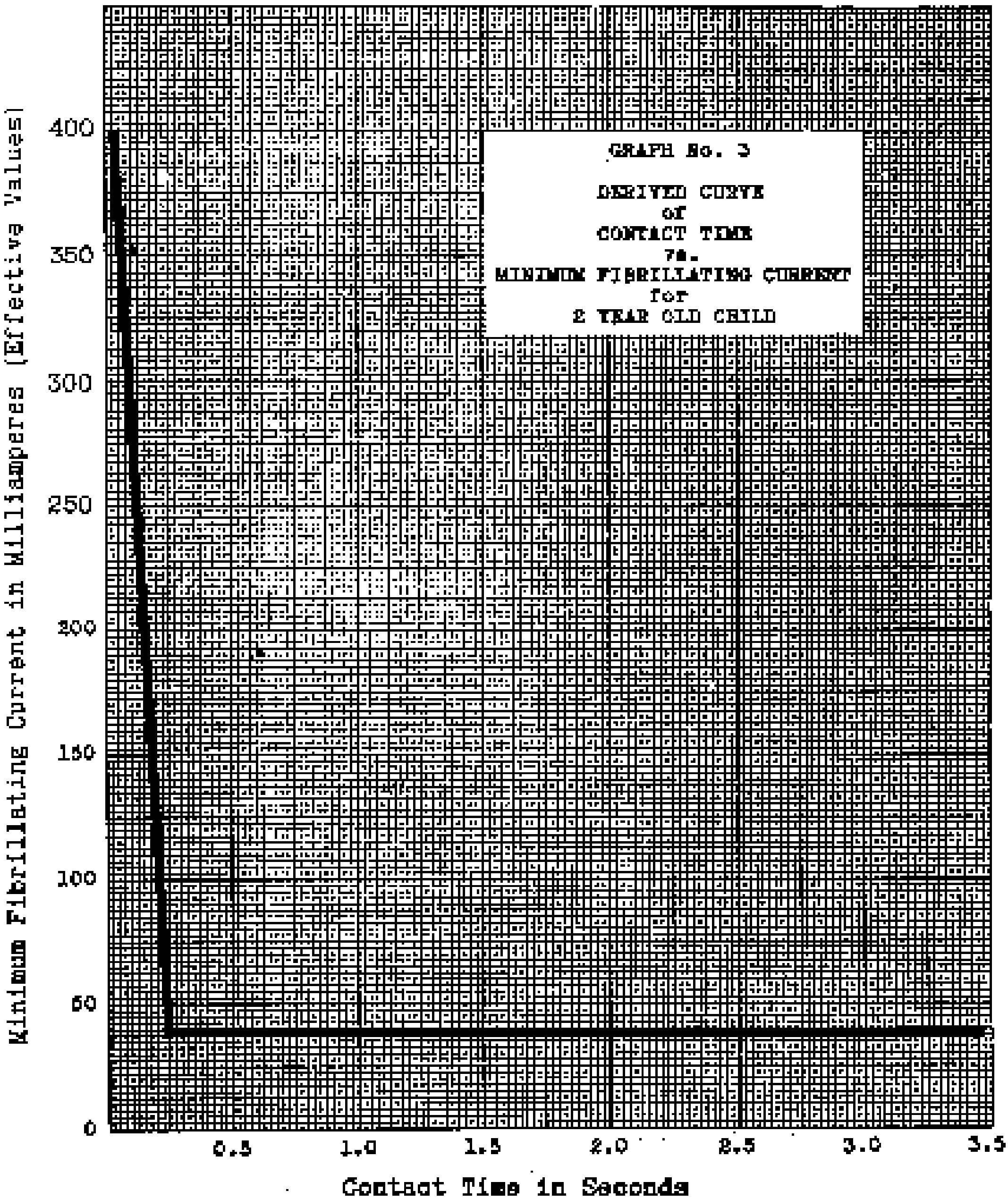


FIG. 3—DERIVED CURVE OF CONTACT TIME VS. MINIMUM FIBRILLATING CURRENT FOR 2-YEAR OLD CHILD.

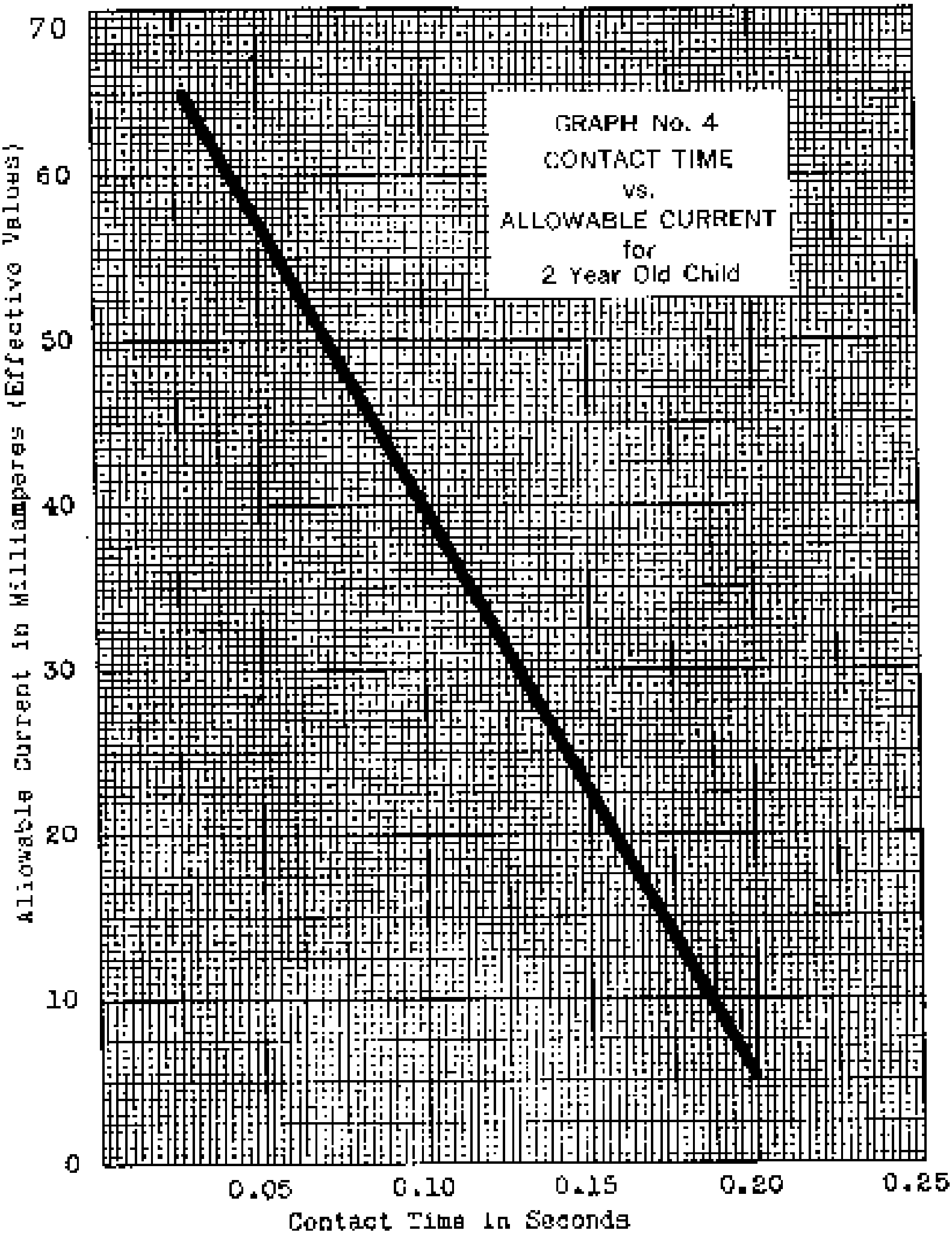


FIG. 4—CONTACT TIME VS. "ALLOWABLE CURRENT" FOR 2-YEAR OLD CHILD

News and Notes
Continued from page 3

European Mains Voltage 230 V

Most EEC countries have decided that as of January 1, 1993, equipment must be marked with a 230 V rating. In Sweden, this 230 V marking has been obligatory since 1991.

Electric and Magnetic Fields

In November, 1992, the Board of Governors of NEMA (National Electric Manufacturers Association) voted to commit $2 Million over a 5 year period to contribute to the EMF health effects study being jointly conducted by NIH and DOE.

More Electric and Magnetic Fields

From ANSI's "Standards Action," February 5, 1993:
"APPROVAL SUSPENDED.
"ANSI/IEEE C95.1-1992, Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields (3 kHz to 300 GHz).

"The BSR action taken on November 18, 1992, to approve the above standard as an American National Standard has been appealed. Approval is therefore suspended."

Until the appeal is resolved, the USA has no National standard for safety levels of E-M fields.

ISO 9000

The Department of Defense is conducting a study to determine if the military should replace its MIL-Q-9858 and MIL-I-4520 with ISO 9000.

The Federal Drug Administration uses ISO 9000 as its basic standard but embraces special requirements for medical equipment.

CSA Announces Certifications for the USA

CSA announced in their "Inform" publication dated February 15, 1993 that on December 24th, 1992, CSA's Rexdale facility was officially accredited by the US Occupational Safety and Health Administration (OSHA), as a Nationally Recognized Testing Laboratory (NRTL). The accreditation covers testing and certification to over 360 ANSI/UL standards for a wide range of electrical, electronic and other products which require testing or certification by a NRTL, in accordance with OSHA regulations. Effective immediately, CSA will accept applications for testing, evaluation and certification of products and components to US Standards and Codes. Products certified by CSA to US Standards, in accordance with the terms of OSHA accreditation, will be identified by the CSA Mark with the indicator "NRTL". Products Certified by CSA to both US and Canadian Standards, and which are also intended for the Canadian market, will be identified with the indicator "NRTL/C" adjacent to the CSA mark. Details of the above can be obtained from your local office of CSA.

UL Announces Certifications for Canada

UL announced that it is the first safety certification organization in the US to be granted Certification Organization (CO) and Test Organization (TO) accreditation for Canada by the Standards Council of Canada. All UL facilities that handle both certification and testing will be able to certify all product categories. Under terms of the program, UL will be able to evaluate products to Canadian National Standards and Codes and authorize their clients to use a new UL mark for Canada on compliant products. The new mark will be the familiar UL in a circle with a letter C outside the circle at the 8 o'clock position. As a result, UL is able to provide all certification services that are needed for its manufacturing customers to gain product acceptance and do business in both

Canada and the United States. For more information, please contact your local UL office.

The following article was obtained from the July/ August 1992 Newsletter published by M.A. Lamothe and Associates and Ultratech Engineering Labs Inc.

Getting Your European Approval in North America

There is considerable confusion with respect to obtaining the various approvals required to apply the CE mark to electrical products. At present, the approval to use the CE mark can only be issued by a European 'Notified Body'.

To make it easier for companies located outside of the European Community, the European Commission will be negotiating Mutual Recognition Agreements (MRA's) with the governments of other countries. Once the MRA is in place, it should be possible for, say a European company to go to their local 'Notified Body' to obtain CSA Certification and a Canadian company to go to CSA to obtain approval to use the 'CE' mark.

The Notified Bodies in Europe will also be able to arrange with the approval agencies in the other countries to 'subcontract' the technical aspects of testing and product evaluation for various products. The subcontracted organization must meet all of the EN 45 000 and EN 29 000 requirements.

There are a variety of opinions as to the best approach for entry into the European market and there will be a number of agencies offering to provide the required approvals. Our advice is to check the agencies credentials very carefully to make sure they are recognized in Europe by one of the 'Notified Bodies'. The approval to use the CE mark is definitely a case of Buyer Beware. ❑

Chairman's Message
Continued from page 1

officers. Leading a geographically dispersed organization such as ours has both its rewards and challenges. We're looking for those of you who have a vision for the future of the PSTC to seriously consider making yourselves available for leadership and service. One personal goal I have is to see greater geographical representation; it would, at the minimum, tend to make TC-8 more cohesive and foster greater interaction among our various chapters. If you'd like to share your ideas on the future of TC-8, especially to explore taking on a more active role, please contact me, Brian Claes, at (408)578-5035 ❑

ANSI/ISA S82.01
Continued from page 5

These requirements are based upon current standards including the national electrical codes.

Another significant difference is the reference to IEC component standards throughout IEC 1010-1. The National Forward will allow the use of ANSI standards. Although this will be acceptable in the United States, it will be necessary to determine the difference between the IEC and the ANSI standard in order to determine the acceptability of the product outside the United States. This will require a significant effort by manufacturers to push for harmonizing of component standards and the various test labs to identify and resolve differences. The ISA standard includes informative Annex O to cross reference similar CSA, IEC, and UL component standards. It is encouraging to note that many component manufacturers are able to obtain multiple approvals from UL, CSA VDE, etc. This shows that in general, there are no conflicts between the standards for these components. However, there are some components such as wire and fuses that will require significant effort to harmonize the requirements.

A major difference between the existing ISA S82.01 and the revision will be the spacing tables. The revision has much more extensive spacing tables. Spacings include not only the through the air spacing (known as clearance), but also the spacing over the surface of an insulator (known as creepage distance). This latter spacing is necessary because insulating materials vary in their resistance to the phenomena known as tracking. Tracking is the tendency of an insulator to build up carbon granules between two conductive parts. Eventually, this build up results in a continuous short.

Tracking results when conductive condensation occurs. Products used only indoors where temperature and humidity are controlled will not be affected by this phenomena. Products used otherwise will require spacings for some insulators (e.g. bakelite) to be much larger than for other insulators (e.g. ceramic). The relevant parameter affecting this spacing is called the Comparative Tracking Index (CTI). Generally, a CTI of over 600 allows spacings to be no larger than the clearance spacing. A CTI of 175 or less may require significantly larger spacings.

This issue of spacings may be the biggest change required by manufacturers. The new spacing tables permit much smaller values than previously used in many cases. However, it requires the manufacturer to understand the application (or identify the limits to the user) in more detail. As stated previously, the manufacturer must identify the type of environment in terms of the likelihood of condensation. This is called the pollution degree. There are four categories, but only two relevant to S82.01:

Pollution Degree 1 - No pollution or only dry, non-conductive pollution occurs.

Pollution Degree 2 - Occasionally, a temporary conductivity caused by condensation must be expected.

Another important environmental parameter is the magnitude of transients that may occur. This is defined in terms of the installation category. The three common installation categories are:
Installation Category I - Signal level with transients smaller than Category II. In general, all secondary circuits are Category I. However, Field I/O circuits with long lengths that will be subjected to induced noise from nearby lightening strikes and/or high current equipment should be rated as Category III.

Installation Category II - Transients expected at typical 20 A mains receptacles. These transients are smaller than Category III, having been reduced by the branch circuit wiring inductance.

Installation Category III - Transients expected at mains distribution panels.

The expected transients are based upon the rated voltage and the installation Category. The spacings are consequently based upon these transients. The manufacturer will be required to inform the user about the Installation Category.

As mentioned previously, the third relevant parameter determining the spacings is the CTI. It will be necessary for the manufacturer to obtain the CTI for insulators used in the product in order to determine if the spacings are adequate. This will be an ongoing process as manufacturers of components such as connectors, terminal blocks, fuse sockets, etc. become more knowledgeable about insulation coordination and the difference in spacing requirements based upon environment, transients, and CTI. The break-points presently used for the CTI are as follows:

CTI > 600	the best you can get, ceramic, porcelain
CTI > 400	
CTI > 175	applies to circuit boards. Not all meet this value. Flexible circuits using polyamide are less than 175
CTI > 100	the lowest acceptable CTI.

Hydrostatic testing has been required previously for equipment operating on pressures above 300 psig (2000 kPa). The new standard will require testing be done for equipment operating at pressures of 7-1/2 psig (50 kPa) and above. Tests may even need to be done at lower pressures if a hazard may occur from leakage.

The limits of shock hazard have been broadened by a more detailed description of the nature of the circuit. The voltage limits are 30 Vrms, 42.4 Vpeak and 60 Vdc. This puts the common European voltage of 48 Vdc as not a shock hazard in dry locations. This resolves a long standing discrepancy between European and North American shock hazard limits.

The revision to ISA dS82.01 is now out for public comment. It is anticipated that the completed document will be "on the streets" in August or September of this year. ❑

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. Those interested in listing their names should contact the Editor.

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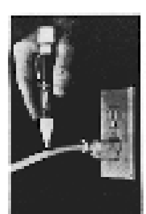

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Ervin Gomez at (408) 447-4070 (phone) or (408) 257-5034 (fax)

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