PRODUCT SAFETY COMPLIANCE - AN OVERVIEW

The product safety compliance process is described, with particular attention to international standards.

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INTRODUCTION

The importance of international product safety compliance cannot be disputed if one wishes to compete in today's world marketplace. Product safety compliance is a major requirement of many designs. Safety marks, such as UL, CSA, and TUV or VDE are associated with the components used. Ultimately, these marks and others appear on finished products. Products lacking appropriate marks, and noncompliant products, may be banned from sale in certain areas. They may also be subject to confiscation and/or impoundment by customs or other government officials. This article will introduce the responsible agencies and the current standards for EDP equipment, identify proven techniques for expediting approvals, and discuss alternatives available to those involved in product safety compliance.

IEC 950 - A WORLD STANDARD FOR EDP EQUIPMENT

Many changes have taken place in the regulatory world over the last five years. Most notable in the field of safety compliance is the new standard, IEC 950. Generated by the International Electrotechnical Commission (IEC), it is quickly becoming the "World Standard" for data processing equipment.

IEC Standards have no force of law behind them. The standards are generated by a consensus procedure within IEC committees and then offered by the IEC for consideration by its members. The IEC standards, if and when adopted by the member countries, may bear the force of law. IEC 950 (Copyright 1986, amended 1988) titled, "Safety of Information Technology Equipment Including Electrical Business Equipment" has been adopted in Europe as European Norm: EN 60 950, in Canada as CSA 22.2 No. 950, and in the U.S as UL 1950. Although all bear the same title, caution is required, as the documents are not identical.

UL 1950 and CSA 22.2 No. 950, very similar in content, contain more than 100 deviations from the IEC document. Reasons for the deviations are many, but include deviations for IEC requirements different from the Canadian Electrical Code (CEC) in Canada or the national Electrical Code (NEC) in the USA. Other deviations are based on UL component requirements, editorial deviations to correct typographical errors, and North American requirements, other than Code based.

EN 60 950, the European Norm, deviates from the IEC version for several reasons. The first is that the EN version suffers a time lag of up to 18 months due to its own ratification process. Since IEC 950 is continually undergoing refinement, some lag and resultant difference is inevitable. Another reason is that the EN version contains deviations with respect to the language to be used for markings in each of the member countries.

REQUIREMENTS IN THE U.S.

The situation is rapidly changing in the U.S. as well. As mentioned above, a new standard is available to manufacturers of information technology equipment. UL 1950 titled, "Information Technology Equipment Including Electrical Business Equipment" was published in March of 1989. Thus, equipment manufactured for sale in the states can be submitted under this new standard to UL or other test labs, allowing equipment to be evaluated for compliance with a standard analogous to IEC 950.

Another cautionary note: A UL Listing to UL 1950 neither infers or confirms strict compliance with the IEC or EN versions described above. However, UL and others can test for compliance with EN 60 950, if determined that this satisfies the legal and marketing requisites.

At this writing (March, 1990), data processing and office equipment can still be submitted for evaluation under the older standards. UL 114, Electric Office Appliances and Business Equipment (1/83), and UL 478, Information Processing and Business Equipment (9/86), can still be utilized, as appropriate.

REQUIREMENTS IN CANADA

In Canada, CSA published 22.2 No. 950 late in 1989, and manufacturers have the option of requesting evaluations under this standard. The cautions regarding the IEC 950 and EN 950 and EN 60 950 mentioned for UL 1950 apply here as well.

CSA 22.2 No. 143, Office Machines, and CSA 22.2, No. 154 Data Processing Equipment, which may be familiar, have now been superceded by CSA 22.2, No. 220, Information Processing and Business Equipment. Current certifications under these two standards, where equipment is not connected to a telecommunications network, may continue until September 30, 1993. After that date, equipment manufactured and certified to CSA 22.2 No. 220 may continue to be listed until September 30, 1999 or until the manufacturer qualifies the product to CSA 22.2 No. 950, whichever event occurs first.

REQUIREMENTS IN EUROPE

The European compliance scene is undergoing a great upheaval at this juncture. Due to the coordination of their internal markets, slated for completion in December, 1992 (EC92), much effort has been expended to simplify compliance methods. Under the "New Approach" doctrine, the European Commission has established broad directives for the protection of health, safety, and the environment, among others.

The development of specific safety standards, known as European Norms (ENs), has been subcontracted to CENELEC. Ninety-five percent of the ENs are essentially renumbered IEC Standards. Furthermore, it has been established that equipment which satisfies the requirements for safety compliance in one of the EC countries, must be allowed to move without impediment throughout the rest of the EC countries.

Thus, equipment satisfying the ENs requirement can be circulated throughout 12 countries after one set of tests. Where ENs have not yet been generated, one can rely on a relevant standard of an EC member country in its stead.

THE STATUS OF STANDARDS

A standard exists in one of three status levels. The specific level determines the applicant's options at a given point in time.

Initially, a standard is in the "Proposed" or "Draft" stage. This status, which may exist for two, three, or more years, provides for input from manufacturers, learned bodies, and the interested public. Many rounds of review are invited and ultimately a consensus is reached regarding the requirements of the standard.

When a consensus is reached, the standard will be "Published." At this juncture, if the standard is replacing an earlier version, the manufacturer has the option of complying with either version of the standard. In any case, the manufacturer has the option of complying with the "Published" standard. The "Published" version is optional until the "Effective" date arrives.

When a standard becomes "Effective," and certification is desired, compliance is mandatory. UL conducts a file review of devices listed or recognized prior to the "Effective" date and notifies manufacturers whether the pre-existing devices are compliant or if they must be resubmitted for consideration. The manufacturer's other choice is to remove the UL markings from non-compliant devices produced after the "Effective" date.

EXPEDITING THE APPLICATION PROCEDURE

The submission package should be arranged in an orderly fashion and the investigating engineer's questions anticipated.

The agencies need the following:

A. Applicant's identification.
B. Manufacturer's identification.
C. Alternate factory locations.
D. Listee, or recognized company if different from Items A or B.
E. Factory contacts.
F. Applicant's agent, if any.
G. Description of dielectric test gear.
H. Complete engineering details and ratings for primary (line-connected) components and major secondary components (power devices).
I. Schematic and PWB layout, color coded with respect to voltage levels. Component layout.
J. Inductive component details.
K. Polymers, including molded parts, bobbins, tapes, varnishes, potting compounds, and other insulating materials should be identified as to maker's name, trade name, generic material, flame rating and associated minimum thickness, file number, and minimum thickness of the part under consideration.
L. When Approved, Certified, or Recognized components are utilized, the appropriate file numbers are provided.
M. A deposit check is included based upon experience or the agency engineer's estimate. UL deposits usually cover one-half of the projected fee while CSA deposits cover the total for the complete project.

UL offers a Category H application procedure which obviates the need for a physical application and the associated delays. It is available to clients with good credit. A similar procedure is available at CSA. In their parlance, it is known as the Fixed Deposit License. At CSA, the applicant must maintain a sum on deposit which is sufficient to fund the new applications.

ACCELERATING THE TEST PROCEDURE

Agency policy normally dictates which of their offices will process a project. Normally, the physical location of the plant or office determines the responding agency office. It is possible to redirect the project to the office of choice through deft application procedures or through the use of an agent. This method may prove useful if the test lab queue at another office is much shorter than the queue at the "local" office.

A little known procedure at UL is the Flexi-job. This procedure provides a means of expediting the paper work at the "local" UL office while the lab portion of the job is subcontracted out to another office where the lab queue is shorter. Although the interoffice communications will absorb some of the time saved, the overall project should show a net savings.

RECOGNIZED INSULATION SYSTEMS

The term Recognized Insulation Systems (RIS) refers to components built in accordance with UL1446, Systems of Insulating Materials -- General. RIS provide a means for establishing that combinations of materials used as insulation are compatible with each other and to verify that their properties do not degrade at elevated temperatures. RISs are rated for use above 105°C. Seven system classes exist, as shown in Table 1.

Components which contain UL recognized insulation systems utilized within their constraints can be used in end products with little additional UL scrutiny with regards to materials. Use of insulating materials rated for the temperatures expected to be encountered in the product, but not qualified as RISs, do not satisfy UL's requirements. Other agencies, such as CSA, may accept the use of temperature rated materials in end products within their temperature constraints without the RIS status.

INDEPENDENT LABS AND AGENTS

Before this topic is addressed, the reasons behind our needs for agency approvals should be investigated. A product is subjected to the scrutiny of an agency for two reasons.

Economic Requirements are determined by customers. In the consumer world, for instance, one must consider the needs and demands of Sears Roebuck Co., K-Mart, or J. C. Penney's. They all require safety marks on their electrical goods and accept UL approvals along with those of other safety labs. In Europe, the major distributors have their own preferences with respect to agency marks. Although the VDE and TUV marks are well known in West Germany and most of Europe, the German safety law calls only for "Safe Equipment." Agency approvals are not necessarily required. The customer is perhaps the best source for information with respect to the requisite standards. The customer's input should be verified by the appropriate test agency. The customer may also accept the attestations of a non-agency lab.

Legislative Requirements are determined in major geographic marketplaces, such as Los Angeles. Electrical goods offered for sale in their jurisdiction are *required* to bear either the City of Los Angeles seal or some other mark acceptable to them. In foreign countries, Germany for instance, the GS mark, indicating Gepruft Sicherheit, (Tested Safe), is *required* for some products and *voluntary* for others. Again, the customer can be of great help in making this determination.

At this juncture, the functions of non-agency participants in the regulatory process will be addressed. As previously mentioned, the customer may accept the results of a non-agency laboratory. A savings of time or money may provide the impetus for their decision.

The supplier, in pursuit of an agency approval, may wish to have a third party verify the test results prior to agency submission. This process bolsters the chance of passing agency scrutiny the first time through.

The supplier may not have the manpower, time, or in-depth knowledge required to shepherd the product through the regulatory process. Although full-time attention is required for the efficient pursuit of safety marks, the level of regulatory liaison work within the organization may not justify the services of a full time engineer. An agent or third party lab may increase efficiency in a cost-effective manner. The agent provides a brokerage function to promote and protect the product and the supplier at the agency. In many cases, the agent may be able to negotiate seemingly unsolvable differences or stalemated situations.

DATA SHEETS

Data sheets for products which are eligible for agency approvals often indicate compliance where none

System	Maximum Hot Spot Temperatures	
130(B)	130C	266F
155(F)	155C	311F
180(H)	180C	356F
200(N)	200C	392F
220(R)	220C	428F
240(S)	240C	464F
>240(C)	>240C	>464F

Table 1. UL Recognized Insulation Systems.

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SELECTING RF/MICROWAVE INSTRUMENTATION FOR COMPLIANCE MEASUREMENTS

The radiation protection professional must choose RF/microwave instrumentation based on its ultimate operating environment.

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INTRODUCTION

During the past 20 years, awareness has increased in the health physics community of the potentially hazardous health effects of radiofrequency (RF) and microwave radiation. This article reviews the capabilities of past and present RF/microwave instrumentation and how their characteristics affect compliance measurements.

The average user is usually unaware of design limitations and compromises that different manufacturers have reached for their particular customer base or measurement philosophy. These compromises dictate how well an instrument will perform in a given RF/microwave environment.

HISTORY OF RF/MICROWAVE ENERGY AWARENESS

Approximately 20 years ago, the commercialization of microwave ovens generated a need for instrumentation operating at 915 and 2450 Megahertz (MHz) in order to obtain leakage information for manufacturers and repair organizations. Awareness of RF/microwave energy and its possible effects led to developments of broader frequency range monitors that, at first, were circularly polarized in an attempt to respond to all polarizations. These instruments were therefore not isotropic in their detection capability, and their effectiveness was markedly affected by geometric considerations. Without a priori knowledge of the field to be measured, a totally erroneous conclusion could have been made on the amount of RF/microwave energy present. These initial products were very broadband for their time, covering the spectrum from 1 to 14 Gigahertz (GHz) with the use of thermistor detectors. While the thermistor was very liner in its response, the receiving antenna design was not, necessitating multiple frequency calibrations to overcome polarization and frequency sensitivity errors of up to 10 decibels (dB). The next generation of these circularly polarized monitors incorporated thermocouple detectors, and improved antenna designs, which reduced frequency sensitivity errors to about 6 dB.

About 15 years ago, the first isotropic detection probes came on the market. Electric field probes became available covering the spectrum from 300 MHz to 18 GHz with a frequency sensitivity of only 3 dB, and a measuring range of 30 dB. During the early seventies the National Bureau of Standards (now the National Institute of Science and Technology, NIST) made many advances in calibration methods and procedures for quantifying RF/microwave fields. Near-field calculations and transverse electromagnetic (TEM cell) developments allowed for even higher calibration accuracies over a broad range of frequencies to uncertainties of +/-0.5 dB. Also in this time period, the development of magnetic field probes was accomplished, in part to measure the magnetic fields associated with high frequency (HF) communication systems. The impetus for the development of much of this isotropic instrumentation was the United States military, particularly the U.S. Air Force. The development of this broadband instrumentation overcame many of the problems associated with the earlier measurement equipment.

A discussion of the ability of the present generation of broadband isotropic instrumentation to perform compliance measurements is important. The 1974 American National Standards Institute (ANSI) Radiofrequency/Microwave Exposure Standard did not include frequency dependent criteria, nor did it differentiate between partial or whole body exposure. In 1982 the ANSI Standard was extensively revised to include frequency dependent exposure criteria. One of the most challenging changes to the standard for equipment manufacturers was the inclusion of these frequency dependent