The Product Safety Newsletter

IEEE

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Volume 3, Number 2 March-April 1990

Chairman's Message

We have completed the initial Reader Survey. Your comments have been read and tabulated. A compilation of the results of the survey appears on page 21 of this issue of the newsletter. Following are a few observations as a result of your input.

Technically Speaking

"Technically Speaking" is, by far, the most praised column. Let me share the following quotations (which represent the theme of most of your comments).

> "... informative, provides an in-depth analysis of safety engineering principles..."

Rich Pescatore

> "Forces one to think of safety in terms of the engineering process rather than blind application of rules."
>
> "... provides insight where none existed before."
>
> "... provides timely, detailed info about pertinent subjects."
>
> "... clearly written..."
>
> "... very informative, but it must be condensed."

My thanks to Rich Nute for sharing his knowledge and enthusiasm with us. It is clear that most of you want this column to continue. It will.

Ask Doctor Z

"Ask Doctor Z" sparked a mixed response. It seems some of you love the column, while others hate it. There weren't many middle ground comments. Your comments ranged from "Liked" and "Informative and entertaining" to "Get rid of Dr. Z" (repeated four times) and "Execution!" This leaves your editor with a tough decision to make regarding the continuation of this column.

Two major functions of this newsletter are to provoke thought and disseminate information. "Ask Dr. Z" does this, although in a manner that some of you apparently find less professional than you would like. On the other hand, many of you like Dr. Z's style, as it provides a bit of humor and wit, while at the same time allows free expression of opinion. It should be clear to PSN readers that this is an opinion column, rather than technical, with an emphasis on the less serious side of "product safetiology."

We certainly can't guarantee you will find "Ask Dr. Z" consistantly hilarious or even mildly amusing. Humor has been defined as someone else slipping on a banana peel. Your banana peel is not very funny-obviously only a safety hazard. However, given that many of you do like the column,

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Chariman's Message

Continued

and that it is consistent with our goals, I suggest that we continue to include it in the newsletter. Read it only if you like it. And if you don't like it ...tell us!

We try to present all points of view that we receive. If Dr. Z (or anyone else) makes a point that you disagree with, please write and let us know. We will attempt to publish your letter or, at the least, express your view and ask for responses. This is *your* forum.

Other Columns

"News and Notes" is another column that many of you said you appreciate. The only complaint was that you wanted *more* news. The real need for improvement seems to be the "Calendar" and the "Area Activity Reports." Both must become more timely and complete so they can be more useful to PSN readers. Finally, a couple of you even said you especially like the "Chairman's Message" (thank you). And then there was the guy that thinks that what needs the most improvement is the Chairman's picture. Oh well!

All kidding aside, your comments are appreciated. They will lead to change. We have received many good ideas for additional topics that could be addressed in the newsletter. We would love to pursue all of your suggestions. One way to get a topic included is to write about it yourself. Some readers have already submitted articles which were well received, and more would be very welcome. As I have said many times, this is a volunteer organization and you need to volunteer to make things happen.

Saving the best for last ...some readers could not decide which columns were favorites or needed improvement. Some general comments:

"PS Newsletter is always very informative."

"I think you guys are doing a wonderful job."

"... (the) diversity presented is healthy ..."

"The entire newsletter is very well done."

"I can't choose. It's like asking a person dying of thirst what type of water do you like best?"

Thank you for your support.

Best Regards,
Rich Pescatore
Chairman

Technically Speaking

Rich Nute

The Use of Overcurrent Protection in Plug-and-Socket Connected Equipment

Rich Nute

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Hello from Vancouver, Washington, USA:

Consider the "direct plug-in" Class 2 transformer-power supply commonly used for low-power devices such as calculators, cassette players, and similar products. Consider also the larger "cousin" known in the trade as the "indirect plug-in" Class 2 transformer (where the transformer is too large to hang from the plug, and must, instead, reside on the floor using attached cords for input power and output power).

These small transformer-power supply devices have no power switch, and have no fuses in the primary circuit.

In North America, it is common for these Class 2 transformer-power supply devices to be safety certified for many uses, including medical equipment (CSA 125 and UL 544) and data processing equipment (CSA 220 and UL 478).

However, these same transformer-power supply devices do not comply with either IEC 601-1 (medical) or IEC 950 (data processing) because they have no fuses in the primary circuit. Not only do IEC 601-1 and IEC 950 require fuses, for grounded products they require fuses in both poles of the supply. (The possible exceptions to this requirement will not be discussed in this article.)

This dilemma has given me cause to pause and consider the hazards addressed by the IEC fuse requirements for single-phase plug-and-socket connected equipment. (See IEC 601-1 Second Edition, Sub-clause 57.6, and IEC 950, Sub-clauses 2.7.1 and 2.7.3.)

Let's begin by discussing the purpose of a fuse, and the function of the building overcurrent protective device as it relates to plug-and-socket connected equipment. Next, we'll discuss when to use a fuse, and whether to fuse both poles of a single-phase, plug-and-socket connected equipment. We'll include a discussion on how to select the value of the fuse.

The Purpose of a Fuse

Let's review the function of a fuse. (In the context of this article I use the word "fuse" as a general term for automatic overcuuent protective device which includes but is not limited to fuses and circuit-breakers.)

Fuses are means to automatically disconnect power under overcurrent conditions.

What is overcurrent? Overcurrent is any current exceeding the maximum current rating of wires, switches, connectors, etc.

Why are we concerned about overcurrent? Overcurrent results in overheating. And overheating can result in fire.

Overheating is due to $I*I*R$ power dissipation in the wire resistance or in the contact resistance of switches and connectors. If I increases (overcuuent), then power dissipation increases very rapidly with increasing I (due to the square function in the power equation) and the conductor or contact overheats. When conductors and contacts overheat, their resistance goes up contributing further to increase power dissipation and the situation approaches a thermal runaway situation.

Such overheating might raise the temperature of nearby materials to their ignition temperature and result in a fire.

In a lesser situation, the overheating might melt plastic wire insulation thus providing undesired and uncontrolled current pathways. We assume that this

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lesser situation results in a hazard, and, therefore, insulation failure due to overheating must be prevented.

Disconnection must be automatic because the circuit may not be continuously attended by someone who will manually disconnect the power, and because overcurrent conditions are not necessarily immediately apparent.

Building Protection

In an electrical distribution system, whether in a building or in a product, automatic prevention of overcurrent conditions is required whenever the wire size is reduced. When wire size is reduced, the cross-sectional area is reduced, and the resistance is increased.

Overheating of wire is due to $I*I*R$ power dissipation in the wire resistance. If I remains constant, and R increases (due to decreased wire size), then power dissipation increases and the wire overheats.

Therefore, when wire size is reduced, it is necessary to reduce the maximum I with a fuse.

In the event of insulation failure between a conductor and ground, the ground return system provides a controlled current pathway by which the current is returned to its source. If the fault impedance is sufficiently low, the fuse will clear the circuit and prevent overheating of the supply and ground return conductors.

(Note that if the fault impedance is high, and the current through the fault does not exceed the overcurrent device rating, then the conductors are not subject to overheating and the situation is acceptable insofar as the purpose of the fuse. However, power will be dissipated in the fault and may result in a fire or other hazard; we will not explore this situation.)

(The ground return system together with the fuse may also play a role in the prevention of electric shock. I have already discussed this role in a previous column.) Let's compare the requirements for the ground return circuit with the characteristics of the different ground return systems used throughout the world.

Operation of a fuse in the event of an insulation fault to ground necessarily requires the ground return circuit impedance be about the same as that of the supply circuit impedance.

In North America, the ground wire and the neutral wire are the same size and are connected to the same ground rod. This gives reasonable assurance that the ground return circuit impedance is about the same as the supply circuit impedance.

In many European installations, the ground wire and neutral wire are the same size, but are connected to their own independent ground rods. This construction places the earth impedance in series with the ground return circuit impedance. Therefore, in such systems, the ground impedance is necessarily greater than the supply circuit impedance.

While every effort is made to assure a low impedance between the two ground rods, occasionally the earth impedance is too high to cause sufficient current to blow the installation fuse. This fault-condition situation is not subject to overheating, but may result in electric shock conditions.

When the earth impedance between the two ground rods is too high to cause the fuse to operate, then a potential difference exists between those two ground rods. If we assume the worst-case where the fault current is equal to the fuse rating, then virtually the entire supply voltage appears between the two ground rods. If the building metal is connected to the ground wire, then, within the building, there is no potential difference between grounded parts and there is no shock hazard—even though at the ground rod there is a potential, gradient nearly equal to the supply voltage.

To prevent electric shock under these conditions, some European authorities require permanent installation of a "residual current circuit breaker" (RCCB) or "earth

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leakage circuit breaker" (ELCB) on the load side of the fuse (in the building installation). These devices are electromagnetic versions of the North American GFCI (ground fault circuit interrupter). The RCCB or ELCB units open the circuit when the difference between the phase current and the neutral current exceeds about 5 to 20 milliamperes. For all practical purposes, the RCCB or ELCB act as fuses for ground-faults-regardless of the fault impedance.

Now let's look at the situation when the power distribution system is extended to the equipment by means of a plug and socket and a length of power cord.

Usually, the power cord wire size is smaller than that of the wires supplying power to the socket. As mentioned previously, whenever the wire size is reduced, a fuse should be required to protect the smaller wire size from overheating. The UK has addressed this situation by requiring a fuse in the plug.

In North America (as opposed to the UK), the fuse in the installation is supposed to protect not only the installation wiring, but also any plugs and cords connected to any receptacle. This requirement is independent of whether or not a fuse is provided within the equipment.

A fuse, being a series element in a circuit could be applied anywhere in the circuit (at the source, at the load, or in the return wire) and still do the job. How- ever, the fuse must be located at the source and in the "hot" leg if it is to provide protection for all possible faults. As a general rule, a fuse should not be used to provide protection of wires and other components on the supply side of the fuse. Therefore, a fuse in the cord-connected product does not provide protection for faults in the cord, line filter, or power switch (where located on the supply side of the fuse).

In North America, wire sizes for power cords, including extension cords, are selected to always be capable of blowing the 15 or 20 amp building fuse in the event of a steady-state short-circuit at the end of the power cord.

The power cord wire size together with its insulation rating must have a sufficiently low impedance to withstand the overheating of the short-circuit until the 20-amp circuit breaker clears the circuit. (Cord-connected electrical heating appliances often have high temperature insulation on their power cords to account for steady-state high current conditions.)

To meet this criterion, the minimum wire size for flexible cords is A WG 18, except for specific applications, in which case there are extensive insulation robustness tests designed to preclude insulation failure.

Ampacity ratings of cords and cordsets are given in UL 817 , Table 90. These ratings are for normal conditions.

Inside a Product

Thus far, we have been talking about the building power distribution, and protecting wires from overheating in the event of an overcurrent condition. For cord-connected products, electric power distribution stops and electric power utilization begins at the load end of the power cord.

When we get inside a cord-connected product, we are no longer necessarily dealing with $I*I*R$ power dissipation in the wire resistance or in the contact resistance of switches and connectors as being the only sources of heat for a fire. Within cord-connected equipment, we have line filters, transformers, and many other circuit components which may be subject to overheating from $E*I$ power dissipation. Now we must consider both $I*I*R$ and $E*I$ power dissipation.

Continued

And, we must consider both insulation and circuit component faults.

To protect against overheating, we must first identify those parts which could dissipate power and which therefore could overheat. Only those parts which can dissipate power can overheat.

Let's look at the common 50-60 hertz transformer: The ideal transformer dissipates no power. But transformers are wound with copper wire having a finite resistance; power is dissipated in this resistance and some heating results. Transformers are made with imperfect magnetic cores; more power is dissipated in overcoming core losses and more heating results. Normally, the heating from these sources is relatively low.

What faults can cause the transformer to overheat?

Let's first consider the primary winding. Here, if the magnet wire insulation should fail, some small proportion of the number of turns would be shorted, and power would be dissipated in those shorted turns. The current would increase in proportion to the number of turns shorted which can rarely be a very large number. (The number of turns that could be shorted depends on the transformer construction.)

With shorted turns, whether primary or secondary, the current increases and the *E*I* power increases. The transformer heats up. The resulting increase in the phase-to-neutral current is not likely be enough to cause the building fuse to open.

Insulation and component failures at the secondary output terminals can also cause transformer overheating without causing the building fuse to open.

Two kinds of output terminal loading simulate the worst-case transformer overheating. One load is the output short-circuit. This maximizes *I*I*R* heating within the transformer. The other load is the output maximum power. This maximizes the *E*I* heating within the transformer .

If the heating resulting from shorted turns or excessive loading could cause the failure of insulation or a fire, then some kind of automatic safeguard must be employed.

For many transformers, one or more fuses is an acceptable automatic safeguard. (In some cases of multiple-winding secondaries, both the primary and the secondaries must have their own fuses.) The fuse value is selected at some value greater than maximum normal load, and less than that load which produces a potentially damaging temperature.

Now, let's take another look at those fuseless transformers that are acceptable under CSA and UL standards, but not acceptable under IEC standards.

For small transformers where rated input current is a fraction of an ampere, the difference between rated input current and fault current for an unacceptable temperature may not be high enough to find a fuse which will not blow under normal current but will blow under abnormal current. In addition, low current fuses tend to have fragile elements and are subject to failure due to mechanical shock.

In these cases, it is common to use a thermal switch as a safeguard against excessive temperature. Indeed, for small transformers, a thermal switch is a better safeguard against excessive temperature than a fuse.

For compliance with IEC 601-1 and with IEC 950, one would need to safeguard the transformer with a thermal switch, and then add a fuse. (Both IEC 601-1 and IEC 950 require that the transformer be protected against overheating under overload or short-circuit conditions; see IEC 601-1, Sub-clause 57.9.1 and IEC 950, Appendix C.) For a small transformer, the fuse is useless but required for compliance.

What about the requirement that, in grounded products, a fuse must be provided in both poles of

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the supply? I've already discussed in the June, 1988, *Product Safety Newsletter* that double fusing does not compromise the safety of the product and should be permitted.

Clearly, automatic overcurrent or overtemperature safeguards are necessary to prevent electrically caused fire.

The building fuse safeguards the building wiring and power cords for both phase-to-neutral and phase-to-ground overcurrent situations.

The local product fuse safeguards the product parts for local *E*I and I*I*R* overheating situations.

At the load end of a power cord, a fuse or other device safeguards against excessive temperature due to power dissipation in line filters, transformers, and many other circuit components which may be subject to overheating. All of these kinds of components are connected between the poles of the supply. A single fuse adequately safeguards against local overheating, regardless of which pole is wired.

Meanwhile, the building fuse adequately safeguards against overcurrent in the event of phase-to-ground insulation failure--whether in the building, the power cord, or in the product.

With the exception of line filter capacitors (which are rarely provided with fuse safeguards), there are no power dissipating components connected from pole to ground. Both poles of the mains circuits must be everywhere insulated from ground. Assuming there is no wire size reduction on the load side of the fuse, there is nothing to safeguard against overheating in the event of an insulation failure to ground (except, maybe, the insulation itself)-even in the event of polarity reversal.

Consequently, the building fuse prevents overheating of wires in the event of failure of insulation between the phase conductor and ground. (Note that this is true regardless of plug polarity: the phase conductor in the product is the wire that is connected to the building phase conductor via the plug and not necessarily the wire with the fuse.)

And, the product fuse prevents overheating in the electric power utilization components within the product. (Note that this is true regardless of plug polarity: electric power utilization in the product occurs between the two poles of the supply.)

In this article, I have shown that fusing is not the only means for safeguarding against excessive temperature within products. Indeed, for transformers, at least, fuses may not provide an adequate safeguard.

I have also shown that, while double-fusing should be permitted, double-fusing should not be required as double-fusing does not provide any safeguarding above and beyond that of a single fuse. (In the case of an insulation fault to ground, where the building ground is connected to a ground rod independent of the ground wire, and where the ground impedance is too high to create overcurrent sufficient to operate the building fuse, a local fuse may reduce conditions for electric shock.)

(1) *From a practical point of view, somewhere in the neighbor- hood of* 4 *to* 6 *amperes and lower, no automatic prevention of overcurrent conditions is required whenever the wire size is reduced. The power dissipated in the wire or contact resistance, together with the power per unit volume and the increase in resistance due to the heating , usually is not capable of an overheating condition.*

Your comments on this article are welcome. Please address your comments to the *Product Safety Newsletter,* Attention: Roger Volgstadt, c/o Tandem Computers Incorporated, 10300 N. Tantau Avenue, Loc. 55-53, Cupertino, CA 95014-0708.

Circuit Breakers: The Myth of Safety

Fredrick F. Franklin, P.E.

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"Contrary to popular opinion, the use of circuit breakers and fuses does not guarantee that short circuit fires will be prevented." This was the lead sentence of an article regarding electrical fires the author published in the N.F.P.A. Fire Journal in 1984. After further research, he patented a simple electronic circuit to be added to circuit breakers to prevent short circuit fires. But a year later, he discovered that European circuit breakers have the same effect, because they use a (9 turn) solenoid coil inside the circuit breaker to make them more sensitive. Efforts are under way to persuade American manufacturers to change to this European style.

By simulating 120 volt short circuit arcs, it was discovered that the arcs have a significant electrical resistance of their own, which can be as high as 0.5 ohm. This keeps the electrical current below the magnetic or instantaneous trip level of most North American circuit breakers. Most people do not realize that small 15 and 20 ampere branch circuit breakers have two modes of tripping. The first is the well-known b which opens thermally, like the thermostat in a home. But circuit breakers also open instantaneously (like a relay) whenever the magnetic field induced by the electrical current reaches a certain threshold. Unfortunately, this magnetic tripping threshold is set too high in almost all North American circuit breakers.

Short circuit currents are simulated by burning through the insulation on conductors and by cutting on their insulation to create arcing shorts. It was discovered that the electrical current levels in 120 volt arcing short circuits are almost always between 150 and 400 amperes. with most levels congregating around 200 to 250 amperes. Hundreds of arcs have been created and an arcing current below 100 amperes has never been observed.

These current levels may be compared to the magnetic or instantaneous trip levels of 15 ampere North American circuit breakers:

Brand A: 120 to 180 Amperes
Brand B: 120 to 230 Amperes
Brand C: 150 to 350 Amperes
Brand D: 325 Amperes
Brand E: 360 Amperes
Brand F: 800+ Amperes
Brand G: 800+ Amperes

The corresponding levels for 20 ampere breakers are:

Brand A: 160 to 240 Amperes
Brand B: 150 to 280 Amperes
Brand C: 200 to 465 Amperes
Brand D: 435 Amperes
Brand E: 480 Amperes
Brand F: 1065+ Amperes
Brand G: 1065+ Amperes

It may be observed that most of these nipping levels are well above short circuit arcing current levels.

There is another way to compare circuit breakers (and fuses), which is to measure their opening times at 200 and 250 amperes, the range of most 120 volt short circuit arcs (see Figure 1 next page).

A third way of comparing circuit breakers and fuses is to compare relative energy as a function of current. It may be observed in Figure 2 that the let-through energy (I2t) for a 5X European breaker falls drastically at about 75 amperes. This is because it suddenly begins opening much more quickly. The let-through energy for the midrange American breaker does not begin to drop dramatically until 400 amperes (27X). The Europeans insert a coil of nine turns or so in each circuit breaker to greatly increase the magnetic forces (see Figure 2). This lowers the magnetic nip level to 75 ampere breaker (5X). Thus at all current levels above 100 amperes, European 5X circuit breakers nip in 0.004 second. This reduces the energy in the arc to negligible levels, for a reported additional

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Circuit Breakers: The Myth of Safety

Continued

Types of Fuse	200 AMPS	250 AMPS
ABC-8 GLASS FUSE	.005	.003
ABC-10 GLASS FUSE	.008	.006
MDA-15 GLASS FUSE	.015	.008
ABC-15 GLASS FUSE	.015	.005
AGC-20 GLASS FUSE	.033	.021
TL-15 PLUG FUSE	.025	.012
TL-20 PLUG FUSE	.063	.016
T-30 PLUG FUS	.375	.080
Type of Circuit Breaker	**200 AMPS**	**250 AMPS**
EUROPEAN 5X	.004	.004
BRAND A 15 AMPERE	.008 - .075	.008 - .032
BRAND A 20 AMPERE	.125 - .133	.051 - .058
BRAND B 15 AMPERE	.004 - .112	.004 - .008
BRAND B 20 AMPERE	.008 - .275	.004 - .152
BRAND C 15 AMPERE	.310 - .450	.192 - .256
BRAND C 20 AMPERE	.100 - .650	.006 - .368
BRAND D 15 AMPERE	.250	.160
BRAND E 15 AMPERE	.360	.230
BRAND F 15 AMPERE	.650	.420
BRAND G 15 AMPERE	.290	.180

Fig. 1 - Opening (Tripping) Times in Seconds

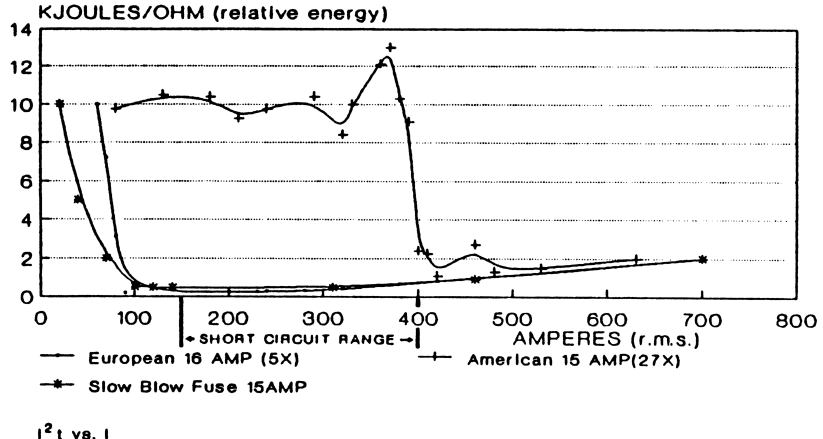

Figure 2

manufacturing cost of only $0.30. This addition would reduce American fires by 20 percent, or roughly one billion dollars per year. Even if short circuits accounted for only two percent of fires, this change would still prevent over $100 million dollars of fire loss each year.

On February 7, 1989, the American product safety engineers for the television and audio manufacturers, such as Sony, RCA, GE, Magnavox, etc., flew to Cincinnati for a special meeting at which video tapes and slides were shown to illustrate these views. Afterward, this R-1 Safety Committee of the Electronics Industries Association (E.I.A.) voted unanimously to petition U.L., the N.I.S.T. (formerly the National Bureau of Standards), and the circuit breaker manufacturers' organization, N.E.M.A., for change. Paragraph 2 of their Position Paper says: "The greatest potential for reducing the risk of fire from arcing shorts in the power supply system as a whole appears to lie in significantly reducing the initial "let-through" energy under arcing short conditions of branch circuit breakers so that they instantaneously trip at or about five times their nominal current rating."

After this meeting the author and other members of the E.I.A.

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were invited to N.E.M.A. headquarters in Washington, D.C. A task force has been formed at N.E.M.A. to study these views, and on May 9,1989, the same video and slide presentations were given to them. One video tape shows a power cord lying on a burning piece of cardboard and plugged into a 20 ampere outlet in the author's office building. The power cord short circuits over 30 times and for two minutes before popping his 20 ampere circuit breaker. In a later video, this test is repeated with blankets lying next to the cardboard. Flying copper globules from the arcs ignite three blankets before popping the 20 ampere breaker. Both of these videos were taken the first time the tests were conducted. A copy of either video may be obtained by sending $25.00 (each) to P.A.C.E. Inc., 4325 Indeco Court, Cincinnati, Ohio 45141.

For over a decade, the insurance industry and the electrical industry have argued about electrical fires. Many in the electrical industry argued that they could not simulate electrical fires, and therefore, they do not occur .The simulations and video tapes mentioned above should put that argument to rest, but the usefulness of circuit breakers is such an ingrained myth that it may not be soon. Most people continue to misunderstand electrical fires. Many electrical engineers maintain that all shorts are dead shorts, and therefore that no short circuit fires occur. Their reason, in short, (0 resistance) cannot dissipate any heating energy and therefore that it cannot cause a fire. But on demonstration video tapes, paper is ignited numerous times by simply cutting on a power cord with diagonal cutters. So are blankets. In this type of test, where the diagonal cutters first create a dead short between the conductors, the alternating magnetic forces induced at the short by the high electrical currents push the conductors (the wires and the cutters) apart. This creates an arc of significant energy (and its own electrical resistance) in the air almost every time. Thus arcs immediately result from dead shorts, unless the conductors are well bonded mechanically.

The amount of energy allowed into an arc by most American circuit breakers is well-known to electricians. They have developed a common saying, in which they point to circuit breakers in a panel and say, "you can weld with them!"

Besides tripping times, another indication of relative safety is the amount of metallic melting allowed at an arcing location by the circuit breakers. It is well known that a short circuit which causes a fire in building wiring always leaves a melt on the metal conductors. In fact, the energy in arcs which cause building fires is great enough to melt at least one conductor completely apart over 97% of the time. When a 5X European style circuit breaker is inserted into the circuit for simulations, either no melt at all or a very tiny melt develops. (The same is true of 15 ampere American fuses.) 0.004 second is such a short time that very little arcing energy can develop.

If most American circuit breakers do not prevent short circuit fires, what do they accomplish? Their usefulness seems to be limited to tripping on dead shorts. Most people think fuses and circuit breakers are useful for preventing overcurrent fires. But overcurrents great enough to overcome the large factor of safety built into wiring insulation are very rare. As an example, the first video tape shows scenes of a 14 gauge copper romex-type cable through which 100 amperes is flowing, in both the hot and the neutral conductors. Traditionally 14 gauge copper has been rated at only 15 amperes. Yet after one hour, the paper wrapped around the grounding conductor inside the cable is not even scorched.

Circuit Breakers: The Myth of Safety

Continued

Thus the factor of safety built into the insulation is more than 7:1. The video also shows scenes of a 16 gauge power cord sandwiched between two layers of carpet and through which 60 amperes flows in both conductors for one hour. The plastic insulation does not even melt, let alone burn. Overloads well above 60 amperes in branch circuits are highly unlikely, because so many appliances would have to be plugged in to draw that much current. In a career of over 1500 fire investigations, only one overcurrent fire in building wiring was observed. In that case a circuit breaker remained stuck in the "on" position, after a dead short developed in the wiring. Overcurrent is a myth which developed when firemen repeatedly found 30 ampere fuses and pennies behind fuses at fire scenes. The real danger of the 30 ampere fuses and pennies was that they allowed much more energy into the arc when a short circuit occurred than a 15 or 20 ampere fuse would have. Even when a penny was used behind the fuse, there was usually a 60 ampere, or 100 ampere main fuse in place to prevent an overcurrent fire.

The third type of electrical fire is a high resistance connection, which occurs when two conductors pull apart so that only a small cross sectional area remains in contact. It also occurs when aluminum connections oxidize. In 1500 fires, only two (significant) fires were caused by copper connections, and six by aluminum connections. All of the aluminum connection-fires occurred in very large conductors, such as where cables feed circuit breaker panels. No (significant) connection fire has ever been confirmed in small branch circuit aluminum wiring. One reason for this low incidence is that most connections are enclosed in a metal or plastic junction box. Thus the flying metallic globules and heating energy are contained. Many small fires, of the $50 variety, are reported by others in outlets and wall switches, but the incidence of significant fires developing in them are very low. The energy, the flying globules, and any resulting fire are contained very well, even for short circuit arcing. Conduit has this same effect. Once short circuit energy is minimized, conduit might not be needed.

Tables A and B list the incidence of various types of fires investigated during the past five years. After finding a short circuit melt on a conductor at a fire scene, the only way for an investigator to prove that it occurred prior to the fire and not during the ensuing fire is to prove that the melt is located at the point of origin of the burn patterns. Every other cause at that origin must then also be eliminated. Thus an "electrical" fire expert must also be expert at investigating all types of fire causes, including arson. An electrical engineering degree, by itself, is not of much assistance.

Table A. Total Causes

1. Electrical	37 %
2. Arson	11 %
3. Flammable Liquids	8 %
4. Fuel Gas	5 %
5. Smoking	5 %
6. Kerosene Heater	2 %
7. Cooking	2 %
8. Other Causes	10 %
9. Undetermined	20 %
	100%

Table B Electrical Fire Causes

1.	Short Circuits	30.0 %
2.	Overheating	5.0 %
3.	(H.T.L.'s too slow)	
4.	High "R" Aluminum	1.0 %
5.	Broken Neutral	0.5 %
6.	Overcuuent	0.1 %
7.	High "R" Copper	0.1 %
8.	Televisions	0.1 %
9.	Motors	0.1 %
		37.0%

During short circuit arcing simulations, a phenomenon was discovered which would be useful for preventing short circuit fires in higher current and higher voltage circuit breakers, where

Continued

Circuit Breakers: The Myth of Safety

Continued

the cost of a microprocessor would not be prohibitive. It was found that in virtually all arcs, the arc extinguishes and re-ignites repeatedly. This almost always results in missing half cycles and quarter cycles in the sine-wave waveform. In quarter cycling, the arc does not re-ignite until near maximum voltage is reached at the peak of the sinewave. It is believed a computer could easily detect these missing half cycles and quarter cycles, and immediately trip a larger circuit breaker to minimize short circuit energy.

Besides short circuit arcing, the only other significant cause of electrical fires in the author's experience is high temperature limit thermostats (and fusible elements) which take too long to function after the main thermostat sticks in the "on" position. They function only after the fire has begun, in appliances such as commercial deep fat fryers, electric dryers and coffeemakers. These devices could be given a quicker opening time, by using solid state sensors, etc. Improving high temperature limits and minimizing short circuit energy would reduce electrical fires to negligible levels, in the author's opinion, and eliminate the most confusing aspect of fire investigation for most people—electrical.

As of this writing, the Europeans are not aware that their 5X circuit breakers prevent arcing short circuit fires so well, because apparently no one there has ever measured the currents in household short circuits arcs either. The Europeans began using the solenoid coil in their circuit breakers 15 to 20 years ago for other reasons. It is hoped that U.L. and the N.F.P.A. will not delay in insisting that North America circuit breakers be changed to the European style, to prevent 20% of our fires.

The tests, measurements and discoveries mentioned in this article are the author's.

About the Author:
Frederick F. Franklin is a 1964 graduate of a 5-year program at the Ohio State University in Electrical Engineering. He worked as an electronics engineer for nine years before forming P.A.C.E., Inc., in Cincinnati, Ohio in 1974. P.A.C.E. is a full-time forensic engineering firm which has investigated over 4,000 fires and accidents of every type in Ohio and its surrounding states. Mr. Franklin has testified at over 60 trials as an expert witness; 97% of his cases settle out of court.

According to the author, the following letter appeared in the March, 1984 edition of the *IEEE Spectrum:*

"I am an EE {Ohio State, 1964) who has investigated more than 40 accidental electrocutions during my forensic engineering activities over the past 12 years. Over 12 of these electrocutions were caused by120 Volts ac. In all of these cases, which involved power supply utility, the third wire ground was either nonexistent or was interrupted at some point. Third-wire grounds work. They either cause enough current to be drawn by the short circuit to pop the circuit breaker or fuse, or in the case of a soft short circuit they keep the voltage on the machinery and equipment casings so low that no one can be hurt. I have never observed an electrocution to be caused by a double insulated tool or [to occur] when a ground fault interrupter was in place. The one 120 V electrocution that occurred with a third-wire ground intact occured because a portable generator was being used, and the workman dropped the junction between his power tool's cord and its extension cord into the water in which he was standing. It is generally accepted in the industry that currents of 0.1 amperes can cause fatal electrocutions. Because of

Continued on page 15

Ask Doctor Z

Fred

In the world of Product Safety and Certification, there are many pitfalls for the unwary. If you have a problem that seems insoluble, then it's time to ask Doctor Z! He has the answers, derived from his many years of training and experience in the Science of Product Safetiology. Pitfalls hold no terrors for Dr. Z, since he is on a first name basis with most of them. Any resemblance to persons, places, products, agencies, or good advice is purely coincidental, but don't let that stop you. Write Dr. Z today!

Dear Dr. Z:

Recently I was opening a UL Standard when I noticed the Foreword. What does it all mean?

-Puzzled in Peoria

Dear Puzzled,

I was about to start answering your question when I realized that you had not asked "What does it All Mean?" in the cosmic sense. A question like that would be difficult, but appropriate, for me to answer. However, since you are only inquiring about the Foreword of a UL Standard, I will turn this question over to my lab assistant, Fred. As you can see from his picture, he has already made an attempt to answer the cosmic question. Fortunately, he survived.

Doctor Z

Dear Puzzled,

Hello, this is Fred. That is, these words are written by Fred, they are not actually Fred. But of course you knew that already, and that wasn't even the question you were asking. But this is my big chance so I want to be as precise as possible in my answer. That is, when I start writing my answer, which I haven't yet, but I will very soon.

Here it is: The Foreword seems to be a lot like the "basic speed law" in California, which says that any speed is illegal if it's dangerous. However, I don't think it says that any speed is legal if it's not dangerous. Come to think of it, that's a lot like strict product liability , which says that any product that hurts you must have been defective in the first place. Anyway, let me pick out a couple of good parts from the Standard UL 1950 Foreword.

C. A product which complies with the text of this standard will not necessarily be judged to comply with the Standard if, when examined and tested, it is found to have other features which impair the level of safety contemplated by these requirements.

D. A product employing materials or having forms of construction differing from those detailed in the requirements of this Standard may be examined and tested according to the intent of these requirements and, if found to be substantially equivalent, may be judged to comply with the Standard.

Part C apparently says that even if your product agrees completely with every word of the Standard and meets all of the requirements written down, UL doesn't have to accept it, but they might. They have to look at it and test it first to find impairments before considering rejecting it. Of course you have to know about contemplation because the Standard is supposedly contemplating a certain level of safety, though perhaps not actually describing it.

Part D apparently says that even if your product doesn't have the right materials or the right construction described in the

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Abstracts

by Dave Lorusso

Dave Lorusso

The following is the beginning of a regular feature for the Product Safety Newsletter. Written by Dave Lorusso, the column will highlight articles of interest to the product safety community. Contributions and suggestions are always welcome.

The following articles were submitted for our review:

- "The Push to Comply with European Safety Standards" was published in the November, 1989 issue of *Evaluation Engineering.* The author, Neil Sclater, discusses the results of his interviews with engineers and managers of American component suppliers. The article focuses on West German test organizations, specifically, Verband Deutscher Electrotechniker (VDE) and Technischer Uberwachungs Verein (TUV). Some pros and cons are described in using VDE and TUV.
- " A primer on International Regulatory Standards", was published in the November, 1989 issue of *Powertechnics Magazine.* The author, Dou Leschak, provides power supply safety design guidelines for creepage and clearance spacings, insulation application, and the flammability of internal and external plastics. Agency follow-up is discussed, including production line testing-
- "Selling in Europe, How to Get VDE Certification", was published in the December 7, 1989 issue of *Machine Design.* The author, Gregg Galluccio describes the Verband Deutscher Electrotechniker, E. V. (VDE) and the certification schemes available. Differences in VDE vs. UL standards are discussed. Steps to aid in obtaining VDE certification are presented. Additionally, factory inspection and EMI/RFI emission requirements are discussed.
- "Power Supplies -Complying with European Standards" was published in the January, 1990 issue of *Evaluation Engineering.* The author, Neil Sclater, discusses compliance with European standards, notable safety and emissions, for switching power supplies. Power supply manufacturers share their views on magnetics used in power supplies, the cost of compliance, emissions, and the commonality of UL, CSA and IEC standards such as: leakage current, creepage distance and dielectric withstand voltages.
- "Engineers Star in UL Variety Show: on the Job" was published in the April 24, 1989 issue of *Electronic Engineering Times.* The author, Terry Costlow, describes the variety and diversity of engineering work at Underwriters Laboratories (UL) Inc. Trends in UL electronics testing and multi- ! agency testing are briefly discussed.
- "DANGER, CAUTION, WARNING-Product Warnings" was published in the December, 1989 issue of *Professional Safety.* The author, A. V. Riswadkar , provides information on adequate warnings and instructions for products. The article discusses the duty to warn, key elements of a warning, and effectiveness of warning.
- "Exposure to Low Frequency Electromagnetic Fields and Cancer Development" was

Continued

Abstracts
Continued

published in the November, 1989 issue of *Professional Safety* Author Daniel H. Anna focuses on extremely low frequency (ELF) radiation. Discussion centers on current research about the effects of ELF exposure.

- "Nine Paths to Effective Warnings" was published in the November 6, 1989 issue of *Design News.* The author, Phillip M. Davis, Esq., discusses guidelines to use when developing and evaluating warnings, labels, packaging, and instructions. The credibility of warnings and the attempt to modify behavior are briefly discussed.
- "More Ways to Build Better Product Labels" was published in the November 20, 1989 issue of *Design News.* The author, Phillip M. Davis, Esq., describes guidelines to apply to a warning and labeling system to adequately educate the user on safe product usage and to satisfy the legal responsibility of the manufacturer

About our new Abstracts Editor:

Dave Lorusso is working as a principal engineer for Codex/ Motorola in Canton, Massachusetts. Dave has responsibility for regulatory compliance of the Codex/Motorola product line. He has a BSEE from Northwestern University and an Associate in Electronic Engineering Technology from Wentworth Institute of Technology. Articles of interest to the product safety community may be sent directly to Dave at the following address:

Codex/Motorola
20 Cabor Boulevard (Cl-20)
Mansfield, MA 02048
Phone: (617) 821- 7609
Fax: (617) 821-4211

[The PSN staff wishes to thank Dave for volunteering his valuable time to assist in this publication -Ed.]

Circuit Breakers: The Myth of Safety
Continued from page 12

some of the tests I have done to simulate accidental electrocution, however, it is my suspicion that currents even as low as 0.01 amperes may sometimes cause fatal electrocutions. Again, third wire grounds work!"

Frederick F. Franklin
Cincinnati, Ohio

The following infonI1ation was received from the author just before going to print:

"At a joint UL, NEMA, and EIA meeting on April 5, 1990, the EIA and NEMA voted to fund UL research efforts in this area. The author was invited to participate in the writing of the test procedure.

After 1-1/2 years of initial research, UL reported that it believes there would be a benefit to using 5X circuit breakers in circuits where they would not nuisance trip. After some months of initial testing, NEMA reported nuisance tripping only by window air conditioners, table saws, and high power microwave ovens."

Frederick F. (Rick) Franklin

Bibliography:

1. Frederick F. Franklin, " A Survey of Electrical Fires," Fire Journal, Volume 78, No.2, March, 1984, Pages 41-44.

Letters to the Editor

EC1992
Dear Sir:
Being the owner of RETLIF TESTING LABORATORIES, an independent EMC testing laboratory and the Chairman of the American Council of Independent Laboratories (ACIL) Government Relations Committee, I reviewed the above referenced article with considerable interest. Clearly we all understand the importance of the "EC1992" and we, in the ACIL, have followed it extremely carefully to detem1ine its overall impact to the U.S. independent testing industry.

I found the article to be quite interesting and as technically correct as one can be covering an issue which is changing almost daily. However, I must take exception to the author's "Plan of Action" item 6, "Get experience with appropriate European certification labs." WHY? Aren't U.S. laboratory good enough to perform this testing? Sure they are! It has nothing to do with capabilities. The fact is the EC refuses to accept U.S. generated test data on regulated goods and refused to "notify" any U.S. laboratories.

It is clear that the Europeans are attempting to control both their marketplace and ours by controlling testing and certification. And it is extremely frustrating when major corporations in this country accept this treatment.

Small manufacturers and laboratories can and will be seriously hurt if this inequity is not corrected. I can assure you that through our efforts at ACIL with the Dept. of Commerce, FCC and USTR we are fighting to protect the interest of small business and the U.S. laboratory industry.

I would assume that the Product Safety Technical Committee shares ACIL's interests in this area since you will note that it is in basic agreement with one of the founding positions of your committee, that being "Understanding the contribution to product safety of the test house.".

Very truly yours,
Walter A. Poggi
Chairman

Circuit Breaker Article
"In rebuttal", if you publish Mr . F. Franklin's article on Circuit Breakers: Circuit breaker manufacturers do not agree with many of Mr. Franklin's test methods, conclusions and comments and have or are addressing them through NEMA.

Donald Fischer
Square D Company

CSA 950/IEC 950
I attempted to order the CSA *9501* IEC 950 and U.L. 1950 comparison article from Richmond office of CSA. It is not available. I was able to order the CSA 950, cost $98.00. This is for your information.

Fred Phillips

Oops on UL 1950 Info
The article titled "UL Modifies 1950 File Review" ("News and Notes," *Product Safety Newsletter,* Jan/Feb 1990) might more accurately have been titled, *"Product Safety Newsletter* Modifies 1950 File Review!"

Many readers were surprised to find out out that "Products now list under the ITE category would have to be reviewed to UL 195(prior to March 15, 1990, or be transferred " Of course this a typo. The effective date of UL 19590 is March 15, 1992-according to reliable sources at UL.

Sincerely,
Paul McDonald
Electro Service Corp.

P.S.-Keep up the good work, the PSN and the monthly meetings continue to be beneficial source of information.

[The editor apologizes for the above oversight. Our readers continue to keep us on our toes-Ed.]

Letters to the Editor

Continued

Another Offer to Help

Thank you for the two copies of the newsletter. It looks very good and satisfies a real need to give product safety and testing experts a forum for communication and swapping information.

I have been appointed as the new chairman for ISA SP82.01. This committee created ANSI/ ISA-S82.01 "Safety Standard for Electrical and Electronic Test, Measuring, Controlling and Related Equipment". Experts such as Richard Nute served on this committee. Additional work will be oriented towards harmonizing with CSA C22.2 No.142 and IEC 1010.

I also chair ISA SP12.4 and NFP A 496 subcommittees dealing with purged and pressurized equipment. My primary expertise is in intrinsically safe and nonincendive equipment for use in flammable atmospheres.

I have had articles published and would be inclined to write on subjects that are related to my business work load or to current committee work. Many of the tests described in safety standards could use supporting instructions to explain the purpose of the test, the equipment (where it can be purchased), precautions when doing tests, how to interpret results, etc.

I hope you do not restrict the newsletter to IEEE members and look forward to the next issues.

Regards,
Richard C. Masek, P .E.
Supervisor, Product Safety
BAILY CONTROLS
COMPANY

[The PSN welcomes all contributions, especially from leaders such as Mr. Masek. Those expressing an interest in contributing to PSN will be contacted by our Technical Articles Editor in the near future.-Ed]

Ask Doctor Z

Continued from page 13

Standard it still might be OK with UL. They must decide to look at it and test it the same way the Standard intended they should, even if it didn't mention how, so you have to know the intentions of the Standard. If the results are pretty much the same as a product with all the "right stuff' then it might be all right.

The key seems to be to get to know the Standard. Contemplate with it, maybe attend yoga classes together. That should make you more flexible, too. But you must be cautious. Like the father of a teen-aged girl you may be asking, "Are your intentions honorable?" And once the two of you are close, you will realize that all the requirements are guidelines instead of requirements.

The rest of the Foreword is a snap. Part A says requirements change, Part B says you'd better follow them if you want Listing, Part E says it's not their fault, and Part F says watch out when you test. And that's about it!

All the best,
Fred

Area Activity Reports

Chicago Chapter
The last meeting was on January 16, 1990. Mitsubishi Electric Sales was gracious enough to allow the use of their facility. Mr. Saul Rosenbaum VP/Research for Leviton Mfg. spoke on FGCIs and related products, including the newly required IDIC.
(Suggestion/Ideas-Contact John Allen.)

The Chicago Chapter is in desperate need of a secretary.Volunteers, please contact John Allen.

John R. Allen, President

Los Angeles Chapter
The last meeting of the Product Safety Technical Committee in Los Angeles was on March 5. Charlie Bayhi of MAI Basic Four Inc. will present the proceedings of the CBEMA meeting of February 27.

The next meeting will be on Monday, April 30 or May 7, at 6:30 pm at Barman Electronics, 8500 Balboa Blvd., Northridge, CA 91325. Martin Quezada of LH Research will discuss IEC 555 and Power Factor Correction.

Those interested in the activities of the Los Angeles chapter should contact Mr. Rolf Burckhardt at (818) 368-2786.

Editor

Portland/Seattle Chapter
Our February meetings were highlighted by a presentation by Jack Lee of the Bonneville Power Administration. Jack is an Environmental Health Specialist overseeing transmission line biological studies since 1974.

Jack's presentation examined the numerous studies that have been made concerning the possible health hazards associated with exposure to power line fields. Jack pointed out that while no concrete evidence has been made to show a hazard, their research continues to cover a broader scope and the new higher power transmission lines. It was interesting to note how using an electric blanket all night gives you twenty times the exposure than watching TV.

Two programs are coming soon that should be interesting to Product Safety members. On Friday, March 23, 1990, Peter Perkins will conduct a one-day seminar on Product Liability and Safety at 290 Smith Memorial Center, Portland State University. Cost is $195.00 including lunch and parking.

Oregon Center for Advanced Technology Education (OCA TE) will sponsor John Whittaker of the University of Alberta talking about "Probability and Public Safety" on Thursday, April 19, 1990, at Oregon Graduate Center.

Want a trip to Washington DC? Provide a paper for 1990 IEEE International Symposium on Electromagnetic Compatibility. Contact John Kneicht at Underwriters Laboratories 708/272-8800.

The Portland Section will have its meeting on Tuesday, March 20 1990, at 7:30 pm at the Portland General Electric building (14655 SW Old Scholls Ferry Road, Beaverton, at the south end of Murray Road). The featured speaker will be Debbie Tinsley, Engineering Team Leader for the Medical and Laboratory Equipment Group at UL. She will explain UL' s new capabilities as a "one stop" testing house. UL can now test to the specifications of CSA, VDE and of course, UL.

For more information, contact Fran Pelinka at (503) 641-1414 or Heber Farnsworth (206) 356-5177.

Al Van Houdt

Santa Clara Valley Chapter
The first meeting of the year was held January 23, 1990, after a break in the chain for December.

Mr. Creg Sato of Underwriters Laboratories reviewed the staus of the File Review for UL1950. After comments from industry, UL has decided to change the File Review and allow presently Listed equipment to remain Listed under the 4th Edition of ULl14 or

Continued

Area Activity Reports

Continued

UL478 instead of being re-evaluated to the new UL1950 standard. There are also some changes in labeling proposed so as to identify the type of equipment standard that the units are Listed under. There is to be another UL Industry meeting in March to discuss the proposed changes to the File Review.

The February 27th meeting main event was a presentation by Mr .Matthias Heinze of TUV on spacings and insulation thickness.

Mr. Heinze reviewed the history of the present require-ments in EN60950. The creepage and clearance values basically came from VDE 110, and insula-tion thickness for transformers came to be based on the electric strength tests from IEC 380 and 435.

He also noted some rules to follow in designing a product:

1. If a transformer is external to the equipment, it will be required to meet the through insulation thicknesses specified in EN60742 for Isolation Transformers. This also applies to Telecom products.
2. For switch mode power supplies, TUV will use the definition of working voltage in VDE 805, part 100 A2, ie., peak voltage, to determine the creepage, clearance, and insulation thickness required.

Mr. Heinze also noted that EN60950 allows the one fuse to protect a product and that it is assumed that there is a 16A branch protector in the hot line; that 230/400 volts is becoming the standard voltage in Europe; that MOVs are not allowed line-to-earth; and use red for emergence switches and lights, only.

For more information about the activities of the Santa Clara Valley chapter, please contact David McChesney at (408) 895-2400 extension 2771 or John Reynolds at (408) 942-4020.

David McChesney

Northeastern Chapter

The most recent meeting of the Northeastern chapter was held on Wednesday, January 24. The CSA liaison report indicated that the NFPA ‘s harmonizing with CSA and CEC would attempt to bring the NEC and CEC into alignment. CSA 950 is now released and includes a telecommunications requirement. UL and CSA are working out the differences between UL 1459 and CSA 0.7.

Bruce Langmuir reported that UL is combining UL standards 1270, 1409, and 1411 into a document referred to as UL 1492. He also reported that UL is reviewing the use of printed wiring board foils to replace the grounding wires to accessory outlets under the requirements of UL 1270.

The technical presentation was by Mr. Larry Rogers of the Quality Management Institute. Mr. Rogers provided a presentation on the implementation of quality systems and QMI’s registration program and reviewed the motiva-tion and justification for the institution of formal quality programs. He noted the cost savings and improved product quality gained through a formal program. To be competitive with Europe, Mr. Rogers noted that it may well be necessary for North American manufacturers to institute such programs.

The calendar provides information about upcoming events. Those interested in the activities of the Northeast chapter should contact Mr. Bill VonAchen at (508) 263-2662.

Editor

Orange County/Southern California Chapter

The February meeting was held in conjunction with the Power Electronics Conference held in Long Beach. The featured speaker was Mr. Josef Kirchdorfer of Weber AG, a manufacturer of circuit breakers, who gave a presentation on Overload and Short Circuit protection.

Continued

SymposiumUpdate
Call For Papers

In order to properly develop our session at the 1990 IEEE International Symposium in August, you may have noticed that we have had several releases of our "Call for Papers."

We now are requesting a submittal of a paper or tutorial which specifically discusses any connection or conflict between electric shock protection and EMC control methods.

Due to the time constraints involved, we have decided to organize a tutorial instead of submitting papers for publication. This means that the review process time can be reduced and the format of the submitted material can be less formal. We feel that this allaws us to be better prepared for the Symposium.

Also, the format of any printed material that is handed out during the Symposium, although technically accurate and well written, will not need the additional polish required of a published paper.

We presently have three submittals in response to our "Call for Papers." These are:

Methods of Protection Against Electric Shock- Thomas Lundtveit, Staff Engineer, Underwriters Laboratories Inc. Provides an overview of various methods of protection against electric shock that can be incorporated into the design of a product. These include grounding, double insulation, shielding, ground fault circuit interrupter, immersion detection circuit interrupter and polarization.

Personnel Protection Devices for Use on Appliances-Robert L. LaRocca, Engineering Group Leader, Underwriters Laboratories Inc. Presents an overview of some devices that have become available to the manufacturers of appliances to reduce the risk of electric shock resulting from insulation failures (ground fault) and accidental immersion. These devices, known generally as personnel protection devices, consist of Ground Fault Circuit Interrupters (GFCI), Appliance Leakage Current Interrupters (ALCI) and Immersion Detection Circuit Interrupters (IDCI).

Derivation of Equipment Grounding Impedance Values -Rich Nute, Safety Engineer, Hewlett Packard. Presents approaches to finding appropriate values for equipment safety grounding and bonding impedances.

In our "Call for Papers" we requested that each paper should mention any connection or conflict between the electric shock protection means discussed and EMC control methods that might be used. After further consideration, it was decided that authors of papers on product safety may not necessarily be as knowledgeable about both electric shock protection means and EMC control methods. Therefore we are requesting submittal of a paper or tutorial which discusses any connections or conflicts between electric shock protection and EMC control methods (for example, leakage current, grounding points, etc.)

Please send any submittal to:
John Knecht
UL, Northbrook
333 Pfingsten Road
Northbrook, Illinois 60062

Area Activity Reports
Continued

The March meeting will provide a discussion of the events involving the CBEMA meeting held February 27 and 28, 1990. The April meeting will feature a presentation by Mr. Martin Quezada of LH Research who will discuss harmonic distortion and power factor correction.

Those interested in the activities of the Orange County/Southern California Chapter should contact Paul Herrick at (714) 770-1223.

Paul Herrick

Guest Editorial

John McBain

Reader Survey Results

This survey has several purposes besides the obvious one of finding out who wants to keep subscribing to the PSN. Some results available now are worth describing.

One of the main purposes of the survey is to establish the proportion of readers who are actually IEEE or EMC Society members. This information was requested by the EMC-S BOD because of their financial backing of the PSTC, which allowed the PSTC to continue publishing and mailing the Product Safety Newsletter during 1989. Although a long-term objective of the PSTC is to become a Technical Council, which means seeking support from other IEEE Societies as well, the EMC-S BOD unilaterally was willing to "start the ball rolling" (or "start the wave-front propagating"?). Their initial sponsorship arose from several technical and non-technical interests in common between the EMC Society and the previously independent Product Safety Society. But serving the interests of EMC Society members remains their highest priority, so they want to know how many PSN readers are members.

Reader Survey results can be summed up roughly as follows. From a mailing list of approximately 1300 names we have had so far about 50% of the surveys returned. This means that we will be cutting the mailing list in half as we start 1990 (remember, if you didn't send in your survey, we warned you!), although we expect it will grow rapidly throughout the year .Of the respondents, about 50% are already IEEE members, and around 50% of IEEE members are also EMC Society members. It is interesting that *Product Safety Newletter* readers include members from at least 27 IEEE Societies, including especially the Reliability, Engineering Management, Industry Applications, and Dielectrics & Electrical Insulation Societies. On the other hand, over 30% of the respondents who are IEEE members do not belong to any Society.

Not being an expert on statistics, I cannot say exactly how significant our results may be. It seems as if interest in product safety is quite widespread within the IEEE and the idea of a Technical Council for Product Safety may have broad appeal. The PSTC still needs some assistance from the EMC Society, but, hopefully, other Societies interested in product safety will become co-sponsors. If some PSN readers are involved with other IEEE Societies, please speak up! I would welcome any com-ments or suggestions from you about presenting our case to your Society's BOD.

Now you may be wondering about the comments we received on the different articles published in the PSN. Rich Pescatore has discussed that more extensively in this issue's "Chairman's Message", but I have a few statistics for you (see below).

Survey Results

Column Name	Favorite	Needs Improvement	Comments (summarized)
Tech Speak	198	9	excellent technical info could be briefer
Or. Z	50	34	need more & better questions. Funny or serious?
News/Notes	49	7	great info but should expand!
General Articles	19	2	good info on specific topics
Area Reports	4	6	must be more timely!
Calendar	0	6	eliminate TBO's!
Chairman's Message	8	3	informal updates
Cartoon	1	1	
Letters to the Editor	2	0	

Continued

Editorial

Roger Volgstadt

"What do you think of when the product is ready to ship and the approvals are not in place? Long nights of testing? Working up your resume? If you do, you know how we feel here as we look for support for our next edition."

For the last year and a half, Tandem Computers Incorporated has very generously provided valuable time and resources needed to make this newsletter a reality. Due to a change in personnel, starting with the next edition, we will no longer have this resource. Consequently, we need support
from those in the San Jose Area who would be able to provide their time to continue this publication. From the comments we have received on the reader survey form, we know that there are literally hundreds in the Product Safety profession who consider this newsletter a very valuable resource. Unless we can find several individuals willing to share the work required to assemble, edit, and publish this newsletter, we may not be able to continue in the present format.

Would you seriously consider contributing perhaps a few hours every other month so that this publication can continue? Training and equipment are available. All we need are several willing hands. Please join us in making a contribution to the Product Safety profession.

Roger Volgstadt
Editor

Guest Editoral

Continued from page 20

Results are somewhat skewed since this chart leaves out the many surveys which said "Everything is great!" or made no comment at all. However, it is pretty easy to see which items are popular and which need improvement. If you would like to make additional comments, let me point out the the Letter column had by far the best ratio between "favorite" and "needs improvement". So write a letter and become part of the best column in the PSN! How's that for statistics?

Unfortunately, several people returned surveys without a name, with a name but no address, or completely blank. The post office forwarded one that had been ripped in half, or, rather, they forwarded half-the half without the name. So there are some people who have diligently sent in their forms and are expecting to receive this newsletter, but they will be dropped from the mailing list. If you know someone like that, don't flaunt your PSN in front of them. Pity their distress and tell them to give me a call on the PSN Subscription Hotline, (408) 447-0738.

News and Notes: "Nothing newsworthy since our last publication? Hardly! But our overwhelmed News Editor needs the support of our readers to make the column a reality. Would you consider sending him information of interest to the product safety community? If just a few of our readers did this once in the next year or two, we would have plenty of material for publication. Please help us keep the safety community informed. Material can be sent directly to Dave Edmonds in care of Xerox Corp., 800 Phillips Road, Mail Stop 843, Webster, New York, 14580. Fax number (716) 422-7841."

Institutional Listings

The Product Safety Technical Committee of the IEEE EMC Society is grateful for the assistance given by the firms listed below and invites applications for Institutional Listings from other firms interested in the product safety field.

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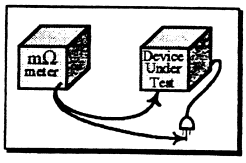

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Calendar

The Product Safety Technical Committee of the IEEE EMC Society

Chicago Chapter Activities

Tuesday, March 20, 1990

Subject: TVSS, Related Products, and an analysis of the UL requirements for such.
Time: 6:30 pm
Location: UL
333 N. Pfingsten Rd.,
Northbrook, ll.,
Contact: John Allen
(708) 827- 7520
John Knecht
(708) 272-8800
(ext. 3416)

Tuesday, May, 22 1990

Topic: TBA
Location: TBA

Los Angeles Chapter

Monday, Apri130, or May 2, 1990

Subject: IEC 555 & Power Factor Correction
Speaker: Mr .Martin Quezada
LH Research
Time: 6:30 pm
Location: Harmon Electronics
8500 Balboa Blvd.
Northridge, CA 91325
Contact: Mr. Rolf Burckhardt
(818) 368-2786

Portland Chapter Activities

Tuesday, March 20, 1990

Subject: Safety & the Canadian Trade Agreement
Speaker: Debbie Tinsley, UL
Time: 7:30 pm
Location: G.E. Co
14655 SW Old Scholls Ferry Road
Beaverton, OR
(at the south end of Murray Road)
Contact: Fran Pelinka
(503) 641-1414

***Tuesday, April* 17, 1990**

Subject: TBD
Speaker: Bob Wearson
Time: 7:30 pm
Location: G.E. Co
14655 SW Old Scholls Ferry Road
Beaverton, OR
(at the south end of Murray Road)
Contact: Fran Pelinka
(503) 641-1414

Seattle Chapter Activities

Wednesday, March 21, 1990

Subject: Safety & the Canadian Trade Agreement
Speaker: Debbie Tinsley, UL
Time: 7:30 pm
Location: Advanced Technology Labs
22100 Bothell Highway SE
Bothell, WA 98041
Contact: Heber Famsworth
(206) 356-5177

Wednesday, Apri118, 1990

Subject: TBD
Speaker: Bob Wearson
Time: 7:30 pm
Location: Advanced Technology Labs
22100 Bothell Highway SE
Bothell, WA 98041
Contact: Heber Famsworth
(206) 356-5177

Northeastern Chapter Activities

Wednesday, March 28,1990

Subject: TBD
Speaker: TBD
Time: 7:00 pm
Location: Sheraton Boxborough, Mass
Routes 111 and 495
Contact: Bill Von Acher (508) 263-2662

Wednesday, Apri125, 1990

Subject: TBD
Speaker: TBD
Time: 7:00 pm
Location: Sheraton Boxborough, Mass
Routes 111 and 495
Contact: Bill Von Acher
(508) 263-2662

Wednesday, May 23, 1990

Subject: TBD
Speaker: TED
Time: 7:00 pm
Location: Sheraton Boxborough, Mass
Routes 111 and 495
Contact: Bill Von Acher
(508) 263-2662

Calendar

Continued

Santa Clara Valley Chapter

Tuesday, March 27,1990

Subject: Ergonomics for Seating
Speaker: J. Howard, America Seating
Time: 7:00pm
Location: Apple Computer 20705 Valley Green Drive Cupertino, CA
Contact: John Reynolds (408) 942-4020

Tuesday, Apri124, 1990

Subject: Circuit Breakers/Let Through Characteristics
Speaker: Rep. from Weber
Time: 7:00 pm
Location: Apple Computer 20705 Valley Green Drive Cupertino, CA
Contact: John Reynolds (408) 942-4020

Tuesday, May 22,1990

Subject: CSA 220/CSA 950 Standards
Speaker: Grant Schmidbauer
Time: 7:00 pm
Location: Apple Computer 20705 Valley Green Drive Cupertino, CA
Contact: John Reynolds (408) 942-4020

Orange County/Southern California

Tuesday, March 6,1990

Subject: CBEMA meeting
Speaker: C. Bayhi
Time: 7:00 pm
Location: MAl Basic Four 14101 Myford Road Tustin, CA
Contact: Paul Herrick (714) 770-1223

Tuesday, April 3, 1990

Subject: HanI1onic Distortion & PF Correction
Speaker: M. Quezada, LH Research
Time: 7:00 pm
Location: MAl Basic Four 14101 Myford Road Tustin, CA
Contact: Paul Herrick (714) 770-1223

Institutional Listings

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