IEEE EMC SOCIETY

The Product Safety Newsletter

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Chairman's Message

1996 International EMC Symposium

Mark your calendars and make plans to attend the 1996 IEEE EMC Society International Symposium to be held in Santa Clara, CA from August 19 to 23.

The theme of the Symposium is “EMC: Silicon to System”, but product safety is included, too. One of the midweek sessions features paper presentations highlighting product safety-related papers. Also, our technical committee, TC-8 (Product Safety), will be sponsoring a workshop on European Union CE Marking issues: "EU and You: Direction for the Road to Compliance.” The focus will be on Telecom, Medical Device, Machinery and Low Voltage Directives. The workshop is scheduled for Friday morning August 23 from 8:30 to 12:00. We will keep you advised of further Symposium developments including details of the TC-8 Annual Meeting.

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The Product Safety Newsletter

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Subscriptions are free and may be obtained by contacting "Subscriptions", below.

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Letters to the Editor

(Kevin Ravo, our Chapter Activities Editor, passed the following letter on to the PSN. It is reproduced here in part with permission from the author-Ed.)

Dear Kevin,

I noticed an item under "News and Notes" [PSN, Vol. 8, No. 5, Nov-Dec, 1995] about Mexican certification that wasn't quite right, so I'm forwarding my comments to you (lucky guy).

The article says that Mexican test labs will accept testing done at other "approval houses" (this expression always galls me). Any accredited Mexican (SINALP) lab is required under the terms of its accreditation to generate its own data (on Mexican soil) and risks losing its accreditation, or worse, if it represents data from another source as its own. The day foreign data is acceptable in Mexico, we'll be shouting it from the roof-tops - but that day has yet to arrive.

Second, the article isn't very clear about who in Mexico can hold a certificate. Only the manufacturer of products made in Mexico, or the legal importer or importers of record of products manufactured elsewhere can hold a certificate. Other entities, Mexican or not, cannot hold NOMs.

Finally, although the Mexican electrical code was published in October of 1994, it didn't go into effect until July of 1995, and then only partially, for basic construction material categories. In general, IT equipment shouldn't be effected by this event.

I know that Erin McLaughlin wrote an article about Mexican approvals some time back. Maybe it's time for another. What are your thoughts? This may be a good chance to remind this distinguished audience of our presence in Mexico ... At any rate, feel free to pass this info on, and tell them that if anyone has any questions, they can certainly give me a call.

Tim Calland
UL, Mexico Office
Phone: 52-5-294-7660 ■

Mark your calendars and make plans to attend the 1996 IEEE EMC Society International Symposium to be held in Santa Clara, CA from August 19 to 23.

Area Activities

by Kevin Ravo
voice: 408-985-2400 ext. 32311
fax: 408-296-3256
email: KRAVO@aol.com

The following is an overview of recent or planned activities for the various Local Groups around the USA. If you have any activities' information that may be of interest to readers, please forward it to the above address and I will try to include it in the next issue.

Santa Clara Valley Chapter

February Meeting:
The social was held at El Torito's followed by the meeting at Applied Materials.

Business items consisted of a discussion of the 1996 EMC Symposium, the MJD Award, and PSTC Elections in May.

The main presentation was Ergonomics in the Workplace by Gary Kress, Ph.D, Human/Machine Systems. Gary discussed various topics related to workplace injury.

Strains and Sprains account for 40% of lost workdays. Ergonomics is the designing of jobs to fit people and addressing hazards associated with activities, not equipment. The traditional focus has been on hardware rather than the operator. In an ergonomic work system, the focus is on the worker.

For more information or questions, contact:

Gary Kress, Ph.D.
457 Hawthorne St.
Monterey, CA. 93940
voice: 408-375-7200

March: HazOps and System Safety - Charles Hoes, Hoes Engineering.
April: Product Safety Hazards and Electromagnetic Fields - Dan Weinberg, Ph. D.
May: Part 6 for Telecom Equipment - Dan Barsotti, UL.
June: CPSC Role and Function - Lee Baxter, CPSC

For additional information contact:
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voice: 408-985-2400
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e-mail: 743141.3433@compuserve.com

Central Texas Chapter

For information, contact:
Vic Baldwin
voice: 512-990-6342
fax:: 512-990-6145

Orange County-Southern California Chapter

February Meeting:

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Technically Speaking

Internet: richn@hpbpq6.bpo.hp,com

MODELS FOR PROTECTION AGAINST INJURY

How does safety work? That is, given a hazardous situation, how do we prevent injury from that situation?

At first, these questions seem far too abstract to even begin to formulate an answer. So, let's consider some real situations, and then form some generalizations.

Consider a pot of boiling water on the stove. Clearly, if we were to touch the pot or the water, we would incur a burn. So, we don't touch the pot, and we don't put a finger in the water.

Consider similar situations where we are careful to avoid the hazardous situation. Consider the process of crossing a street. We avoid crossing in front of a nearby moving car. Consider the Chernobyl nuclear power plant disaster. We avoid getting within 20 miles of that site.

We simply stay away from the hot pot, the boiling water, the moving car, and the radiation-emitting power plant. We interpose distance between us and the hazardous situation. In some cases, that distance is small as in avoiding a burn from a pot of boiling water. In other cases, the distance is large as in avoiding the radiation from Chernobyl.

And, we avoid putting a finger into an empty Edison-base light socket.

So, one means of protection against injury is personal avoidance. Personal avoidance is usually accomplished by putting distance between us and the hazardous situation.

How much distance?

That depends on the nature of the situation. If we are considering the pot of boiling water, then the distance need only be a few inches. If we are considering glass-making, then the distance from the furnace needs to be quite a few feet. In these two cases, the distance can be predicted from the fall-off of heat and temperature with distance.

If we are considering crossing the street, then we do some mental vector analysis of our velocity and

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EMCA
Generic Safety Standard Activity

by Jim Kearns and Gino Lauri

ECMA is a Europe based international association founded in 1961 and dedicated to the standardization of information and communication systems. The work of ECMA has always been recognised as far sighted and reflecting technological trends at an early stage. As a consequence many ECMA Standards have become international and European Standards. To ensure close co-operation ECMA has established formal liaisons with all European and international standardization bodies. Similar to other standards writing organizations, the work of ECMA is carried out by Technical Committees (TC). ECMA TC12 has recently undertaken the task of developing a user friendly "generic" safety standard.

It is the opinion of the members of ECMA TC12 that with the advent of multimedia products the borderline between different classes of products, like IT equipment, audio-video equipment, communication equipment, and the environment within which the equipment is used, has become blurred. This situation has highlighted the fact that existing standards covering single classes of products are occasionally inconsistent and in conflict.

The philosophy being applied in the development of this ECMA standard is to define hazard-based requirements, using engineering principles and taking into account relevant IEC equipment standards, e.g. IEC 65, IEC 950 and IEC pilot documents, e.g. IEC 664 and IEC 1140. Where technical discrepancies between standards emerge, a conclusion will be based on engineering principles, and will be presented to the relevant IEC technical committees for consideration.

The principles of safety and the technical content of IEC 950 and IEC 65 will be used to assist in this development. It is however to be emphasized that the ECMA/TC12 activities do not aim to merge IEC 950 and IEC 65: the goal is to develop a generic standard for electronic equipment which may be used in a domestic and professional environment, and to offer it as the basis for a new IEC standard.

This new ECMA Standard will be hazard-based and the associated requirements will be based on the philosophy of prevention and protection. The following hazards are being considered as basic:

Electrical shock hazard

Electrical shock is due to current passing through the human body. Currents of the order of a milliampere can cause a reaction in persons in good health and may cause indirect danger due to involuntary reaction. Higher currents can have more damaging effects. Voltages up to about 40 V peak, or 60 V d.c., are not generally regarded as dangerous under dry conditions, but parts which have to be touched or handled should be at earth potential or properly insulated.

Mechanical hazard

Mechanical hazards may result from sharp edges, sharp corners, hazardously rotating or otherwise moving mechanical parts and from equipment

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Hi-Pot Leakage Current

(The following is in response to a question raised on the IEEE Product Safety internet discussion group-Ed.)

Hi-Pot leakage current is proportional to measured leakage current.

If you are doing an ac hi-pot test, then the hi-pot current will be proportional to the ac leakage current. If you are doing a dc hi-pot test, then the hi-pot current will be proportional to the dc leakage current.

Specifically:

$$\text{Hi pot I} = \frac{\text{hi-pot test volts}}{\text{leakage I test volts}} \times \text{leakage current}$$

You can also calculate the hi-pot current from the capacitive reactance of all the Y-capacitors in the mains circuit. You will need to add some capacitance to account for the mains-to-ground capacitance of the mains circuits and mains transformer.

The hi-pot trip current must be set at some value greater than the actual current required for the hi-pot test. The value must account for the component and manufacturing tolerances contributing to leakage current (the tolerances of the Y capacitors and the variation in mains-to-ground wiring capacitances).

For example, if the 250-volt leakage current is 2.0 milliamperes, then the hi-pot current for a 1500-volt hi-pot test would be:

$$\text{hi-pot current} = \frac{1500}{250} \times 2.0$$

$$\text{hi-pot current} = 12.0 \text{ milliamperes}$$

You would set your hi-pot trip current at, say, 15 milliamperes to account for component and manufacturing tolerances.

The actual value of the trip current is not important. The purpose of the hi-pot test is to find gross manufacturing errors (which are catastrophic hi-pot failures). I don't believe it is very useful to attempt to use the hi-pot test to discriminate against excessive tolerance buildup in mains-to-ground capacitance.

By the way, there is no published current limit for the hi-pot test, either in standards or certification-house rules. In the "old days," hi-pot testers had no current trip. The only way you could tell a failure (other than hearing the ZAP!) was that the voltmeter would fail to advance to full voltage. Some hi-pot testers also had ammeters, in which case you knew you had a failure when the ammeter needle pinned to the high end of the scale.

Richard Nute ■

Safety Net--News from the Internet

by John Quinlan

This is the first installment of a new column in PSN which will report on safety, EMC and compliance-related discussions and resources which appear on various Internet forums. Ideas for the column content and format are still evolving and will hopefully be shaped by readers' comments. If you have a comment or suggestion for future editions, or a specific Internet subject you would like to see addressed, please contact me at: quinlanj@voicenet.com. For now, the column will track some of the compliance-related topics that have been recently discussed on the Internet, and then selected parts of the dialog for one or two of these topics will be published. The topics will be selected primarily from the emc-pstc list and relevant newsgroups. The dialog will be edited into a question and answer format. The editor reserves the right to edit the material based on available space and relevance to the subject matter. Although selection of topics is necessarily subjective, the number of messages that a topic generates will certainly be part of the criteria.

Perhaps the best way to start the first column is by briefly listing some of the principle Internet resources for safety, EMC and compliance issues. Most of this information has been extracted from an informal EMC/compliance FAQ, authored by Bill Lyons (bill@lyons.demon.co.uk) and periodically posted to the sci.physics.electromag newsgroup.

LISTSERVERS

EMC-PSTC: To subscribe, send a message to majordomo@mail.ieee.org with the following phrase in the message body (brackets omitted): subscribe emc-pstc <your_email_address>

TREG (Telecom Regulatory Electronic Grapevine): to subscribe, send a message with your request in the message body to scott%hpsdde@SDD.HP.COM

NEWSGROUPS

sci.physics.electromag (preferred), sci.electronics.design, sci.electronics.misc

note: an RFD for an unmoderated newsgroup devoted to compliance is circulating, and a CFV should be forthcoming. Mark Zenier (mzenier@netcom.com) and Bill Lyons are the proponents.

WEB SITES

Regulatory Compliance Information Center at http://uc.com/compliance_engineering/

Compliance Engineering Magazine at http://www.ce-mag.com

The IEEE Electromagnetic Compatibility Society at http://www.emclab.umr.edu/ieee_emc/

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Executing Product Safety Functions

[We are grateful to the author for providing a series of condensed installments from his book "Managing Product Safety Activities". This text is a registered copyright of Paul W. Hill & Associates, Inc., and is reproduced with permission. Details about the book may be obtained by calling (407) 368-2538 - Ed.]

The preceding section dealt with the basic activities of a product safety function. This section will deal with establishing the means to execute those functions.

Product safety activities are multi-disciplined in nature, acting in conjunction with several different functions within a company. Such a span of activity requires some means of keeping product safety efforts in perspective and channeled, such as a recognized operating plan, so as to continuously support the product safeness objectives of the business.

When undertaking the installation of an ISO 9000 management system such a document clearly outlining the intent, major objectives, procedures, and tracking of results for the activities of product safety are an absolute necessity.

Importance of a formal plan

The ideal product safety mission statement is a document issued by the senior management of an organization outlining the basic product safeness policy and practices to be followed in the development, manufacture and distribution of the organization's product and services.

Such a statement of intent and purpose is the charter of the product safety effort.

Also, the product safety mission statement becomes a critical element should the safeness of a product become the issue in a litigation action. Under such circumstances, management must convincingly establish that a recognizable process was in place for handling product safeness matters in an orderly and reasonable manner.

In the event of a litigation action, it is essential to dispel any hint that product safeness factors were ignored or received only casual management consideration in the design, manufacture or servicing

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International Product Safety News Safety Link at http://www.safetylink.com/

LANGUAGES REQUIRED BY THE LVD

This issue's highlighted topic pertains to the languages required by the LVD for product documentation and safety markings. The dialog, which was initiated by Doug Henderson (Doug_Henderson@isd.3com.com) on 01/31/96, elicited eight responses. Edited versions of Nick Rouse's (nrouse@fisonssurf.co.uk), Peter Perkin's (p.perkins@ieee.org) and Volker Gasse's (gasse@de.ibm.com) responses appear below.

Doug Henderson poses the question:

With regard to the LVD, is there a list of EU member languages in which product manuals, safety markings, and other documentation must be translated? For example, many of us currently have German passages in our manuals because we have our products licensed by TUV for Germany. What about French, Italian, Greek, and other languages?

Nick Rouse responds:

The languages you mention are just the working languages in which all EU documents, even unofficial working documents, are issued. There are 11 official languages of the EU: Danish, Dutch, English, Finnish, French, German, Greek, Italian, Portuguese, Spanish and Swedish. There is, as far as I know, no official regulation that says that safety warnings in all these languages are necessary or sufficient to enable free marketing throughout the EU. To market a product in a particular European country you must CE mark it for any mandatory directives requiring that mark, and meet all additional safety requirements of that particular country. In the UK, for example, there is a requirement to use English for any warnings necessary for safe operation. There is nothing to stop you from CE marking a product with English-only safety warnings and marketing it only in the UK and Republic of Ireland, if you meet all other specific national safety requirements. National governments are permitted to add specific national safety requirements under Article 9 of the LVD, provided that these are reported to the Commission and other member states, to give them the opportunity to object. You may be able to obtain information about specific national requirements from the Commission. I suspect you will have to produce versions in all 11 languages if you want sell throughout the EU, and you may have to add Norwegian and Icelandic if you want to sell to the full EEA. Most manufacturers resign themselves to the fact that the single market is only a distant ideal, and they or their agents must make accommodations for the local markets.

Peter E. Perkins responds:

The clearest direction regarding languages required for sales into the EU comes from the Machinery Directive, which states:

"The instructions must be drawn up in one of the Community languages by the manufacturer or his authorized representative established in the Community. On being put into service, all machinery must be accompanied by a translation of the instructions in the language or languages of the country in which the machinery is to be used and by the instructions of the original language. This translation must be done either by the manufacturer or his authorized representative established in the Community or by the person introducing the machinery into the language area in question. By

way of derogation from this requirement, the maintenance instructions for use by the specialized personnel employed by the manufacturer or his authorized representative established in the Community may be drawn up in only one of the Community languages understood by that personnel."

Regarding the hazard markings on the equipment, if the company does not want to provide full multilingual markings, an alternative that I have been recommending is to not only copy the hazard markings labels into the manual, but to also have a description of the marking that repeats the wording on the marking. When this is done, the description of the marking will be translated with the manual and the local person will have an explanation of the markings in his language.

Volker Gasse adds:
The requirements described by Peter Perkins are correct for the Machinery Directive 89/392/EEC. For Germany, however, when you have a product complying to the LVD 73/23/EEC amended by the Directive 93/68/EEC, a national A-Deviation to EN 60950 A3:1995 exists. This deviation requires that the maintenance instructions also be translated into the German language (Annex ZC 1.7.14). This is currently in force although it is in contrast to the EU harmonization requirements. Other similar local deviations may exist. ■

Update to "Upcoming Clearances and Creepage Distances for IEC 950"
by Lal Bhara

The article "Upcoming Clearances and Creepage Distances for IEC 950", published in the November-December, 1995 issue of *the Product Safety Newsletter*, was written after the Copenhagen meeting of WG6 in September , 1995. Since then, various comments were received on the document 74/435/CD which was the result of the WG6 of TC74 at Copenhagen. During the last meeting of WG6 in Paris in March, 1996, the national committee comments were reviewed by WG6 and a new document 74/435/CD has been published. For clearances, this document gives two choices to the designer. The first choice is the present clearances as given in the second edition of the IEC 950 including amendments 1, 2, 3 and the forthcoming amendment no. 4.

The second choice will be the clearances as given in the previous document 74/435/CD which will now be contained in the normative annex. The two choices are alternatives to each other and cannot be mixed. Likewise, the present electric strength test in the second edition of IEC 950 stays as it is when clearances in the body of the standard (ie: subclause 2.9) are used. The electric strength test given in the annex should be applied when clearances in the annex are used.

instability.

Heat hazard

Heat hazards may result from high temperatures on surfaces which are accessible to the user, or from short-circuiting of adjacent poles of high current supplies or high capacitance circuits causing arcing or ejection of molten metal resulting in undesirable reactions and/or burns.

Excessive temperatures resulting from overloads, component failure, insulation breakdown, high resistance or loose connections, etc. could cause a fire risk. Moreover, fires originating within the equipment should not spread beyond the immediate vicinity of the source of fire, nor cause damage to the surroundings of the equipment.

Radiation hazard

Radiation hazards may result from functional provisions in the equipment, or from secondary effects resulting from equipment operation. Types of radiation include sonic, radio frequency, infrared, high-intensity visible and coherent light, ultra-violet, laser and other ionising or non-ionising radiation, etc.

Chemical hazard

Chemical hazards may result from contact through inhalation or other physical contact with substances used in the operational process of the equipment, or from excessive temperature causing vapours or fumes from materials or components used in the construction of the equipment.

More information

The publication of the resulting ECMA Standard is expected in August 1997. If you are interested in participating in this work and your company is already a member of ECMA then you should contact the ECMA Secretariat. A list of ECMA member companies can be obtained from the web, see addresses below. If you would like to find out how to join ECMA or learn more about the organization and its work, you can obtain full details either from the ECMA Secretariat or from the ECMA home page on the Web.

The addresses are:

ECMA
114 Rue du Rhone
CH1204 Geneva Switzerland

Fax: +41 22 849.60.01

E-mail:helpdesk@ecma.ch
Web: http://www.ecma.ch
FTP site: FTP.ecma.ch

Jim Kearns is European Product Safety Manager, Apple Computer Limited, Cork, Ireland.
Gino Lauri is Senior Technical Officer, ECMA, Geneva, Switzerland. ■

the moving car velocity. Again, we could predict the distance through vector analysis.

If we are considering the Chernobyl incident, then we can consider high-altitude winds to predict the direction and distance of wind-born fall-out.

If we consider the Edison-base light socket, then the distance can be very small, provided we don't actually touch the metal conductors.

What does this have to do with product safety?

One way in which safety works is by personal avoidance. Individually, we make personal avoidance work by interposing sufficient distance between us and the hazardous situation.

Now, let's consider that we want to pick up the pot of boiling water. To do so, we commonly use a "hot pad" or "mitt" or some thing between our hand and the pot. This "thing" prevents the pot from burning our hand.

Consider also that, in the summer, to avoid sunburn, we anoint our body with a lotion which prevents the hazardous sun rays from reaching the skin.

Or, at Chernobyl, the workers dress in protective clothing that prevents the nuclear energy from reaching the body.

So, another way in which safety works is by personally interposing some device which attenuates or deflects the energy before it reaches the body. For the purposes of this discussion, such devices, e.g., the hot pad, the sunburn-preventing lotion, and the protective clothing are personal safeguards.

A safeguard is a protective device interposed between the hazardous situation and the body. It is a personal safeguard because it is attached to the body.

Individually, we make personal safeguards work by interposing them between us and the hazardous situation.

We have discussed two means of safety, personal avoidance and personal safeguards.

Note the use of the word "personal." Such safeguards are effective only if we know when and how to use them.

In most cases, someone will need to tell us when one is needed, and sometimes how to use it. For the hot-pad, we probably learned from our parents. For the sunburn-preventing lotion, the instructions on the label tell us these things.

Note that for both personal avoidance and personal safeguards, safety is accomplished by interposing something, either distance or a device, between the hazardous situation and the body.

We said that a safeguard is a protective device interposed between the hazardous situation and the body. If we attach that safeguard to the equipment or product, we now have an equipment safeguard.

Note that an equipment safeguard works just as a personal safeguard except that instead of being attached to the body, it is attached to the equipment.

For example, the equipment enclosure commonly provides protection against electric shock. It is interposed between the hazardous situation and the body. But, it is attached to the equipment.

There is a big difference between personal safeguards and equipment safeguards.

A personal safeguard is only effective if the individual chooses to use it, and uses it in accordance with instructions.

On the other hand, equipment safeguards are independent of the person using the equipment. The only caveat is that the safeguard must be sufficiently robust to withstand normal use of the equipment for the lifetime of the equipment. (Sometimes, the safeguard must be sufficiently robust to withstand abnormal use.)

A manufacturer controls equipment safeguards. He cannot control personal safeguards or even personal avoidance.

However, every manufacturer at various times does attempt to invoke personal avoidance and personal safeguards through the use of warnings. A warning is an instruction to either avoid a situation, or to employ a personal safeguard. Therefore, a manufacturer should understand that use of a warning is a poor substitute for an equipment safeguard.

CONCLUSION

I have described three models for protection against injury, personal avoidance, personal safeguard, and equipment safeguard.

Each is used every day by each one of us. Safety is accomplished by interposing a safeguard between the hazardous situation and the body.

An equipment manufacturer cannot control safety by means of personal avoidance or personal safeguards. Therefore, his only avenue for making safe products is to provide equipment safeguards for every hazardous situation.

*****

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 55-53, Cupertino, California 95014-0708.

If you want to discuss this article with your colleagues as well as with the author and editor, e-mail your comments to emc-pstc@ieee.org. ■

Thanks to Mr. Ewald Reichert of TUV Reinland FEMAC for his excellent presentation on the new requirements in Japan as they relate to the S-Mark

For additional information contact:
Ewald Reichert
TUV Rheinland FEMAC
voice: 619-792-2770

March: Same location as usual. Additional program speakers are needed for the rest of the year.

For information or comments, please contact:
Charlie Bayhi
voice: 714-367-0919

Chicago Area Chapter

No activity yet. Any one interested is encouraged to contact: John Allen
voice: 708-238-0188

Colorado Area Chapter

March: Possible Coors Field tour
April: No meeting/activity
May: Tour of Tesla in Colorado Springs
June: No meeting/activity

For information, please contact:
Richard Georgerian
phone: 303-417-7537
fax:: 303-417-7829
e-mail: richardf@exabyte.com

Northeast Area Chapter

March: Meeting at EMC Corp., technical presentations on telecom by Detecon and design of switching power supplies with pfc.
April: Annual NPSS dinner, technical presentation by CPSC.
May: Meeting at EMC Corp., technical presentations by TUV Essen, TUV Product Services and TUV Reinland.
June: Meeting at EMC Corp., technical presentation on PTC's and risk assessment by Weinstein Associates.

For additional information contact:
Dave Lorusso or Cliff Stark
EMC Corp.
171 South Street
Hopkinton, MA 01748
voice: 508-435-1000 x 7518
fax:: 508-435-5067
email: lorusso@emc.com

Pacific Northwest Area Chapter

Still no activity in this area. Anyone interested is encouraged to contact:
Scott Varner
voice: 360-817-5500 (ext. 55613)
fax:: 360-817-6000
e-mail: 47772949@mcimail.com

That is it for this month.

Best Regards,
Kevin Ravo ■

Product Safety Coordination in Engineering Education

One of the most common generalizations I have heard about product and system safety practice is that engineers are provided little, if any, education on the topic in either their undergraduate or graduate work. The emphasis of the engineering curriculum is on basic functionality. It is left up to resident safety experts of their future employers to bring engineers up to speed in safety, reliability, etc. Experience suggests this is both expensive and very wasteful.

There are several ways to address this situation. One path is to provide an improved focus for product safety information for practicing engineers. This is one of our aims in becoming a Product Safety Technical Council. We will provide a function common to all technical councils, transfer of information through technical publications and symposia.

Another path is through alliances with other organizations, both within and outside IEEE. One such opportunity is our formal relationship with the IEEE Environmental Health and Safety Committee, an IEEE Technical Activities Board-level committee. We are helping EHS assess interest in a joint partnership with the National Safety Council and its recently formed
Institute for Safety Through Design (ISTD). The ISTD focuses on improved occupational safety through better design of workplace processes and equipment. One of its key initiatives is engineering education. To further this, it is part of another organization, the Joint Council for the Health, Safety and Environmental Education of Professionals, whose members represent professional societies, academia and professional certification boards. The major focus of this council is reincorporating core ESH principles in formal engineering curricula. In keeping with this goal, a major Joint Council project nearing completion is the publishing of formal guidelines for engineering curricula. If successfully implemented, the guidelines could significantly improve the safety capabilities of engineers graduating in the basic engineering disciplines.

Previous approaches to effective safety education and integration have not been as effective as they could have been. The most expedient solution to this is coordination with other interested groups which bring other perspectives and experience to the collective table. TC-8 and the Product Safety Working Group, with our emphasis on safety in design among other practices, has a lot to offer to these efforts and we can greatly benefit from the perspectives and experience of others.

We are investigating involvement with these organizations, and I believe they offer great potential for advancing both product and non-product EHS practice. I will keep you posted of progress in future Newsletter editions. In the meantime, I would like to hear from you on the issues of improved engineering education and partnering with other organizations. Please contact me as indicated below.

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of the product.

Product safety check list

Before a mission statement for a product safety function can be developed it is necessary to list activities in which one would expect the function to be engaged. The mission statement can then incorporate those activities that are deemed necessary to produce reasonably safe products.

If an audit were made of a well structured product safety organization, the auditor should readily recognize the following activities regardless of the organization's size or structure.

1. Minimum levels of safeness are formally defined and incorporated into product design objectives.

2. Products are fault tested for identification of possible latent safeness faults.

3. Products are certified to comply with recognized industry safety standards.

4. The safeness status of a product is reviewed by senior management prior to release into commerce.

5. There is a mechanism to review engineering changes and supplier modifications to safety sensitive parts and materials.

6. Safety certification is maintained valid throughout the production life of the product, including all field upgrades, new features or accessories and remanufactured product.

7. A formal product recall plan is prepared, tested and ready to implement if necessary.

The more mature product safety organizations might also include internal safety standards to supplement industry standards. Many would participate directly, or sponsor individuals, in safety standards development such as UL's Industry Advisory Groups or IEC Technical Committees and Working Groups. Some would have professional development training in product safeness for product developers, quality assurance and safety engineers. Those with products having contractual obligations to comply with ISO 9000, will become involved in its installation and registration processes.

Establishing product safety objectives

Product safety objectives should define the safety attributes of a product. They should not be ambiguous, lengthily or legalistic, but simply and clearly state the level of safeness management expects to be reflected in the organization's products.

These objectives might be stated as follows:
PRODUCT SAFETY POLICY AND OBJECTIVES

"All products shall be designed and manufactured to comply with the following safeness attributes:

1. Products shall be safe for their intended use and foreseeable misuse associated with the manufacture, operation, servicing and end of life disposal of the product.

2. Examples of the product, representative of units to be marketed, shall be fault tested to detect latent hazards. Observed hazards will be corrected by design, component and material changes or provision be made for appropriate warnings.

3. Products shall be certified to recognized industry safety standards. Evidence of compliance will be authorization from a test and certification agency to display its monogram or logo on the product".

Some elaboration might be in order such as including the company, division or organization name in the title. In item 3 it may be necessary to include internal company safety requirements if they also must be considered.

One might wish to include in the term "products" those units intended for internal use only such as demonstration and training units. Also in this grouping are trade show units, marketing test units and those "not for sale" units consigned to distributors or other situations in which the equipment may not always remain within the manufacturer's strict control.

Translating objectives into requirements.

Once the overall objectives for the safeness of a product have been established it is necessary to transform the objectives into specific design requirements.

This task might be defined as follows:
The Product Safety Manager (or individual responsible for product safety matters) will identify the industry safety standards appropriate to the product. Safety standards shall be identified for each intended marketing area. Product design objectives shall provide for compliance to the requirements of these standards".

The standards referred to would almost certainly include one or more from the following standards generating groups:

a) Underwriters Laboratories (UL), component and equipment standards.

b) Canadian Standards Association (CSA), component and equipment standards.

c) International Electrotechnical Commission (IEC), component and equipment standards.

d) Internal company standards and product safety directives.

e) Regional requirements in marketing areas with special safety requirements such as Japan, Nordic Countries, and others with "national deviations" to safety standards.

f) American National Standards Institute (ANSI) for testing procedures referenced in UL standards.

Additional elements might include internal company safety standards or special situations of end use. Another special requirement is ergonomics if the product is considered to be office work place or work station equipment. Ergonomic standards may be required, particularly for European markets and for ISO 9000 management systems. A widely used ergonomic standard covering office and computing equipment is the German standard ZH 1/618, "Ergonomic Guidelines for Workstations". Various regional standards for video dis-

play devices may also apply.

Product evaluation and testing.

The product safety function must have some means of testing and evaluating products for safeness attributes and the ability to comply with certification requirements. It is not advisable to rely on engineering tests or worst case testing of a product for this information. Engineering evaluations are almost always performance oriented and do not adequately assess safeness attributes of a product.

The safety function need not have elaborate test facilities. Some product safety testing can be combined with or utilize existing product development or component and materials engineering evaluation equipment. However, some safeness testing equipment is unique or specialized and will be necessary for determining the ability of a product to comply with the requirements of safety standards. Dielectric strength, fault current carrying capacity of earth ground circuits, ground current leakage testers, accessibility probes, creepage and clearance measurement capabilities are examples of evaluation tools and equipment not generally found in product development facilities.

It is not desirable to submit products to certification agencies without prior evaluation to compliance requirements. There are several reasons for this:

a) Self certification programs offered by some agencies require extensive test documentation. Without the ability to exercise a product to all the requirements of a safety standard this very desirable means of product certification can not be utilized.

b) Costly redesign to obtain compliance can be reduced. In many cases, indications of safety deficiencies or non-compliance can be found early enough in the product development cycle to be easily corrected.

c) Test agencies do not check each and every item in a standard during certification tests. This can result in a certification oversight that surfaces later as a safety issue in the field.

d) Valuable design feedback information is lost. Certification test reports contain little safeness correction information if test results are recorded simply as pass or fail.

For these reasons it is essential to exercise the product to all certification requirements. The only exceptions being those items which are well documented from suppliers as certified, recognized or approved by agencies such as flammability ratings of materials or component approvals.

Designating required evaluation and testing activities for a product safety operating plan might be stated as follows:

Product representative of units to be marketed shall be evaluated to determine the safeness level of the product and its ability to be certified by a safety testing or regulatory agency. These evaluations shall include:

1. Intended use and foreseeable misuse or abuse.
2. All operator functions, including replenishment of consumables.
3. All service and maintenance functions.
4. Adequacy of instructions, warnings and manuals shipped with the product.
5. Potential hazards and latent safety faults not

likely to be detected by routine manufacturing tests or quality assurance activities".

Additional elements might include designation of the organization responsible for making the evaluations. In items 2, 3 and 4 it might be well to list all instructions and manuals supplied with the product, including installation instructions, set-up and powering-on, permissible adjustments by operators, and the general care and housekeeping chores associated with the equipment.

Product safeness reviews.

In almost every product development effort there is some short fall of the design objectives. Some result from design trade-offs as various engineering problems surface. Others occur due to revisions of performance specifications, revised operating characteristics, or as materials and component changes are introduced during the product development cycle.

Similarly, there can be short falls in the safeness objectives for a product. Revision of design objectives and design trade-offs during the product development cycle often change the safeness level of the final product. It often occurs that fault testing uncovers hazards not considered in the initial design objectives or detected during design and development activities.

In addition, product safety certification may be marginal with one or more parameters barely satisfying the requirements. Such marginal safety parameters can swing the product in an out of certification compliance due to normal manufacturing variability and fluctuations in materials and components from suppliers.

Taken one at a time, these compromises and trade-offs appear acceptable to the individuals making them. However, collectively they represent a body of product safeness uncertainties to senior management and those with a more comprehensive view of safeness risks the business can or can not accept. It is clear that there must be a formal process for determining the acceptability of residual safety risks. The most efficient procedure is a review of the safeness level of the product by a review team, chaired by a member of senior management. The chairperson of the team must report to a level of management having the authority to require corrective actions or to accept the safeness risks on behalf of the business.

The process of reviewing the safeness level of a product before initial release into commerce might be defined in the Product Safety Policy and Objectives statement such as:

Prior to manufacture or distribution of a product a review of its safeness level shall be conducted by a product safeness review group to determine the acceptability of residual risks associated with:

1. Deviations from original design objectives.
2. Results of fault testing.
3. Certification status, particularly marginal levels of compliance.
4. Adequacy of warnings and instructions for the installation, operation and servicing of the product.
5. Adequacy of plans for certification maintenance throughout the production life of the product.
6. Adequacy of procedures for handling safety related field incidents and product recall.

Other issues might also be included such as compliance to internal safety standards or safety directives and manufacturing safety requirements is-

sued by OSHA and EPA. Under item 6, a specific plan or process for satisfying the safety incident reporting requirements of the Consumer Product Safety Commission (CPSC) is advisable, which will be discussed later. For the impact OSHA, EPA and the CPSC may have on product safety matters see the section, "Regulatory Agencies Which Influence Product Design".

Assigning product safety responsibilities.

It is essential that one individual member of management be given responsibility for the safeness of products. To regulatory agencies, litigating parties or consumer groups it must not appear that there is an apparent diffusion of product safeness responsibility. Nor should there be the appearance that one area such as marketing, engineering or manufacturing dominates product safeness considerations.

Good management practice would dictate that responsibility for product safeness not be lower in the organization than the point at which all product safeness influencing inputs come together. From this position in the organization an integrated and balanced picture of the safeness of a product can be made independently from single contributors whose interests may be parochial in nature.

The policy and practices statement might assign responsibility and authority as follows:

AUTHORITY AND RESPONSIBILITY

Authority to establish product safety requirements, determine the acceptability of residual risks, overseeing the implementation of this Policy and Practices Statement, and the delegation of responsibilities for various aspects of product safeness is assigned to (list senior management name and title)".

Model Policy and Practices Statement.

All of the items in this section can be summarized in one brief, clear, unambiguous document. A model of such a document is shown in Appendix A. It may well be all that is necessary to define the role of product safety in an enterprise regardless of size, structure or product marketing regions.

Portions of this section on a Policy and Practices Statement used here and in Appendix A are from the seminar material "Managing Product Safety", by P.W. Hill, 1987 as developed for EMACO, Inc. and is used here with permission.

The next section considers organizing the product safety effort. ■

In the Jan-Mar edition of *the Product Safety Newsletter*, we cited *TUV Rheinland World News* as our source for the summaries "Update on the CE marking and Electrical Components" (page 17) and "What is an SIC Code..." (page 18).

The publisher of this newsletter requested that we note that *TUV Rheinland World News* is a publication of TUV Rheinland of North America, Inc. For information about copies of this publication or about TUV Rheinland of North America, please contact Valerie Mosher at 203-426-0888, ext. 123.

The Editor apologizes for any misunderstanding.

Institutional Listings

We are grateful for the assistance given by these firms and invite application for Institutional Listings from other firms interested in the product safety field. An Institutional Listing recognizes contributions to support publication of the Product Safety Newsletter of the IEEE EMC Society Product Safety Technical Committee. Please direct inquiries to:
Ron Baugh at 503-691-7369 (phone) or 503-691-7568 (fax).

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