The Product Safety Engineering Newsletter

IEEE PSES Product Safety Engineering Society

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What's Inside

President's Message

ISPCE 2012 Conference!

"Socrates sat down and said 'How splendid it would be Agathon, if wisdom was the sort of thing that could flow from the fuller to the emptier of us when we touch each other, like water, which flows through a piece of wool from a fuller cup to an emptier one." (Plato's "Symposium")

PSES is so vibrant! You have just received the special Symposium issue of the Newsletter, and here you receive the "regular" issue of the Newsletter, with some additional outstanding material, articles, and information regarding the activities that are happening in the Society.

Our Annual Conference, the ISPCE 2012, is around the corner and the Committee, chaired by Anna Klostermann and her outstanding and energetic team, have excelled and exceeded all that you have been accustomed to in previous years.

New initiatives, more papers, more topics, more exhibitors, an outstanding keynote speaker, and—an opportunity to network, communicate and…drink together. (Did you know that the word "Symposium" in Greek actually does mean "drinking together"? (See the quotation above from Plato.)

Whatever your reason, whatever your interests, I hope to see you all in the beautiful city of Portland in early November.

Member vs. Membership…

"*The man who follows the crowd will usually get no further than the crowd. The man who walks alone is likely to find himself in places no one has."*

One of the "buzz words" floating around for quite a while is that "society membership must grow." Inasmuch as this is probably correct, let me contemplate on the word. What do we mean by membership? Look at the photo on the bottom left. Who is the individual? What you see on the

The
Product Safety Engineering Newsletter

Newsletter Committee

Officers of the IEEE PSES

IEEE PSES Web Sites

http://www.ieee-pses.org/
http://psessymposium.org/
http://product-compliance.oc.ieee.org/
http://www.ieee-pses.org/emc-pstc.html
http://www.ieee-pses.org/newsletters.html
http://www.ieee-pses.org/pses.html

left is "**membership,**" but not the "**member**!"

Indeed, IEEE membership has grown, and—gladly—I say that thanks to the efforts of many, PSES membership is growing as well. But what does that mean? If we look at you, the individual member, as part of a crowd, we can no longer serve YOU the individual; we only see the crowd!

Source: IEEE Membership Presentation 11.17.11

I am sure that the point is clear: when we focus on "membership" the "member" gets lost in the crowd, while, if we focus on the "member," he can get **I**nspired, **E**nabled, **E**mpowered and **E**ngaged. (What did you get? IEEE!)

PSES membership grew dramatically in 2010. We plan on future membership growth in the 3–5 percent range. We continue to assess the total market for product safety engineering related membership, and believe that the global market is substantially higher. Chapters being formed globally have the potential for hundreds of members. This is why we believe that the Society must continue to focus on providing value for members as well as expanding PSES globally in order to increase our membership.

The membership committee believes that there are five main steps in the lifecycle of memberships and it begins with **AWARENESS**. Increased awareness facilitates new member **RECRUITMENT**. **ENGAGEMENT** strengthens member ties and improves **RENEWAL** rates. **REINSTATEMENT** of former members completes the cycle.

We are actively implementing the above philosophy to all facets of our membership development approaches. **Focusing on individual members one at a time will be our mission during the next several years**. By empowering local Chapters to provide value to members in order to grow the society, we have no doubt that PSES will succeed in the long run.

"Patience, persistence and perspiration make an unbeatable combination for success." (quoted from Napoleon Hill)

Specifically, as of 2011 our efforts are as follows:

Focus on member support;

Build solid chapters with regular meetings, providing a forum for discussion on a wide range of timely topics;

Build leadership at every chapter;

Provide support for presentations and other activities;

Aggressively promote benefits from annual conference attendance;

Collaborate with other societies, especially to support joint chapters and activities;

Provide a monthly package of conference information, technical committee and society news to all chapters, and other interested societies/organizations;

Expand LinkedIn Technical Community;

Provide board support to building individual chapters.

An example of the proactive approach executed by the PSES is that of the study of the distribution of PSES members globally. Based on the IEEE data base, the members were "mapped" and locations for formation of potential chapters (PSES-only or joint chapters) were thus identified. We believe that chapters form the core of member and membership development and therefore the emphasis on chapter development.

The following are examples of the maps created

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Chapter Safety Probes

To see current chapter information please go to the chapter page at: http://www.ieee-pses.org/Chapters/index.html

People Looking To Start Chapters

Dallas Texas

Jonathan Jordan
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Denver Colorodo

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China

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Japan

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Ohio

Jim Bacher
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Argentina

Silvia Diaz Monnier
silviadm@inti.gob.ar

Central Texas
Meeting Date: 9/18/2012

Topic: "Drinking water: What is it really and how safe is it?"

Speaker: Dale Ritzen, Quality Manager, Austin Manufacturing Services

Meeting opened with general announcements concerning upcoming meeting topics, the CTPSES website and LinkedIn access, the 2012 and 2013 Product Safety Symposium (in Austin) as well as other regular business. After the announcements, Dale Ritzen, Quality Manager at Austin Manufacturing Services, was introduced. Dale's topic covered the regulatory requirements for drinking water - both tap and bottled, as well as examples of various problems with drinking water in both formats. After Dale's presentation several questions were asked about specific areas of interest in this topic and a short discussion followed.

Portland
Meeting Date: Tuesday 18th Sept, 2012
6:30pm networking and refreshments, 7pm meeting
Intertek conference room
Intertek Testing Services
22887 NE Townsend Way
Fairview, OR 97024 (Google or GPS your way there, if needed)

Topic: Anomalies in Product Safety; a different view

Speaker: Rich Nute, our internationally known local guy

Abstract: From Rich's vast experience he took the group on a tour of issues that arise in product assessment according to the standards which don't always seem to make sense all the time; a bit of PS101. For instance, what are the key variables in dealing with burns from hot surfaces?

Standards usually specify a max temperature, is that adequate under all circumstances. What are the key variables in dealing with an energy hazard?

Or do spacings always insure adequate isolation in the face of an applied voltage? These questions are not product or standard specific but apply in a myriad of situations. Join us for this interesting evening working to wrap your mind around all of this; come and broaden your understanding in these fundamental ideas.

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News and Notes

Call for Articles

PSES is planning to bring out next issue (Winter 2012) of its eNewsletter in December 2012 and would like to invite news, articles, reports etc. to share amongst the members of PSES all across IEEE. You are requested to contribute.

All PSES chapters and TACs are also requested to send reports on the activities/events organized by their respective chapters/committees. This will help our readers and other IEEE volunteers to appreciate your initiative and understand the benefits of organizing such activities. You can also include a link to your chapter website for a more detail report. Please send your contributions in MS WORD and digital images in jpeg format to dan.roman@ieee.org.

Please send the contributions by 15th December 2012.

IEEE Consumer Electronics Magazine

General Call for Papers

The IEEE Consumer Electronics Society launched its flagship society magazine during the first quarter of 2012. The magazine is published on a quarterly basis and over the past 18 months has featured a range of topical content on state-of-art consumer electronics systems, services and devices and associated technologies.

There is a running call for new articles on Engineering topics of relevance to CE.

Articles should be broadly scoped – typically review and tutorial articles are particularly suited to the Magazine.

Technical articles may be suitable but these should be of general interest to an engineering audience and *of broader scope than regular technical papers*.

Some example fields of interest include:

Digital Broadcast & HDTV	Smart-Grid & CE	Displays for CE
Interactive & Immersive TV	Home Networks & Services	Storage & Digital Media
Smart Imaging & Cameras	Audio Systems & Technologies	CE & Digital Content Issues
Mobile Devices	Security & Rights Management	Device Interconnects
Digital Video Processing & Codecs	HCI & User Interface	Haptics & Multi-Touch
3D Imaging & Display	Wireless & RF in CE	CE Image & Signal Processing
Home Healthcare	New & Emerging Technologies	Gaming Devices & Systems
Social & Economic Impacts of CE	Wireless Sensor Networks in CE	CE & Cloud Computing

Articles related to the background story behind engineering standards or practical experiences in product specification and design are particularly welcome. Tutorials on CE related technologies or techniques are also encouraged.

The Magazine will also feature regular sections devoted to standards, patents & IP matters, security & digital content, device tear-downs and reviews of books and engineering software & design tools. If you are interested in contributing please contact the editor at cesmagazine@gmail.com for feedback and to discuss the suitability of your ideas for an article.

Articles should be submitted to: http://mc.manuscriptcentral.com/cemag by mid-November for the Spring issue; mid-February for the Summer issue; or mid-May for the Fall issue to allow time for peer review.

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Acceptance of Validated Symbols

Acceptance of Validated Symbols by Certification Agencies

by Lal Bahra

IEC (International Electrotechnical Commission) and ISO (International Organization for Standardization) have helped the manufacturing industry by creating symbols and publishing them in the form of their respective standards. The most well known and widely used standards are as follows.

IEC 60417, *Graphical symbols for use on equipment*
There is no longer a paper edition of this standard. The last paper edition was the 3rd edition, and it was withdrawn on October 22, 2002 (all parts). It has been replaced by the IEC database for symbols and has been published in a database format since October 2002 at http://www.graphical-symbols.info/equipment. Since then, the database publication of IEC 60417 Edition 1 has been in continuous maintenance.

Snapshot versions of the IEC database used to be available for purchase. Starting this year, IEC has stopped that practice. Now you can purchase a yearly subscription to the database and renew it every year. You can also download a snapshot of the database if you have paid subscription to the database.

IEC/ISO database for Graphical symbols
This database contains a complete set of symbols for use on equipment that are included in IEC 60417 and ISO 7000. IEC permits subscription to the combined database or just the IEC 60417 database. These are available for purchase from the IEC web store at http://webstore.iec.ch/webstore/webstore.nsf/$$search?openform.

ISO 7000 is available free of charge at the ISO web store. You have to create your ID and password and then order the standard at http://www.iso.org/iso/store.htm.

ISO 3864, *Graphical symbols — Safety colours and safety signs*
ISO 3864 consists of the following parts, under the general title *Graphical symbols — Safety colours and safety signs*:

– ***Part 1: Design principles for safety signs and safety markings***
This part of ISO 3864 covers the design principles for designing symbols and signs for use in work places and public areas for preventing accidents. It also addresses the colour scheme (safety identification colours); meaning of geometric shapes for various types of symbols (for example, circle, square or rectangle and triangular shaped symbols); etc.

– ***Part 2: Design principles for product safety labels***
This part of ISO 3864 covers the meaning of colours on hazard severity panels; single safety sign for a product; the text panel; combination product safety labels; etc. for use on products.

– ***Part 3: Design principles for graphical symbols for use in safety signs***
This part of ISO 3864 covers criteria and guidance for the design of graphical symbols for use in safety signs.

– ***Part 4: Colorimetric and photometric properties of safety sign materials***
This part of ISO 3864 covers the colorimetric and photometric requirements and test methods for the colours of safety signs.

IEC TR 69878, *Graphical symbols for electrical equipment in medical practice*
As the name implies, it covers symbols used for medical equipment (many from IEC 60417).

IEC 60617, *Graphical symbols for diagrams* (available as a database of some 1750 symbols)
As the name implies, it covers symbols that are used on electrotechnical diagrams or schematic diagrams. This is available for purchase at the IEC web store.

IEC 60027-1, *Letters symbols to be used in electrical technology - Part 1: General*
It is for letter type symbols. IEC60027 series has

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-1, -2, -3, -4, -6, and -7 standards.

IEC 60073, *Basic and safety principles for man-machine interface, marking and identification – Coding principles for indicators and actuators*

This establishes general rules for assigning particular meanings to certain visual, acoustic and tactile indications.

ISO 7000, *Graphical symbols for use on equipment*

It provides a collection of those graphical symbols which are placed on equipment or parts of equipment of any kind in order to instruct the person(s) using the equipment as to its operation.

IEC 80416-1, *Basic principles for graphical symbols for use on equipment--Part 1: Creation of graphical symbols for registration*

This part of IEC 80416 provides basic principles and guidelines for the creation of graphical symbols intended for registration in an IEC or ISO database, and provides the key principles and rules for the preparation of title, description and note(s).

ISO 80416-2, *Basic principles for graphical symbols for use on equipment – Part 2: Form and use of arrows*

This part lays down the basic principles and the proportions for arrows used to indicate various elements, forces, functions or dimensions. The arrows defined in ISO 80416-2 are used as graphical symbols or graphical symbol elements.

IEC 80416-3, *Basic principles for graphical symbols for use on equipment -- Part 3: Guidelines for the application of graphical symbols*

This part of IEC 80416 provides guidelines for the application of graphical symbols for use on equipment in order to maintain visual clarity and overall consistency when such graphical symbols are applied. It stipulates the permissible extent by which a symbol original may be modified in reproduction for actual use on equipment

ISO 80416-4, *Basic principles for graphical symbols for use on equipment -- Part 4: Guidelines for the adaptation of graphical symbols for use on screens and displays (icons)*

This part of ISO 80416 provides guidelines for the adaptation of graphical symbols for use on screens and displays (icons) on a wide range of equipment, such as electrotechnical equipment, photocopiers, vehicle dashboards and home appliances. It also provides principles for maintaining the fidelity of icons to the original graphical symbols.

ISO/IEC 13251, *Collection of graphical symbols for office equipment*

This standard provides a collection of graphical symbols which are used typically on office equipment to aid in the user operation of, for example, personal computers, printers, telephones, and copying machines.

Technical subcommittee SC3C for IEC 60417

SC3C is responsible for IEC 60417 and many other symbol standards. When a new symbol is proposed to SC3C, the proposal is reviewed and distributed to the National Committees (NCs) participating in SC3C and other Technical Committees (TCs) which are on the liaison list of SC3C for their review and acceptance. If there are no objections, SC3C then proceeds to validate the symbol. Once the symbol is validated, the secretary of the SC3C adds the validated symbol to the IEC database. If there are negative comments to the proposed symbol, the comments are discussed via e-mail or at the next meeting of SC3C, which meets two to three times a year. If the comments are not resolved, the document then goes through the DC, CD, CDV and FDIS cycle before it gets accepted and validated.

It is a general understanding that once the symbols are validated by SC3C, they can be used on products. The requirements stated in the product standards for the use of the symbols still apply. These are usually as follows:

a) The product standard may require a specific symbol, or the product standard may contain a published National Difference that modifies the IEC requirement; and

b) Any symbol (especially new symbols) also must be reproduced and adequately explained in the safety instructions.

The usual assumption that certification agencies

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should accept the validated symbols is not true. IEC standards are not mandatory and therefore, the certification agencies are not obliged to accept them. That is why the end product standards need to make appropriate statements that the symbols used on the equipment must be in accordance with IEC 60417, ISO 7000 and other IEC standards. A manufacturer must be allowed to use symbols that are in the IEC/ISO data base as long as there is no conflict with the requirements of the product standard. Certification agencies need to have access to IEC/ISO databases for symbols to find out if the symbols in question are in the database. A manufacturer should provide the appropriate information to the certification agencies and discuss with them to learn their requirements for acceptance of validated symbols.

The validated symbols become part of the IEC symbols database within 24 hours after they become validated. The only way to buy the next edition is to subscribe to the database. The alternative of buying a snapshot version is no longer available at the IEC web store. http://webstore.iec.ch/webstore/webstore.nsf/mysearchajax?Openform&key=60417&sorting=&start=1&onglet=1 You may request the certification agency to check the database by subscribing to the IEC/ISO symbols database.

Reference to symbol standards in product standards

IEC 60950-1, subclause 1.7.1 states the following:

"Where symbols are used, they shall conform to ISO 7000 or IEC 60417 where appropriate symbols exist".

Although this statement is made only in the sub-clause in 1.7.1 for power rating, there are numerous other references to IEC 60417 in IEC 60950-1. In practice the allowance of IEC 60417 has been given wider applicability.

IEC 60065, clause 5 states the following:

"Graphical symbols shall be in accordance with IEC 60417 and ISO 7000, as appropriate."

Likewise, IEC 62368-1, F.2.2 for Graphical symbols states definitively and broadly:

"Graphical symbols shall be in accordance with IEC 60417 or ISO 3864-2 or ISO 7000. In the absence of suitable symbols in IEC 60417 or ISO 3864-2 or ISO 7000, the manufacturer may design specific graphical symbols."

Also, Table F.1 – Instructional safeguard element description and examples (IEC62368-1) clearly states,

"The symbol for elements 1a and 1b shall be from IEC 60417, or ISO 3864-2, or ISO 7000, or Equivalent".

Additionally, there are multiple other references to specific IEC 60417 symbols throughout the standard.

In view of the above, new symbols should be considered to meet the intent of product standards such as 60065, 60950-1 and 62368-1 when they are added to the IEC 60417/ISO7000 Database. Definitely, the application of the validated symbols, especially the new ones, must not conflict with any of the other provisions of the product standards, in particular if the published product standard references a specific symbol, or if there is a published National Difference that modifies the IEC requirement. Of course any symbols (especially new symbols) also must be reproduced and adequately explained in the user instructions.

In practice, a determination is needed to confirm that the published new symbol is compatible with the specific application of product standard to a particular construction/product. Therefore, as presently done, acceptance of specific new symbols to address a particular hazard or condition needs to be a part of the overall product investigation process.

Why are new symbols needed?

Instructions and warnings should be in the local language of the country where the product is going to be used and the safety standards reflect this as a requirement. All marked warnings and instructions must be in the language. It is very difficult if not impossible to put such instructions on the product in all the required languages if the manufacturer is making a global product. The triangle symbol with exclamation mark or sign has been used to draw attention to the manual where instructions are provided but for warnings and cautionary statements, the triangle symbol is combined with the actual symbol for the hazard that you are trying to make the user aware of. Some examples are as follows (usually it is permitted to combine the symbols):

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Reserved for warning (Figure 3 of ISO 3684-1). Triangle (may be with yellow background) indicates that it is a warning or caution.

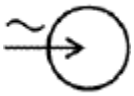
ISO7000-0434 (A or B) Exclamation mark or sign inside a triangle indicates to read the warning in the manual

ISO7000-0419 with an "i" for instruction: Book symbol with an "i" inside draws attention to non-safety instructions.

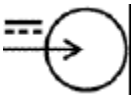
Combination symbol made from the above symbols: Book symbol with triangle symbol and "i" inside draws attention to safety instructions The translations then can be produced in the user's manual.

Some specific examples of newly validated symbols and problems that you may face

Recently some countries wanted the wording placed on the label, for example "input rating," next to the actual marked input rating. It is extremely difficult to add all the translations on the product label. Likewise, the wording "output rating" was required to be next to the output rating. Therefore, the symbols below were proposed to SC3C to be added to IEC/ISO 60417/7000 databases. These were validated and added to the IEC/ISO database.

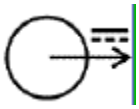


(IEC 60417-6045) To indicate an a.c. rated power input



(IEC 60417-6046) To indicate a d.c. rated power input

(IEC 60417-6047) To indicate an a.c. rated power output



(IEC 60417-6048) To indicate a d.c. rated power output

Even though the symbols become part of the database, some certification agencies may still not accept them. Their reason can be just that these symbols are not in IEC 60417; or the symbols are not in the end product standard. Manufacturers need to discuss such issues with the certification agencies and ask them as to how the certification agencies will accept them. Usually a compromise with the certification agencies can be reached when additional requirements specified by the certification agencies are implemented.

Other newly validated symbols

Many other symbols newly added to the database serve a similar purpose: to use less room on the already packed label. Some of the important ones for the IT industry are given below.

(IEC 60417-6056) To indicate the instructional safeguard to keep away from moving fan blades

(IEC 60417-6057) To indicate the instructional safeguard to keep away from moving parts

(IEC 60417-6044) To indicate that listening at high volume levels for long periods should be avoided in order to prevent possible hearing damage

(IEC 60417-6043) To indicate that the marked item contains sharp edges and should not be touched without taking care

(IEC 60417-6069) To indicate that the marked source is a very bright light and not to watch the high level beam

…and many more.

Another example of a newly validated symbol

Some small products such as brick-type power supplies or direct plug-in units are provided with double insulation construction throughout and functional earth for EMC purposes. The internal functional earth conductor is relatively small as it is not supposed to carry any fault current because it is double insulated from all hazardous voltage parts. Many times, a series resistor is also provided between input earth and the output dc.

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This construction does not pass the bond impedance test (usually conducted at 25 A to 40 A. Some countries (for example Australia, New Zealand, United kingdom and Germany) have requirement for Portable Appliance Testing (PAT) before the equipment can be used and then again on a periodic basis. In Australia and New Zealand, the standard for PAT testing is AUS/NZ 3760. Such tested products are provided with a tag indicating the date the PAT testing was done and the date when the next PAT testing is due. The procedure followed by the tester/tagger is to first check the continuity of earth from input earth blade to the DC output and if it shows continuity then the product is subjected to the bond impedance test at a much higher current. The functional earth conductor is not for safety and is of a very small size as it is not supposed to carry any fault current and therefore, may open under this higher current test and the units will be declared as unacceptable.

There was a need to indicate that these units are double insulated and have functional earth only so that testers/taggers do not conduct the bond impedance at a higher current. Australian committee responsible for AUS3760 accepted that such units can be marked with functional earth symbol  (IEC 60417-5018) and the symbol and the complete explanation can be provided in the safety instructions. Annex A explains that no bond impedance test shall be conducted on products marked with functional earth symbol and a higher electric strength test for double insulation may be conducted. This proved to be a quite reasonable approach. It was suggested that this matter should be discussed in the committee responsible for small power supplies.

 TC108 of IEC which writes IEC 60950-1 and IEC 60065 is responsible for ITE (Information Technology Equipment), including small power supplies for use with ITE. It was discussed and agreed that a symbol that truly represents the double insulation construction and functional earth needs to be developed. The symbol proposed for this was the functional earth symbol inside a double square.

SC3C reviewed this and sent it for an eight week comment period to national committees (NCs). There was no objection from any of the NCs, and therefore the symbol was validated and added to the IEC/ISO database. But a couple of certification agencies refused to accept this symbol; their reason was that the symbol was not in the standard for the small power supplies under discussion.

There are more than 10,000 symbols in the IEC/ISO data base and it is nearly impossible to import all symbols into the product standards. TC108 has agreed to add a statement to its standard that IEC/ISO symbols are considered to be acceptable as long as they are used according to the rules given in the standard.

TC 108 agreed to call such equipment class II (provided with double insulation construction and functional earth) in accordance with IEC 61140.

Class II equipment with a two conductor power cord (without functional earth) is required to be marked with symbol IEC 60417-5172:

Class II equipment with a three conductor power cord (provided with double insulation construction and functional earth) may be marked with symbol IEC 60417-5018:

or symbol IEC 60417-6092:

The UK has Portable Appliance Testing (PAT) requirements (IEE code of practice for PAT testing) as well. Similar issues were seen in the UK. The new approach will help UK testers/taggers (qualified persons designated by the equipment owner to test and tag the equipment with the date when the equipment was tested; and the next due date for tests) to accept such class II equipment with double insulation construction and functional

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earth when identified with the symbol IEC 60417-5018:

or the symbol IEC 60417-6092:

The wording in the product standards needs to be strengthened when reference to IEC/ISO symbol standards or database is made. The text needs to clearly say that the use of such symbols is considered acceptable as long as they are used in accordance with the requirements of the end product standards (for example, inclusion of the symbol and its explanation and any other precautions in the safety instructions).

Symbols that went through the full IEC development process:

Following are examples of symbols that received negative comments from a NC. They have to go through the regular IEC approval process (go through DC (document for comments); CD (committee document); CDV (committee document for vote); FDIS (final draft international standard); and IS (international standard) after the symbol number gets assigned.

IEC 60417-6049: Country of manufacture

To identify the country of manufacture of products. In the application of this symbol, the “CC” shall be replaced by the two letter country code defined in ISO 3166-1.

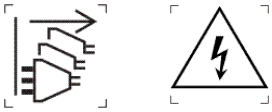
Name of manufacturer and date of manufacture may be added adjacent to this symbol.

Note The graphical symbol element used as an outer shape is modified from ISO 7000- 2497.

IEC 60417-6050: Model number or type number

To identify the model number or type number of a product. In the application of this symbol, the model number or type number of the product should be accompanied with this symbol. Model or type number will follow the # symbol.

IEC 60417-6172: Disconnection, all power plugs, published 2012-9-15



To provide instruction that to avoid shock hazard, all power sources shall be disconnected before servicing.

Another symbol that was proposed to eliminate marking of text

Another symbol that was proposed to SC3C and is going through the validation process is described below.

Symbol for connection of Protective Earthing (PE) before connecting supply

Many standards cover equipment which has high touch (leakage) current. The following or equivalent marking is required on the product near the supply connection point:

“High touch current, Earth connection essential before connecting supply”

The following symbol was proposed to replace the text and is going through the validation process.

Connection, protective conductor (PE). To provide instruction that the protective conductor (PE) should be connected first to main protective earthing terminal before connecting the line and neutral to avoid shock hazard, and that a PE connection to the main PE terminal is essential before connecting the mains to avoid electric shock.

In the application of this symbol, IEC 60417-6042 and IEC 60417-5019 shall be used in conjunction with this symbol. The result is the combination of symbols given below.

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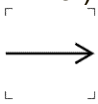
The following symbol IEC 60417-5022 indicates movement in one direction (and this is combined with PE to indicate connect to protective earthing terminal)



Conclusion

IEC and ISO have a development process for new symbols. The new symbols are added to the IEC/ISO database on a regular basis after proper approval by the national committees. Symbols are a crucial part of manufactured products. They must be used in accordance with the requirements given in the product standards and the symbol standards.

Lal Bahra, P. Eng., works as a senior regulatory engineer at Dell Inc. These materials are not offered as and do not constitute legal advice or opinions. Seek independent legal advice with respect to compliance or any particular issue. The content of this document reflects the opinions of the author and may not reflect the opinions of Dell Inc.

TAC News

Forensics and Failure Analysis

The FFATC LinkedIn group has reached over 750 members! This online forum is a great place for failure analysis investigators to join and have discussions concerning failure analysis of new and mature components and circuits, rare failure modes not commonly seen in any given product line, and tools and techniques used, to name a few topics.

The leadership group of the FFATC is looking for interested and dedicated persons to join this leadership group to augment our efforts to grow the contributions and importance of this committee to the field of quality failure analysis and its ability to feedback findings to the improvement of electrical and electronic product safety. If you are interested in helping lead this effort, please join the LinkedIn group "Forensics and Failure Analysis" and contact Daren Slee.
http://ewh.ieee.org/cmte/pses/ffat/

ITE Product Safety

The 15 members of the Technical Committee for ITE continues to meet each month via teleconference (Mondays, 3PM CST). We discuss various topics of interest to IT products and safety especially the technical details of the new safety standard, IEC 62368.

Telecom Safety

Current topics being discussed at the monthly meeting include:

- Falling Remote Radio Heads
- TC-108 National Committee activity
- New Telcordia GR-3171-CORE, Issue, Generic Requirements for Network Elements Used in Wireless Networks Physical Layer Criteria. Review draft.
- TSTC Proposal for IEC 60950-22– Battery Cabinet Ventilation - Submitted to US TAG. Telcordia is interested in adding the provisions of our proposal to the next edition of GR-487-CORE.
- Smart grid issues
- 380Vdc power systems
- Solar panel integration
- IEC 62368-1 and its impact on the telecom industry.
- AC Power Cross Considerations for Non-Telecom Signaling Lines (e.g. Ethernet, Alarms) Run in Outside Plant
- IEC 62368 and MOV requirements

Guarding Emergency Stop Faults

Editor's note—This is the third in a series of articles reprinted through the courtesy of Doug Nix from postings on the Machinery Safety 101 blog (http://machinerysafety101.com).

Guarding Emergency Stop Devices
by Doug Nix

Much confusion exists when it comes to Emergency Stop systems, and clients often ask me if it is "OK" to guard emergency stop devices like e-stop buttons, foot pedals, pull-cords, etc. Without getting into a ton of regulatory details, this article will look at the requirements in for emergency stop devices in three key jurisdictions: Canada, the U.S. and the European Union.

If you need information on the functional aspects of emergency stop systems, see "Emergency Stop - What's so confusing about that?"

Why Guard an Emergency Stop?

Generally, emergency stop devices, or e-stop devices as they're often called, need to be protected from unintentional use. This problem occurs because in order to be useful, e-stop devices have to be located close to where people work. An e-stop you can't reach when you need it may as well not be there in the first place. So emergency stops are located at "normal operator stations." This often means they are located under the edge of a machine table, or on an operator control bar like that used on power presses, putting the e-stop within reach, but also in the "line-of-fire" when it comes to the operator's normal movements.

To prevent unintended operation, people often want to put rings, collars, or worse—covers on or around e-stop devices to keep people from bumping them. Some of these can be done and should be done, and others are for good reason never permitted.

Regulatory Requirements

Let's take a look at the key requirements from the regulations world wide:

1. Emergency Stop devices must be clearly identified. The technical standards require that emergency stop devices be colored RED with a YELLOW background. [1]

2. They must be located within easy reach of the operator. This applies to all normal workstations where operators interact with the machine. For maintenance and service activities where workers may be in locations other than normal workstations, a pendant or other portable control must be used to cause machine motion. This device must include an emergency stop control along with other complementary safeguarding devices such as enabling devices and hold-to-run controls. This is not required where access is only allowed under lockout conditions. [2], [3]

3. Buttons must be palm or mushroom-shaped devices.

4. Devices must require manual resetting. This means that the device must latch in the operated position and require a deliberate action to reset the device. This includes actions such as: pulling put a pressed button, twisting a button to release the latched condition, pressing a reset button on a pull-cord to reset the tripped condition, etc. [1]

5. Unguarded: This means that easy access to the device may not be impeded, considering the personal protective equipment (PPE) that workers are required to wear. Devices that would be considered to be guards would include:

    a) Close fitting rings or collars that require a worker to insert a finger inside the ring or collar to reach the device and activate it,

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b) covers that close over the device to prevent access,

c) Locking devices that prevent access to the device, etc.

Considering point 5 above, isn't this the end of the discussion? Not at all! There are a few factors to consider first.

An important consideration is the potential for accidental operation. Depending on the machine or process, accidental operation of emergency stop devices may result in significant lost production and/or damage to equipment. In cases like this, it is reasonable to protect the device from accidental operation as long as the measures taken to protect the device do not impede the operation of the device in emergency conditions.

ISO 13850 [4] supports this idea in Clause **4.4 Emergency stop device**:

4.4.2 An emergency stop device shall be located at each operator control station, except where the risk assessment indicates that this is not necessary, as well as at other locations, as determined by the risk assessment. It shall be positioned such that it is readily accessible and capable of non-hazardous actuation by the operator and others who could need to actuate it. **Measures against inadvertent actuation should not impair its accessibility.** (Author's Note: Bold text added for emphasis.)

Summing Up

The key difference between North American thinking and International/EU thinking is in the term "unguarded" as used in the North American standards, versus [reference 4, §4.4.2] where the designer is reminded, "Measures against inadvertent actuation should not impair its accessibility."

In my opinion it is reasonable to protect an emergency stop device from inadvertent operation by placing a ring or other similar structure around an emergency stop device as long as the structure does not impair easy access to the device by the operator.

I know this opinion appears initially to go against the established North American standards, however it can be logically argued, based on the definition of the word "guard."

A guard is a device that **prevents access** to something, usually a hazard. Considering that we are talking about a control that is designed to reduce or limit harm, any structure that does not prevent access to the emergency stop device associated with the structure should be considered to be acceptable.

That said, devices like:

- Hinged covers;
- Doors;
- Locking devices;
- Narrow collars; and
- Any other device or structure

that unduly limits access to the emergency stop device cannot be considered acceptable.

Effects of PPE

The phrase "unduly limits access" has specific meaning here. If workers are expected to be wearing PPE on the body part used to activate the emergency stop device, such as gloves or boots for example, then the structure placed around the emergency stop device must take the added dimensions of the PPE and the reduction in tactile capability that may occur (e.g. heavy work gloves make it hard to feel things easily), and must compensate for the effects of the PPE.

Big gloves/boots = Big opening in the structure.

Lighting and protective eyewear can also play a part. You may need to use reflective or luminescent paint to highlight the location of the device in low light environments or where very dark eyewear is required, like that needed by welders or used by workers around some infrared lasers with open beam paths.

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Effects of State-of-Mind

It's also important to consider the likely state-of-mind of a worker needing to use an emergency stop device. They are either urgently trying to stop the machine because,

1. Another safeguard has failed and someone is involved with a hazard, including themselves, or

2. The machine is damaging itself or the product and they need to limit the damage.

Both scenarios have a high level of urgency attached to them. The human mind tends to miss obvious things including training, when placed under high levels of stress. Structures placed around emergency stop devices, such as covers, that completely block access, even though they may be easily opened, may be enough to prevent access in an emergency.

The answer you've all been waiting for!

So in the end, can you put a structure around an emergency stop to reduce inadvertent operation of the device:

YES!

Just make sure that you consider all the factors that may affect its use, document your analysis, and don't unduly restrict access to the device.

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This article is republished by permission from the Machinery Safety 101 blog (http://machinerysafety101.com, 3-Sep-2010).

References

[1] IEC 60204-1, 2009, *Safety of machinery – Electrical equipment of machines – Part 1: General requirements*

[2] CSA Z460, 2005, *Control of Hazardous Energy – Lockout and Other Methods*

[3] ANSI ASSE Z244.1, 2003, *Control of Hazardous Energy – Lockout/Tagout and Alternative Methods*

[4] ISO 13850, 2006, *Safety of machinery — Emergency stop — Principles for design*

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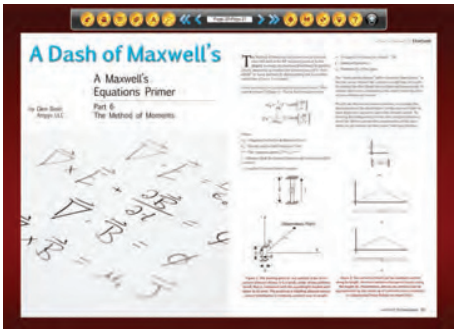

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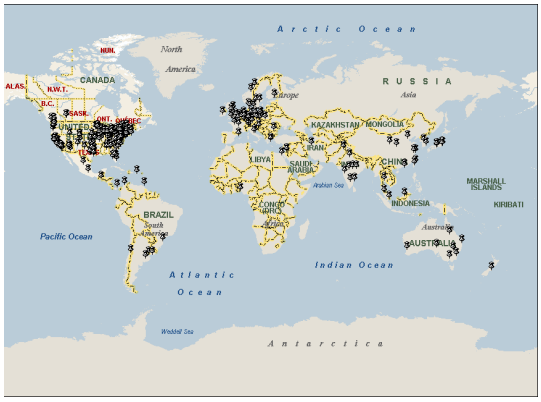
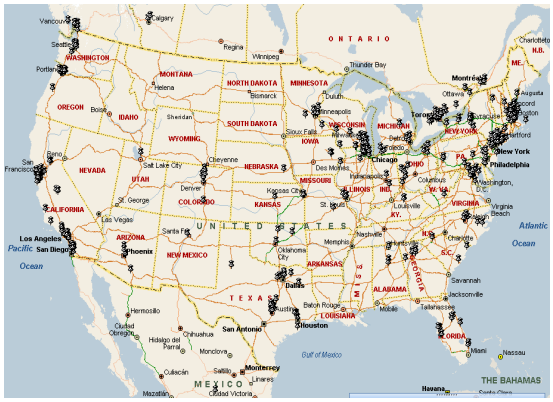
Continued from Page 3

(supported by spreadsheets with tabular data) for that purpose globally (all regions) and in the U.S. (Regions 1 through 6). The chapter development strategy has essentially followed this data base. ***Do you see your location there? Do you have a chapter in your area? If not, why not start one? Contact Thomas Ha, VP for Member Services (tom@gmcompliance.com) or Doug Kealy, Chapter Coordinator (Doug.Kealey@garmin.com) for assistance with any question you may have.***

These are also days of…judgment, and in fact, PSES will soon be undergoing its "review," which is held every five years. Members of the PSES Board have been working very hard in the last few months to put together the Report to the IEEE Society Review Committee. It is interesting to see how, when you are obliged to prepare such a Report, you suddenly come up with new initiatives, new ideas, which we hope to put into practice in the next couple of years.



Dots represent concentration of PSES members globally in 2011



Dots represent concentration of PSES members in the U.S. in 2011

Happy New Year and – Days of Judgement!

The New Year is full of promise, though you may also get a fair share of tough times. With each progressing year, you find yourself growing confident, experienced, and wise. That's the gift of the New Year. Raise a toast to the year that holds many promises. These Happy New Year quotes will fill you with optimism and enthusiasm.

No, I am not mistaken! As I write this message, we, the Jewish People, are in the midst of the "High Days"—the New Year, the Day of Atonement, and the Festival of the Tabernacle. These are days of contemplation, days of reverence, days of self-evaluation. We, as individuals, as we as "we" as a Society, and mind you, we as "humanity" all need an opportunity to look within, see where we can improve and do better, for us, for everyone.
We believe that in this very day, the World was created, and that it is the New Year of the entire World. It is also a time of Joy, of celebration, and… of many vacation days! On and off from work allows me to dedicate much time to deal with the many IEEE matters, of PSES and other IEEE activities in which I am involved.

"Strategy…"

Leaders establish the vision for the future and set the strategy for getting there; they cause change. They motivate and inspire others to go in the right direction ...

In my last message, I shared with you our accomplishments in defining the mission and vision of PSES. Vision is a start, but now we must take the right direction. In Portland, on Sunday, November 4 (preceding the Conference), we will be engaged in Strategic Planning, with the main objective of setting the strategic goals for PSES for the next 5 years. **This is an open meeting**! Why not join us (no RSVP required), just step in and share with us your thoughts. Any idea will be considered seriously. Remember—you are a member, not the membership. You too can express your opinion.

PSES BOD Meetings

Again, I would like to reiterate that all meetings of the Society Board of Directors are open and you are most welcome to attend. We try to schedule our BoD meetings so as to reach out to you, and

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2012 IEEE Symposium on

PRODUCT COMPLIANCE ENGINEERING

Keynote

Don Mays

Director of Product Safety

Deloitte & Touche LLP

November 5-7, 2012

Double Tree Hotel

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we hope that you reach out to us and honor us by attending. As I have said in the past, you are not restricted to being a "silent observer" in the meetings. Indeed, you may talk and express your opinions, make suggestions and take part in our activities. The schedule of BoD meetings is posted on the Society web site (http://ewh.ieee.org/soc/pses) and in the Calendar section of this Newsletter.

Fall

"*Spring passes and one remembers one's innocence. Summer passes and one remembers one's exuberance. Autumn passes and one remembers one's reverence. Winter passes and one remembers one's perseverance*." (Yoko Ono)

Fall (or Autumn, as it is called in some parts of the World) is around the corner. In some parts of the World I am sure it is very well felt already. Cool, dark, sometimes gloomy days… But, after the Fall comes the Winter, which brings New Year—yet another beginning…for the individual, for The Society, for Society, and for humanity. As you sit at home in your warm home (or for the southern hemisphere, I guess in your warming up home, as you emerge into summer), think: what can you do for the Society? How can we make it OUR professional home? How can WE better the offerings that we provide our members? Take the time to write to me or to anyone else on the Board. I want to hear from you and promise that no message will remain without a reply.

Do you think that the Product Safety Engineering Society is meeting your expectations? I invite your feedback on this matter. We need, we ask for your inputs and suggestions. Please write to me with any comment, or just a "hi" message (but make sure that "hi" is not the only word in the subject line or the message gets deleted.
I, as your President am at your service. Please do not hesitate to e-mail me at: eb.joffe@ieee.org. I look forward to your input.

Elya Joffe
President IEEE PSES

Continued from Page 4

We will be recruiting volunteers to help keep the Symposium program running smoothly; here's an opportunity to give back to your professional organization by helping in this. Let us know if you can be a volunteer.

Toronto Section – Engineering & Human Environment Joint Chapter
Doug Nix
4-Sep-12

The Engineering & Human Environment Joint Chapter is made up of members from five different IEEE Societies and the Technology Management Council. The Chapter is part of Toronto Section, stretching from Sudbury on the northwest down to the Greater Toronto area and east to Oshawa.

We are seeking speakers for Chapter meetings in September, October and November this year. Our first elections since 2008 will run this fall, with the winners being announced at our Annual General Meeting in January 2013. Positions open for election are: Chapter Chair, Vice-Chair, Treasurer and Secretary. Nomination forms are in the Q3-2012 EHEJC Newsletter.

We are also seeking more volunteers to join the Chapter Administrative Committee. These positions are appointed, not elected, and include Communications, Events, GOLD and WIE representatives. If you are a member of Toronto Section and are interested in working with a group of dedicated volunteers to provide an interesting and varied technical program to our members, we want to hear from you!

Our Chapter Vice-Chair, Rabiz Foda, attended the Reliability Society Chapters Congress in May, and was able to make quite a few contacts with other Reliability Society Chapters. You can learn more about this event in the Q3-2012 EHEJC newsletter.

Contact Points
Chapter web site: http://toronto.ieee.ca/chapters/humanenv.htm
Chapter email: ehe_toronto@ieee.org

Chapter Chair: Doug Nix, dnix@ieee.org

Arcing Faults

Arcing Faults In Low and Medium Voltage Electrical Systems:
Why Do They Keep Happening?

by Noshirwan K. Medora and Alexander Kusko

Introduction

Arcing faults have occurred at least since Thomas Edison built his first power plant in New York City and started to distribute dc power. Since that time, there has been substantial work done on preventing arcing faults, or at least attempting to reduce injuries to people and damage to property. Still, arcing faults persist, and might even become more frequent and more destructive, however one measures the events. This article addresses the issue from the basis of our experience.

What is an arcing fault?

In simplest terms, an arcing fault is the passage of electric current though an ionized air path in electrical equipment either between line conductors, a line conductor and the neutral, or a line conductor and ground. The event produces a luminous discharge (arc flash) and destruction from the heat of the arc. An example of an electric arc is shown in Figure 1. The destruction produced by the heat of an arcing fault is shown in Figure 2.

Figure 1 – An example of an arcing fault [1].

Figure 2 – High Energy Arcing Fault (HEAF) at Diablo Canyon Power Plant [2].

The physics of the electric arc have been studied by scientists as early as the 19th century. The structure of an arc is shown in Figure 3.

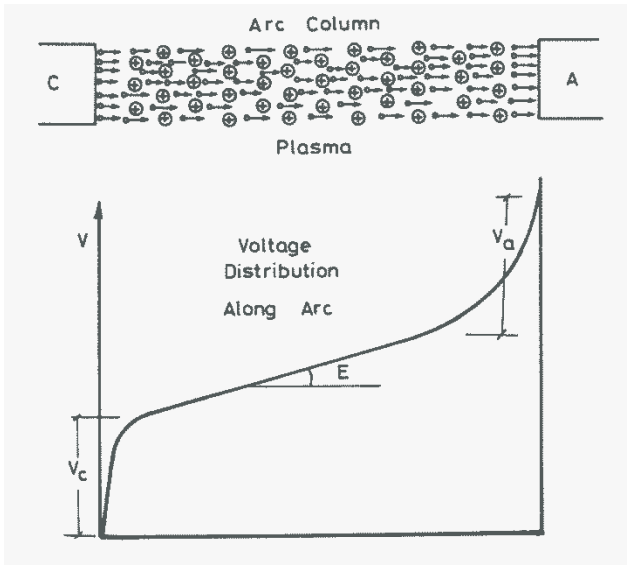

Figure 3 – Electrons and positive ions in the arc and its longitudinal voltage distribution [3].

The voltage distribution in an arc (series or parallel) typically has three defined regions: 1) cathode region; 2) anode region; and 3) arc column. The anode and cathode regions operate with high electric fields. The arc column operates with a relatively low electric field. The power dissipated by the arc is proportional to the product of the voltages in the three regions of the arc and the arc current. The energy dissipated in the arc is

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proportional to the product of the arc power and the time duration. The destruction produced by the arc is related to the energy. The major power dissipation occurs close to the electrodes and is responsible for the melting and vaporization of the metal.

Arcing faults have extremely high energy densities and generate very high temperatures of the order of 20,000 to 35,000 °F. High current arcing faults have the capability of not only melting, but vaporizing copper (vaporization temperature = 2595 °C). As an example, a line-to-line arcing fault in a 2000 A, 480 Vac switchboard vaporized approximately 70 lb. of copper in less than 90 s [3]. This rapid transition from solid to vapor phase results in a high pressure wave due to the extremely large expansion in volume, over 65,000 times for copper. This can cause arc flash hazards, including serious burn injuries over a large boundary area [4].

Furthermore, the air in the arc stream expands in heating up from ambient to that of the arc at about 35,000 °F [4]. The vaporization of metal and heating of the surrounding air results in a very rapid blast due to the high pressure. In arc flash incidents, workers have been knocked off ladders and thrown across rooms. One positive consequence of the high blast pressure of arcing faults is that it can reduce the time a worker is exposed to the arc flash temperatures. A serious hazard is that this explosion of metal and air results in propelling molten metal and equipment parts from the incident point [5].

Why do arcing faults occur?

An arcing fault occurs in electrical equipment when a path is established for an electric current through air between members at a different polarity. The causes are basically the following:

1. Insulation failure, which may be due to:
Contamination by an electrically conductive contaminant such as water;
Aging of the insulation;
Defect in the insulation;
Mechanical damage to the insulation.

2. Error by trained or untrained workers.

The spacing between live parts in electrical equipment is relatively small. As a result, an arcing fault can be easily initialed due to any of the above reasons.

Further, the majority of arcing faults in switchgear and control gear are caused by human error [6]. Numerous workers are injured and killed each year while working on energized equipment. To address this, the IEEE/Petroleum and Chemical Industry Committee formed a working group with the intent to raise awareness of electrical personnel to the hazards associated with arcing faults. Tests were conducted and analytical information was gathered to quantify the hazards associated with arcing faults [5].

This article provides our explanation and our recommendations, based on our experience, for what should be done to reverse the apparently upward trend in frequency of arcing faults.

Authors' experiences with arcing faults

Following serious fires caused by high energy arcing faults, we have had to reconstruct the accident sequences including the time at which protective devices were expected to operate and the duration of the arcing fault. The times may be short, and may be determined from the calculated fault current and the fuse or breaker time-current characteristics. The times may be long, particularly where protective devices failed to operate. The long times can be calculated from the combination of the calculated fault current and the amount of material melted and vaporized by the heat of the arc or by computer modeling and simulation [3].

We have investigated more than thirty high energy arcing fault incidents in the past twenty years that involved extensive equipment damage and personal injury and deaths. We have also performed calculations of probable arcing fault currents and arcing times while investigating these accidents. One of the methods that we used to determine arcing time was to equate energy in the arc with the amount of material melted from the bus bars in typical faults. Another method that we used is computer simulation.

Examples of authors' experiences with high energy arcing fault accidents

Several arcing faults that we have investigated are described as follows:

1. Coal-fired power plant on the U.S. East Coast

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A 5.0 kV, 400 A circuit breaker was supplying ac power to a thermostatically controlled cooling fan at a power plant. Since the cooling system was off, the two electricians assumed that the circuit breaker was de-energized, not realizing that the power system was wired such that if any auxiliary was ON, the cooling fan would be turned on by the thermostat.

The two electricians approached the rack-mounted breaker and racked it out while energized, causing an arcing fault and a fire, with arc flash and severe burn injuries to the electricians. Figure 4 shows the replacement breaker installed at the plant.

Figure 4 – 5.0 kV, 400 A replacement circuit breaker at the power plant.

2. Manufacturing plant on the U.S. East Coast

Two electricians were working on the load side of a mechanical disconnect. The mechanical disconnect was open; however the utility side (line side) was still energized.

The lead electrician stated that the lever of the mechanical disconnect had been placed in the OFF position prior to opening the cabinet door. It was alleged that due to a defect in the mechanical disconnect, the spring-loaded contacts had sprung to the ON position, several minutes after the door was opened. It was further alleged that the arcing fault was the result of the mechanical switch closing the circuit and the high inrush current of the transformer and other loads caused an arc, which resulted in a phase-to-ground arcing fault, which subsequently became a 3-phase arcing fault.

Our investigation revealed that the lead electrician had indeed turned OFF the mechanical disconnect. Investigation also revealed that while the senior electrician had stepped away, the junior electrician had opened the cabinet door.

Our investigation indicated the presence of a metal other than copper in the melted debris on the disconnect switch contacts. Scanning Electron Microscopy (SEM), Energy Dispersive Spectroscopy (EDS) and Fourier Transform Infrared Spectroscopy (FTIR) were used to identify the metal as steel on the melted switch contacts and were also compared to the composition of steel from a typical screwdriver.

It was determined that the junior electrician was unaware that the utility side (incoming side) of the mechanical disconnect was still energized. It is probable that after the junior electrician opened the cabinet door, his screwdriver accidently made contact between one of the energized terminals and the chassis and resulted in a phase-to-ground arcing fault. Subsequently, this became a 3-phase arcing fault and resulted in a fire with arc flash and caused severe burn injuries to the junior electrician. Figure 5 shows the arc damage to the terminals of the mechanical disconnect due to the 3-phase arcing fault.

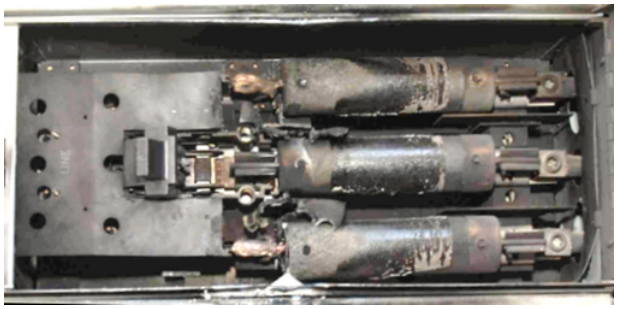

Figure 5 – Arc damage to the terminals of the mechanical disconnect and the fuses.

3. Steel mill in a U.S. Midwestern state

A power transformer with a Load Tap Changer (LTC) was used to supply power to an electric arc furnace. The transformer was rated at 74.7 MVA, 138 kV-Δ / 38 kV-15 kV-Y, three-phase, 60 Hz. Downstream of this LTC transformer was a “furnace transformer” which was connected to the arc furnace.

Late one night, both distance and instantaneous overcurrent relays operated and tripped the LTC

Continued on Page 25

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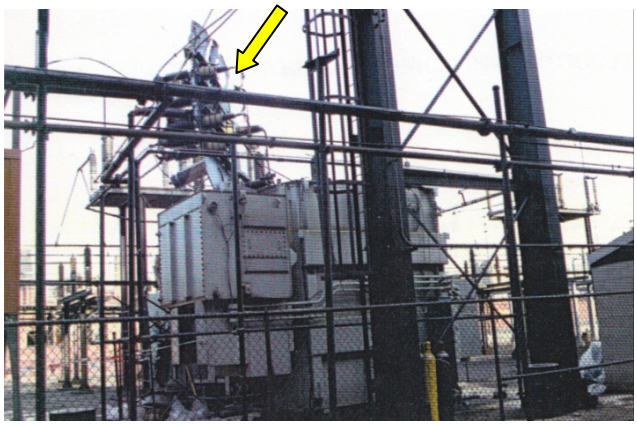
transformer during operation of the arc furnace. Since the sudden pressure relay did not operate, the engineer in charge assumed that the trip was caused by the arc furnace.

On each of three successive attempts to re-energize, the LTC transformer immediately tripped out. On the fourth attempt, the sudden pressure relay operated, but not quickly enough. There was an arcing fault, an explosion and the transformer failed violently. The cover was blown off and the high voltage bushing was thrown across the yard, narrowly missing a plant worker. Figures 6-7 show the failed LTC transformer.



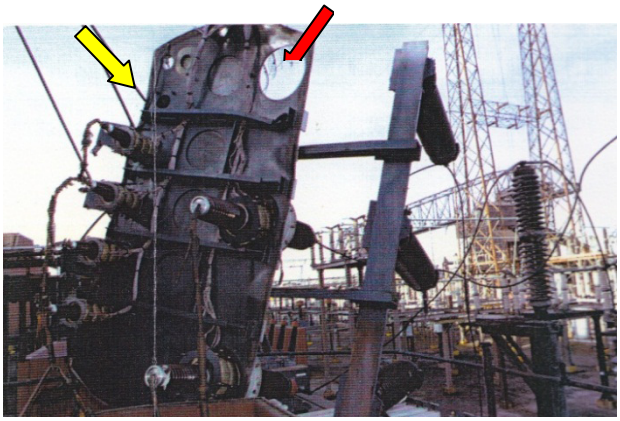


Figure 6 – LTC Transformer that failed violently. Yellow arrow shows transformer cover blown in the open vertical position. Red arrow shows opening where Phase C HV bushing originally was located, but was blown out, narrowly missing a plant worker.

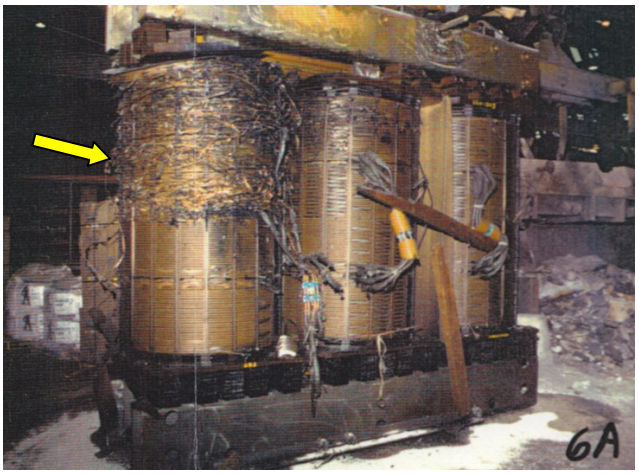


Figure 7 – Failed LTC transformer after being de-tanked. Arrow shows extensive damage to the top half of the Phase C high voltage winding and some damage to the adjacent Phase B high voltage winding.

How to prevent or limit the extent of arcing faults

We propose the following measures to prevent or limit the extent of arcing faults:

1. Maintain good “housekeeping” around electrical equipment, and insure that dirt, water and animals do not get into equipment cabinets and panels.

2. Keep panels, cabinets and switches locked. Issue keys to authorized persons only. Plan for emergencies such as flooding, fire and entry by unauthorized persons.

3. Restrict access and work to trained or licensed electricians, particularly for equipment rated over 120 V.

4. Coordinate the operation of circuit breakers and fuses.
5. Specify shortest fault clearing time.

6. Insure correct fuses and circuit breaker replacement.

7. Work on the equipment by adding insulation to reduce vulnerability to exposed equipment, for example by using insulated bus bars. [*ed note—It may be wise to find out whether such changes will constitute a modification of Listed equipment.*]

Continued on Page 26

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8. Perform computer analysis to determine arc energy and arc flash hazard analysis using detailed arc models, and calculation of arc current using IEEE Std. 1584.

9. Identify arc-flash protection boundary and the incident energy at assigned working distances.

10. Specify the necessary rating of personal protective equipment (PPE).

11. De-energize and ground the system prior to working on the equipment.

12. Follow established engineering techniques and work practices.

However, electrical arcing faults may still continue to occur at what may appear to be a continuing or increasing rate, in spite of all of the work described above. A similar statement can also be made about electric shock accidents, and electrocutions which are not addressed in this paper.

Why arcing faults persist

Our research and experience indicate that there are several reasons for the rate of arcing faults to continue. Among them are the following:

1. Increased usage

Use of electric power continues to grow with population, industrial application, convenience, and new uses; for example, charging electric automobiles. There is more vulnerable equipment available and exposed. The trend of increased electric power usage is clearly evident in the annual growth of electric utility generation and utilization.

2. Higher System Voltages

Utilization voltage in commercial buildings, factories, and other, is changing from 120/240 Volts single-phase to 120/208 Volts 3-phase and 480/277 Volts 3-phase. An arcing fault at 120 Volts will not be sustained; however, an arcing fault at the higher voltages will be sustained, and will be more destructive as the voltage increases.

Further, the higher voltage results in an increased fault current, since the impedance of the arc and the corresponding arc voltage drop is now a lower percent of the system voltage. Table 1 of the paper by Kaufmann and Page shows that the calculated three-phase arcing fault current at 480 Volts is 0.89 p.u. of the bolted fault current, whereas, at 208 Volts, the calculated arcing fault current is only 0.12 p.u. of the bolted fault current [3].

At system voltages of the order of 1 kVac and higher, the arcing fault current is considered equal to the bolted fault current [7].

3. Larger Transformers

Larger distribution and supply transformers are being used to supply increased demand. For example, the old 5 kVA transformer on a pole has now been replaced with a 50 kVA transformer. As a result, the impedance from the electrical source to the arcing fault is lower, the fault current is higher and the resulting arc has more energy and is considerably more destructive.

4. Repair Personnel

The combination of generally increased technical knowledge of the public, and pressure to keep electric power “always available,” has prompted untrained or poorly trained personnel to attempt to “fix” failed electrical equipment with disastrous results.

In our experience, circuit breaker panel doors are often open. To keep the panel door tightly closed, typically one would have to physically close and lock the panel door. This closed/locked panel door would prevent rodents from entering the panel and gnawing at the cable insulation, and/or striding across adjacent bus bars and causing arcing faults.

Many electrical panels are not locked, resulting in rodents entering,

Bolted key interlocks have been adopted to force personnel to follow a specific safe procedure to access an energized cubicle. In our experience, there were at least two instances, where a worker was in a dangerous situation, but no one was available with knowledge to work the bolted key interlock system to shut off power and permit the

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rescue.

Furthermore, there does not appear to be a legal procedure, other than a lawsuit, to penalize trained or untrained people who cause arcing faults due to negligence or other means.

Recommendations

We make the following recommendations:

1. Limit the access to electrical facilities to trained workers to reduce the incidence of arcing faults.

2. Accelerate the requirement for the use of arc fault current interrupting devices by means of the National Electrical Code, required inspections, and publications.

3. Enforce a requirement that repair work on electrical equipment rated above 120/240 Vac only be performed by competent, trained and experienced licensed personnel.

4. Enforce stiff penalties for any negligence in following mandatory safety procedures, such as forcible bypassing of safety interlocks, or absence of proper tags for lock out.

5. Require proper understanding of the various reasons for tripping of protection devices. Emphasize the importance of determining the specific reason for the tripping of a protection device prior to re-energization of the system. Require that a specific test procedure be followed if there is more than one trip of a protection device.

6. Require that all cabinets and electric panels be locked. Use bolted key interlocks where necessary and have trained personnel available on site knowledgeable in their operation.

7. Require completion of periodic seminars and refresher courses on arcing fault hazards stressing the importance of explicitly following the specified safety procedures.

8. Tighten the legal responsibility for people causing arcing and other electrical faults that cause personal and property damage.

9. Insure that replacement fuses and circuit breakers are of the proper rating.

Conclusion

We conclude that if our recommendations are followed, the occurrence of arcing faults will be reduced, with resulting saving of lives and equipment.

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This article is extracted from the authors’ paper,

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Medora N. K., Kusko A, “Arcing faults in Low and Medium Voltage Electrical Systems – Why Do They Persist?”, presented at the 2011 IEEE Symposium on Product Compliance Engineering (ISPCE), IEEE Product Safety Engineering Society (PSES), San Diego, CA, October 10–12, 2011 and approved for publication in the 2011 IEEE Symposium on Product Compliance Engineering Proceedings.

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Compliance News Shorts

October, 2012

Jordan – Technical Regulations

Jordan released a number of draft Technical Regulations on May 31, 2012 covering many of the areas of EU Directives such as RoHS, WEEE, EMC and LVD, as part of a joint project with the EU to facilitate trade between the two regions.

A new agreement on Conformity Assessment and Acceptance of Industrial Products (ACAA) between Jordan and the EU will follow the release and adoption of these Technical Regulations. A notice through the WTO was released by the Jordan Standards and Metrology Organization (JSMO) for most of the areas.

The draft Technical Regulations are available for review on the JSMO website:

http://www.jism.gov.jo/english/standardization/New%20Instructions%20and%20Technical%20Regulations-Vertical.htm

Canada – EMC ICES-003 Revision

Industry Canada has revised the *ICES-003/NMB-003 Interference-Causing Equipment Standard, Information Technology Equipment (ITE),* Issue 5, August 2012. This went into effect in August, 2012, but the Canadian government has allowed a transition period until August 31, 2013.

One of the main revisions is a clarification of product labeling:

ICES-003 Labeling Text, *New Standard*:

CAN ICES-3 (*)/NMB-3(*)

ICES-003 Labeling Text, *Old Standard*:

This Class* digital apparatus complies with Canadian ICES-003.
Cet appareil numérique de la classe* est conforme à la norme NMB-003 du Canada.

* Insert either “A” or “B” but not both to identify the applicable Class of ITE.

For more information, please refer to http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf00020.html#sec3

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Taiwan – Addition of Products to Regulated Product List

Effective July 1, 2012, BSMI will begin to regulate Wireless Access Points, which would include routers, Bridges, Switches and Hubs. BSMI Notification No. 10030010480 specifies that these products are now subject to the Declaration of Conformity certification scheme. Application to the National Communications Commission (NCC) for the wireless function would be required in addition to BSMI DoC.

Table 1: Product (related inspection scheme, HS code and inspection standards) covered:

Product	Related HS code and Description of Goods	Inspection Standards	Inspection Scheme
Routers/ Bridges/ Switches/ Hubs	8517.62.00.00.5 Machines for the reception, conversion and transmission or regeneration of voice, images or other data, including switching and routing apparatus	EMC: CNS13438 (2006 completed version) Safety: CNS14336-1 (2010)	Declaration of Conformity (DoC)

The official BSMI notice is available in Chinese only at
http://www.bsmi.gov.tw/wSite/public/Data/f1320108008946.pdf

Standards Roundup

IEC 62368-1, 2nd Edition

The Committee Draft for Vote (CDV), 108/479/CDV, for the 2nd edition of IEC62368-1, hazard based Standard covering Information Technology equipment and Audio Video Equipment circulated to national committees for vote in December, 2011 was not approved.

The development committee is working to address the comments and issues with the draft, and is expected to release a new draft for circulation by October, 2012.
The new standard is intended to replace both the ITE standard, IEC 60950-1, and the Audio-Visual standard, IEC 60065.

UPDATE: The committee has completed the draft CDV (Committee Documents for Vote). The CDV will be released soon. Expected date of publication is January 15, 2013 according to some sources, assuming the vote is positive.

USA – ANSI C63 Standards

The American National Standards Institute (ANSI) Accredited Standards Committee C63 focuses its work in the EMC area. Recently, the committee has become more active in the telecommunications technical area. The committee is proposing revisions to a number of

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standards.

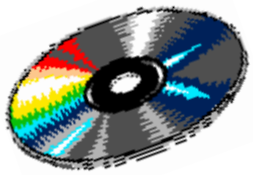
ANSI C63.4 Methods of Measurement of Radio Noise Emissions has been adopted by the US FCC as the official test method guideline for Part 15.
ANSI C63.5 Calibration of Antennas Used for Radiated Emissions Measurements in EMI Control is being rewritten to include new technological advances since its last published version in 2006.

ANSI C63.10 Testing Unlicensed Wireless Devices has its second edition in process with a number of participants on the revision committee. Wireless devices are changing rapidly which need to be reflected in the new edition.
In addition to the main standards, there are a number of subcommittees with activities.

SC-1 Techniques and Development
SC-2 Terms and Definitions
SC-3 International Standardization
SC-5 Immunity Testing
SC-6 Laboratory Accreditation & Conformity assessment
SC-7 Unlicensed Personal Communications Services Devices
SC-8 Medical Equipment EMC Testing

IEC 60065, 8th Edition
The committee has completed the draft CDV (Committee Documents for Vote). The CDV will be released soon.

Past IEEE-PSES Symposium Records



CD Purchasing Information

SYMPOSIUM PAPERS ON CD:

The Product Safety Engineering Society continues to offer past symposium records for sale on CDs. The cost for the CD is $35 plus shipping and handling for IEEE members; $50 plus shipping and handling for non-IEEE members. At this time, check or money orders are the means for payment. Please provide the following information:

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New PSES Members

from 30 June 2012 Through 18 October 2012

Our new members are located in the following countries: Brazil, Canada, China, Ecuador, France, Germany, Greece, Hong Kong, Italy, Japan, New Zealand, Singapore, Switzerland, United Kingdom, USA

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Gregg Kervill
Roger A Plemmons
David P Petry
Steve Anthony Robinson
Christoph Schmitz
Margo Baxter
Todd J Hartzler
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To receive the discount, members must enter or mention the discount code found in the Members Only section of the PSES website.

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

Closing dates for submitted articles:

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

Closing dates for news items:

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

Closing dates for advertising:

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

Institutional Listings

We invite applications for Institutional Listings from firms interested in the product safety field. An Institutional Listing recognizes contributions to support publication of the IEEE Product Safety Engineering Newsletter. To place ad with us, please contact Jim Bacher at j.bacher@ieee.org

Tthe Product Safety Engineering Society will accept advertisements for employment and place looking for work ads on our web page. Please contact Dan Roman for details at dan.roman@ieee.org .

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