
THE PRODUCT SAFETY SOCIETY NEWSLETTER

June, 1988

Vol 1, No. 5

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CHAIRMAN'S MESSAGEby **RICHARD PESCATORE**

Have you thought “Why am I receiving this *Newsletter*? I don’t remember paying for it! It doesn’t contain any paid advertisements! Surely nothing is free! I certainly don’t remember joining anything!” Perhaps I can put your mind at ease.

You are receiving this newsletter because either 1) you really did request to be on our mailing list, or 2) we think that you have an interest in what we are doing. We further think that all of you are professionally interested in the safety of electronic products. If we are right, please read on. If not, please pass this copy of our *Newsletter* on to an associate who *is* involved with product safety. He or she will thank you.

You haven’t had to pay for our *Newsletter* because the Product Safety Society is still in a formative state. Readers of previous *Newsletters* know that we are working toward affiliation with the IEEE as a member Society. We are encouraging product safety professionals to join the IEEE so that they will be eligible to sign our petition for IEEE affiliation. We do eventually need a source of revenue to finance the *Newsletter* and other activities. *However*, we are trying to avoid assuming financial responsibilities until the Product Safety Society is covered by the IEEE administrative structure. What does this mean to you? No dues are anticipated this year.

You don’t remember officially joining the Product Safety Society because, as mentioned above, we are still in the formative stages of starting a professional society. In spite of the tremendous interest among product safety professionals, a rapidly growing mailing list for the *Newsletter*, and local chapters starting in four regions around the U.S., the Product Safety Society has no official members yet. However, that is about to change.

You now have the opportunity to become a CHARTER MEMBER of the Product Safety Society by simply completing and returning the “Membership Application and Questionnaire” found in this issue of the *Newsletter*. So, what do you get for your 25 cent stamp? First, a chance to reaffirm your support for the idea of a professional society that is focused on the interests and concerns of individuals working in the field of electrical product safety. Second, you will continue to receive this *Newsletter*, which continues to grow and include new articles with each issue.

Did I put your mind at ease? I hope so. Now, please help us by returning your completed “Membership Application and Questionnaire” as soon as possible. I am sure that you will agree that your 25 cents has been well spent.

Richard Pescatore
Chairman

TECHNICALLY SPEAKING

by **RICHARD NUTE**

Double Fusing or Fusing Both Sides of the Line

Hello from Vancouver, Washington, USA

Every once in a while, someone asks the question whether fusing both sides of the power line is safe and permissible.

Faults

The first question that must be addressed is: What fault protection is the fuse providing?

There are two kinds of faults: (1) phase-to-neutral (pole-to-pole), and (2) phase-to-ground.

(Note that a fuse cannot provide protection for a neutral-to-ground fault because, by definition, the neutral is grounded. In a neutral-to-ground fault, the neutral and ground conductors become parallel conductors. In accordance with Kirchoff's Laws, the current in the neutral goes down, not up. Hence, the overcurrent does not occur, and a fuse cannot provide protection).

Single Fusing

A single fuse in the phase conductor provides protection for both kinds of faults.

A single fuse in the neutral conductor provides protection for neutral-to-phase faults, but not for phase-to-ground faults. This is one reason why a single fuse in the neutral is not permitted.

Double Fusing

The second question that must be addressed is: Under what conditions does double-fusing provide the same or better protection than a single fuse?

We have already determined that a single fuse in the phase conductor provides adequate protection against both kinds of faults, and that a fuse in the neutral conductor does not. If double fusing is employed, the equipment is protected against both faults, but the neutral fuse is redundant for phase-to-neutral faults, and inoperative for phase-to-ground faults.

The only condition where fusing both phase and neutral conductors yields non-redundant protection against both faults is where polarity reversal is possible. That is, where the phase and neutral conductors could be interchanged on the supply side of the fuse. If polarity reversal is possible, then double-fusing guarantees that the phase conductor will always be provided with a fuse.

With double fusing, protection against both faults is provided for both normal polarity and reverse polarity.

Polarity Reversal

The third question that must be addressed is: Is polarity (phase-neutral) reversal possible in the circuit on the supply side of the fuse? That is, is the fuse location (ie: phase or neutral conductor) constant or variable?

Technically Speaking, *Continued*

Building Wiring and Permanently-Connected Equipment

If we are dealing with building wiring or permanently-connected equipment, then fuse location is not variable, and polarity reversal is not possible. In this case, one fuse — in the phase conductor — provides protection for both phase-to-neutral and phase-to-ground faults.

The NEC, CEC, IEE Wiring Regulations and IEC 364 specifically prohibit fusing the neutral in building wiring and permanently-connected equipment.

Plug-and-Socket-Connected Equipment

If we are dealing with plug-and-socket-connected equipment, then we must examine the supply configuration, socket configuration, plug configuration, and wiring codes to determine whether fuse location is variable or not.

Three-Phase and Multi-Voltage Equipment

For three-phase (eg, 208/120) and multi-voltage (eg, 120-0-120) supplies, the plug and socket must maintain polarity in order to have functionality. In these cases, the fuse location is not variable because any polarity reversal (other than phase rotation) results in incorrect voltages applied to the equipment, usually with immediate catastrophic results, and opening of the building fuse or circuit breaker.

For these cases (plug-and-socket-connected three phase equipment and multi-voltage, eg, 120-0-120 equipment), a fuse in each phase conductor provides protection for both phase-to-neutral and phase-to-ground faults. A fuse in the neutral conductor would be redundant, and should it operate (open), the voltages applied to the various circuits will change and could cause overvoltage, overcurrent and

overheating conditions in at least one of the individual loads. For this reason, a fuse in the neutral must be prohibited, or it must be “ganged” with the phase conductor fuses such that if anyone, including the neutral, operates, they all open.

Single Phase Equipment

For single-phase plug-and-socket-connected equipment, the plug and socket may not reliably maintain polarity, depending on the electrical code and the socket configuration.

Supposedly, the NEMA 5-15R socket maintains the polarity of the building wiring, with the wide blade being the neutral conductor. However, there are several versions of the NEMA 5-15P plug, some with wide blade and some without. Therefore, some plugs allow polarity reversal, while others do not.

In continental Europe, the socket wiring for the common 220 V, 16A plug is not polarized, and the equipment fuse location would be variable. In the UK and Australia, sockets and plugs are polarized, and the equipment fuse location would be constant.

The point is that each plug, socket, and building wiring is an independent situation which must be separately evaluated as to whether polarity reversal is possible. This in turn would make the equipment fuse location constant or variable.

The General Case for Single-Phase Plug-and-Socket-Connected Equipment

For single-phase, single-voltage plug-and-socket-connected equipment, single fusing ONLY provides protection for both faults when polarity reversal is not possible. If polarity reversal is possible, then a single fuse can only provide protection against phase-to-ground faults 50% of the time.

Technically Speaking, *Continued*

For single-phase, single-voltage plug-and-socket-connected equipment, double fusing ALWAYS provides protection for both kinds of faults regardless whether polarity reversal is possible or not.

However, there are two hitches to double fusing:

First, when operating on a polarized system, some safety authorities insist that fusing be provided only in the phase conductor such that all of the equipment is de-energized for protection of the serviceman. This seems to require one fuse only.

However, this can be accommodated by using two, different value fuses. Select the fuse for the phase conductor (when connected to a polarized system) for proper overcurrent protection. Select the fuse for the neutral conductor to be one size larger than the phase conductor fuse. Thus, when connected to a polarized system, the smaller fuse properly opens for phase-to-neutral and for phase-to-ground faults. When connected to a non-polarized system, and with reverse polarization, the smaller fuse provides protection for phase-to-neutral faults, and the larger fuse provides protection for phase-to-ground faults.

Second, some safety authorities insist that fusing be provided only in the phase conductor as required for building wiring. Any fuse in the neutral is cause for non-compliance of the equipment. The only solution here is to change our building codes and regulations to exempt single-phase plug-and-socket-connected equipment from the building requirement.

Your comments to this article are welcome. Please address your response to the Editor, Product Safety Society Newsletter, 2550 Walsh Ave, Santa Clara, CA 95051-1392.

In The Next Issue of

**THE PRODUCT SAFETY
SOCIETY NEWSLETTER:**

ASK DOCTOR Z

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

Write to Dr. Z today!

Traceability of Plastic Materials -A UL Requirement Part 2

An Organized Approach for Compliance

The follow is the second in a two part series on the Traceability of Plastic Materials for Follow-Up Inspections. Last month, Lin Johnson discussed the need to prove traceability of plastic materials. This month, Lin provides suggestions for an organized approach to plastic material traceability.

Traceability is important to UL because plastics have many safety related properties. Many people, even those familiar with plastics, do not realize what safety properties can be involved in a particular design. Which safety properties are at issue is directly dependent on the actual design of the plastic part. This is no different than any other mechanical property.

Examples of safety properties of plastics are:

- 1) Flammability — *Cannot* be categorically specified — is directly related to the minimum thickness of the particular part and is only meaningful when specified with a thickness.
- 2) Hot Wire Ignition
- 3) Arc Tracking
- 4) Mold Stress Relief
- 5) Relative Thermal Index, etc.

The description of the plastic in the UL Follow-up Procedure is very important. UL Engineering requires that the plastic material for a particular component be specified in sufficient detail to insure that the appropriate plastic properties are controlled. This means that wordings such as “Resin Supplier XX; Compound 54321 OR EQUIVALENT” is inadequate. The words “OR EQUIVALENT” are too vague to adequately control plastic material properties. The Follow-up Services Inspector cannot determine when one plastic is equivalent to another. Thus, equivalent plastics must be evaluated by UL Engineering and identified specifically in the Follow-up Procedure. However, some applications of a plastic part require concern over just one specific property, typically flammability. In such situations the end product manufacturer may wish to work with UL engineering to be sure that the wording which is put into the Follow-up Procedure allows the maximum latitude possible. In such situations wordings such as “UL Recognized Component Plastic meeting 94V-2 or better” are possible and allow more flexibility.

1.4 Specific Situations Which Require Traceability:

- a) Custom molded, custom extruded or custom fabricated plastic parts. (Also purely cosmetic or decorative components attached to the product.)
- b) Off-the-shelf catalog components such as: spacers, feet, bumpers, fans, cardguides, etc.
- c) Other: Insulating foam and acoustic foam, PC Boards (ie: from a UL Recognized PC shop)

Traceability of Plastic Materials, *Continued*

NOTE: Any plastic part is subject to traceability if it is identified or referenced in a UL follow-up procedure for a product or Recognized Component subassembly.

2) TECHNIQUES FOR COMPLIANCE WITH TRACEABILITY:

There are basically three ways to satisfy the traceability requirement. The technique which is utilized depends on the individual situation.

A) CERTS (Certificate of Compliance): This is a method of establishing traceability through the use of a CERT document. This can be a form or letter provided by the actual fabricator of the plastic part to the customer confirming the actual plastic material which was used.

B) Recognized Component Molder: The Molder/Fabricator can become UL Recognized under UL746D. The advantages: No CERTS are required; thus the vendor's costs of preparing CERTS, the end product manufacturer's costs of checking and clearing CERTS at Receiving, and the costs of filing and archiving CERTS are eliminated. Additionally, this program has more credibility with UL than CERTS and thus the possibility of an inspector challenging a CERT is eliminated.

C) Use a Recognized Component: Make the individual part a UL Recognized Component or have the subassembly which includes a plastic part be a UL Recognized Subassembly. This is considerably more difficult than "B", but for high volume, standard components such as fans, cardguides, etc., this may be a very desirable marketing feature for the vendor.

3) A PRACTICAL PLAN FOR TRACEABILITY:

Step 1) Make a list of all plastic parts which are identified in any UL Follow-up procedures.

Step 2) Determine if any plastic part is individually listed in the UL Report as an integral part of a UL Recognized Assembly (consult UL Recognized Component Directory (the Yellow Book) under the appropriate category) or could be made to be part of a Recognized Component Assembly. Contact UL Engineering with any discrepancies or requests for alternate constructions.

Step 3) Determine if the descriptions of the plastic parts and the plastic resins specified are accurate and appropriate to allow traceability (do not say "OR EQUIVALENT"). If any discrepancies are noted, contact UL Engineering for evaluation of suitability.

Step 4) List the vendor for each plastic part and determine if each vendor is a UL Recognized Molder /Fabricator or intends to become one soon. {Consult the UL Recognized Component directory, Vol. 2, Category QMMY2.}

Traceability of Plastic Materials, *Continued*

Step 5) Plan a strategy for sourcing as many plastic components as possible to UL Recognized Molders/Fabricators.

Step 6) Determine which components remain after step #2 and step #5. These components will require CERTS.

Step 7) Communicate your intended strategy along with your proposed schedule for compliance to your local UL Follow-up Services Office.

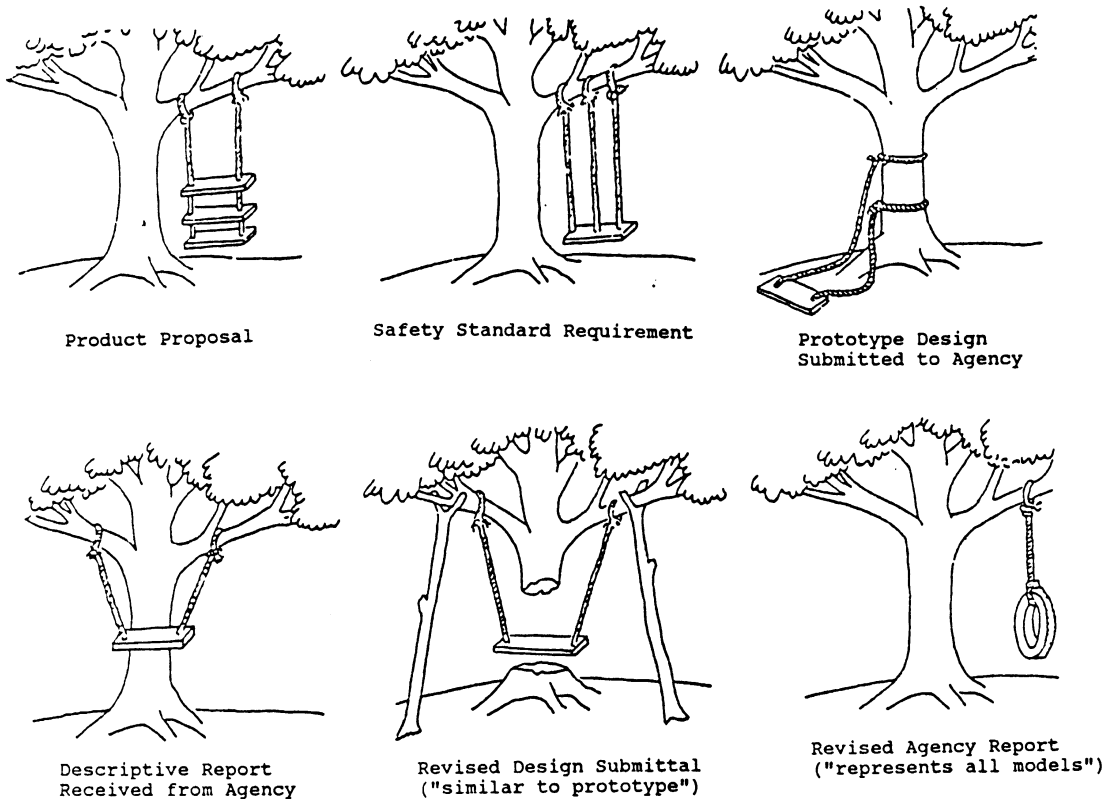
Step 8) Design a consistent CERT form for use with your products (see example on page 15).

Step 9) Develop a consistent plan internally for requesting CERTS from vendors, for clearing CERTS at Receiving and for quarantining and returning components without CERTS.

Continued on Page 15

Please address your questions or comments on the above article to "Product Safety Society Newsletter", Editor, c/o Tandem Computers, 2550 Walsh Ave., Santa Clara. CA 95051.

PRODUCT LIFE CYCLE - AGENCY CERTIFICATION



CHAPTER ACTIVITY REPORTS

SANTA CLARA VALLEY CHAPTER REPORT

The May meeting of the Product Safety Society was chaired by Brian Claes of Tandem Computers. The meeting began by playing a video tape on Warning Labels, the subject of an earlier meeting. Following the tape, Brian began the society subcommittee reports by informing us that as the Program Chairman, he is working with Underwriters Laboratories to schedule a presentation sometime this summer. The topic is to be announced at a later date. Mike Harris of the Constitution Committee then reported that the Safety Society Constitution draft has been completed. Special thanks was given to John McBain for his hard work on the draft. Mike also reported that the IEEE/CHMT will pay the IEEE fees in excess of \$ 20.00 for any prospective member. Contact Mike Harris for details (415-345-9403). Scott Barrows of the Membership Committee reported that the Product Safety Society is now over the minimum required for affiliation with the IEEE, but would like additional names on the petition before the Product Safety Society formally applies to the IEEE.

After the Committee reports, Brian introduced the special guests for the evening: Mr. Roy Clay, President of Rod-L Electronics, his son Chris Clay, a designer for Rod-L and Mr. Thomas Cooke, the Applications Engineer. The night's topic was "Hi-Pot Testing: Recommended Practices & Procedures". Roy began with a series of slides and a general discussion regarding basic Hi-Pot requirements. Roy indicated that almost all electrical products should be Hi-Pot tested. Generally, regulatory and municipal agencies require Hi-Pot testing. However, it should be standard safety practice whether or not it is required by an agency.

The next phase of the presentation dealt with the use of Hi-Pot testers and how to define dielectric breakdown. Roy discussed the vague definition of dielectric breakdown as defined by most product safety standards. The most common definition is "an uncontrolled rise in current". Roy explained it is this vague and subjective definition which makes construction of Hi-Pot testers very difficult.

Roy said there are 5 factors of Hi-Pot testing which should be addressed:

1. AC vs. DC Voltage
2. Rate of Test Voltage Rise
3. Peak Voltage Level
4. Test Duration
5. Sensitivity of Test Equipment

Santa Clara Valley Activity Report, *Continued*

Each of the above may influence whether or not equipment will pass the test. Rod-L's research has shown that the voltage ramp-up rate can have an influence whether or not a piece of equipment would fail the test. Also, the test duration is more significant than the test voltage and AC is generally more severe than DC.

The next meeting will be on Tuesday, June 28, at 7:00 pm at Apple Computer in Cupertino, 20525 Mariani Avenue, on the corner of DeAnza Blvd. (just south of the De Anza exit on Hwy 280). We will be having a presentation by Lew Bass on the topic of "System Safety for Commercial Products: Beyond Certification". Lew will discuss a hazard analysis and risk reduction approach to Product Safety rather than the typical "just meet the Standard" approach. See you there!

NEWS FROM COLORADO:

Steve Tarket is acting as a contact person for people interested in starting a chapter in the Denver area. So don't wait!

Contact: Steve Tarket (M/S 65)
3404 E. Harmony Road
Ft. Collins, CO 80525
telephone 303-229-2481; Fax 303-229-2692

NEWS FROM SOUTHERN CALIFORNIA:

The first meeting of the Southern California Chapter of the Product Safety Society was held at MAI Basic Four in Tustin. The meeting was part organizational and part presentations with 18 people in attendance. Charlie Bayhi provided a brief summary of the history behind the formation of the Product Safety Society, its members and its goal to achieve IEEE affiliation. Following introductions and the Society history, a presentation entitled "Witness and Self Certification Programs" was given by Charlie. The presentation provided information regarding UL's COMPASS program and the Manufacturer's Test Data Program, as well as Group H, Group J, and Group K programs. In addition, information was provided regarding CSA's Category Certification, Custom Rectifier Program, and Shared Certification Program, as well as Fixed Deposit License and Permanent Combined Deposit Agreement. Following this presentation, the group discussed the March 1988 Draft of the Proposed Safety of Information Technology Equipment.

The next meeting will be held at MAI Basic Four on Monday, August 1, 1988 at 6:00 pm. Charlie Bayhi has asked that interested persons let him know if the 6:00 pm starting time conflicts with their schedules.

Contact: Charlie Bayhi, MAI Basic Four, Tustin CA
Telephone: 714-730-2556; Fax: 714-730-3185

Northwest Chapter of PSS News

The next meeting of the Pacific Northwest Chapter of the Product Safety Society will be held on June 29, 1988 at the John Fluke Mfg. Co., in Everett, Washington. The meeting will be hosted by Walt Hart. The agenda will include the following speakers:

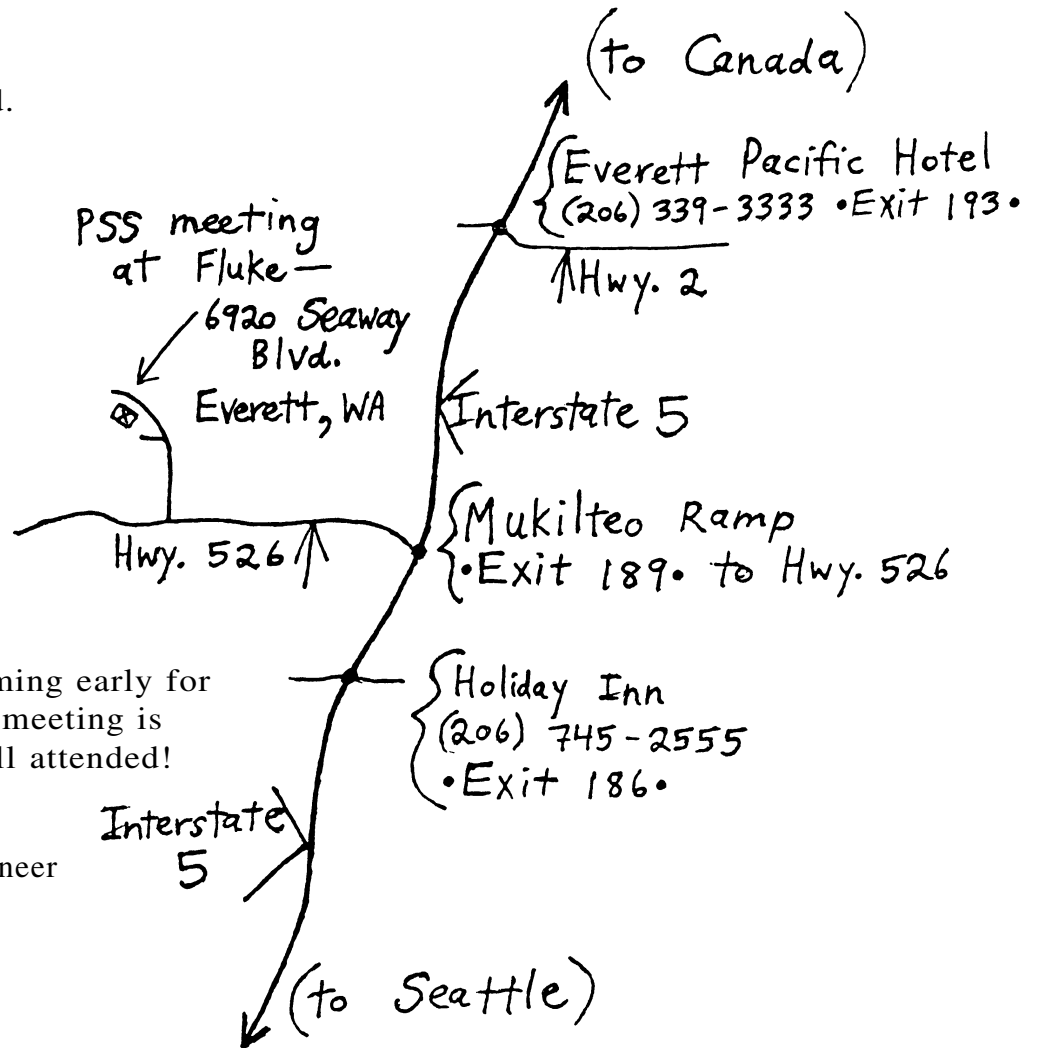
Hal Mickelson of HP speaking on Domestic Product Liability

Ruth Redden of Fluke speaking on European Product Liability

Walt Hart of Fluke speaking on Surge Testing.

Following the meeting there will be a no-host dinner and informal discussion. Those planning on attending either the dinner and/or dinner are asked to contact Walt Hart at the following address or phone number by June 27, 1988. Directions to Fluke are as shown below.

Walt Hart
Fluke Mfg Co.
6920 Seaway Blvd.
Everett, WA
206-356-5177



Please plan on coming early for a good seat as the meeting is expected to be well attended!

Al Van Houdt
Product Safety Engineer
SpaceLabs, Inc.
206-882-3700

NEWS FROM NEW ENGLAND

The first meeting of the Northeastern Chapter of the Product Safety Society was held on May 25, 1988. There were 38 engineers attending and those involved considered the meeting a great success. The enthusiasm and support were very strong.

During the meeting, it was decided that a name change would be appropriate due to the fact that the chapter has attracted members from New York, New Jersey, and Pennsylvania as well as the greater New England area. It was also agreed to conduct regularly scheduled monthly meetings on the fourth Wednesday of each month. The next meeting will be at Dash, Straus & Goodhue (593 Massachusetts Ave., Boxborough, MA 01719), June 22 at 7:00 pm. The topic will feature a round-table discussion on European legal and technical regulatory issues and trade issues.

The chapter received approximately 25 signatures on the IEEE petition and anticipate more to come.

Persons interested in more information about the Northeastern Chapter are encouraged to contact me.

Jim Norgaard
NEPSS Chairman
Dash, Straus & Goodhue, Inc.,
617- 263- 2662.

Editorial

Great ideas for the Newsletter have not been lacking lately. A sampling include the Ask Doctor Z" column (see elsewhere in this edition), a roster of agency names to know who to contact. new technical articles. plus more. We even have individuals who have expressed an interest in helping. Unfortunately, the work load still needs to be spread out. especially if the above ideas and interests are to be adequately addressed. Won't you consider what part you will have in the society. Great ideas need individuals like you to make them happen. Please give myself or one of the officers a call to offer your support.

Roger Volgstadt
Communications Chairman

MEMBERSHIP APPLICATION AND QUESTIONNAIRE

Please complete this form and return it to the address on the back of this page. Fold the page into thirds so that the return address shows, fasten it with two staples, then apply postage. No envelope is necessary. Thanks!

Name _____

Company _____

Street Address/PO. Box/Mail Stop _____

City/State/Zip Code. _____

Phone and Fax Numbers. _____

IEEE Membership: No ____ Yes ____ Number _____

Which IEEE Societies? _____

TOPIC INTEREST SURVEY — Please help us evaluate topics for Chapter meetings and technical articles. Rank the following from “10” (most interest) to a “1” (least interest). Results will be published in a future newsletter.

_____ Product Liability
 _____ Software Safety
 _____ Hazard Accessibility
 _____ Thermocouple Method
 _____ System Safety Analysis Techniques
 _____ Quantitive Risk Analysis/Hazard Assessment Techniques
 _____ CSA Presentation: Information Update
 _____ Human Factors
 _____ Product Safety Management
 _____ UL478/IEC950 Harmonization
 _____ Electrical Fire Hazard
 _____ Other: _____

1. Would you like to contribute articles of technical or general interest, news items, cartoons, editorial comment, or other submittals to the Product Safety Society Newsletter? ____ Yes ____ No.
2. Would you like to help with the start-up of a local chapter of the Product Safety Society in your area? ____ Yes ____ No.
3. Would you be able to act as an organizer for an initial chapter meeting and provide a meeting room ? ____ Yes ____ No.

Scott Barrows
Versatec
2805 Bowers Avenue
Santa Clara, CA 95051

(Product Safety Society)

Plastics, Continued from page 8

Certification Example

CUSTOM MOLDED PLASTIC CERTIFICATION

PART NUMBER (P/N/) — as received: _____

Intermediate P/N received by vendor: _____

NOTE: Traceability at each vendor must be establishable to the "as molded" part

For: (Your company)

From: (Vendor name and address)

COMPLETE THE FOLLOWING:

P/O# _____ P/O Qty _____

Actual Qty. shipped: _____

CERTIFICATION STATEMENT:

This part has been mfg'r'd. to conform with these (Your Company Name) design & specification documents: (please list all documents which trace information to the actual specific mt'l or optional mt'ls which can be used)
NOTE: ACCEPT NO VERBAL INSTRUCTIONS TO CHANGE MATERIALS.

Dwg #: _____ Rev: _____

Dwg #: _____ Rev: _____

THE INFO BELOW SHOULD BE HANDWRITTEN FOR EACH SHIPMENT; NO PHOTOCOPIED SIGNATURE:

The specific mt'l which was used is: _____

(Mfg'r name..Mfg'r designation ("grade"))

Generic type of mt'l: _____

Color: _____

Form of mt'l: (e.g., pellets, ____ mm thick sheet, liquid, etc.): _____

Max. % Regrind which was used is: _____(Greater than 25% is NEVER allowed)

NOTE: No add'l additives are to be added to the Mfg'r designated mt'l; except Structural Foam may have chemical blowing agent added per processing instr

These parts were fabricated between the dates of _____ and _____

I certify that these statements are accurate and complete.

Date: _____

Official Vendor Co. Rep.: _____

IMPORTANT INSTRUCTIONS

for (Company Name) Receiving Department

1. Verify that parts received are the correct (Company Name) Part Number.
2. Determine qty. of parts received in his shipment: _____qty.
3. Verify accuracy of part count by comparing this qty to vendor statement of actual Qty in this shipment.
4. Verify ORIGINAL vendor signature or signature and notation of "replacement CERT:"

Instructions for handling Discrepancies

1. DO NOT PUT THE PARTS IN STOCK
2. Move parts to for special handling.

Instructions for Acceptable CERT

1. Remove CERT and file under appropriate P/N per Receiving Procedure for handling CERTS.
2. Move parts to stock.

NOTE:More than one shipment may be under a single P/O # BUT A NEW CERT MUST ACCOMPANY EACH SEPARATE SHIPMENT. A single shipment may have more than one cert covering individual components within a single P/N.

Product Safety Society Newsletter
c/o Tandem Computers, Inc.
2550 Walsh Avenue
Santa Clara, CA 95051
attn: Roger Voligstadt

The Calendar of the Product Safety Society

June 1988

Wednesday, June 22

Northeastern Chapter Meeting

Subject: European Legal/Technical
Regulatory & Trade Issues

Speaker: Round Table format

Time: 7:00 pm

Location: Dash, Straus & Goodhue
593 Massachusetts Ave.
Boxborough, MA

Tuesday, June 28

Santa Clara Valley Chapter

Subject: System Safety for Commercial
Products: Beyond Certification

Speaker: Lew Bass

Time: 7:00 pm

Location: Apple Computer
20525 Mariani Ave.
Cupertino, CA

Wednesday, June 29

Pacific Northwest Chapter

Subject: Surge Testing; Product
Liability (US & Europe)

Speaker: Har, Hedden, Mickelson

Time: 1:00 to 5:00 pm

Location: John Fluke Mfg. Co.
6920 Seaway Blvd.
Everett, WA

August 1988

Monday August 1

Southern California Chapter:

Subject: to be determined

Time: 6:00 pm

Location: MAI Basic Four
14101 Myford Road
Tustin, CA

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