

From Design to Label: A Look at Safety Certification

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INTRODUCTION

Successful product engineering depends on maintaining an accurate awareness of every detail of the design cycle -- especially details which affect cost factors and project schedules. In virtually every electrical and electronic product sold, an integral, yet often overlooked element of the design process is safety certification. A missing component or safety-related electrical problem can mean rework and extended project deadlines. For engineers and technicians, a clear understanding of the meaning behind "safety label" provides an early opportunity to improve design cycle scheduling, smooth the compliance process, and avoid potential marketing difficulties.

THE MEANING BEHIND THE SAFETY LABEL

The familiar "ETL Listed" or "UL Listed" labels signify that the product has been evaluated to nationally recognized safety standards, and that the manufacturer has agreed to ensure continued compliance and to allow periodic, unannounced, on-site factory inspections. The safety label is not a declaration that a product is unconditionally "safe," but rather that the product complies to applicable safety standards. In this way, the label adds to purchaser confidence in the safety of a product, while ensuring acceptance by code enforcement officials.

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Corporate purchasing specifications, design plans and supply requisitions often limit purchases to products listed and labeled by a nationally recognized testing laboratory. In addition, most major retailers insist on buying only certified equipment. Many localities have actually adopted a safety certification requirement into law. For example, the City of Los Angeles requires that all electric and electronic retail items comply with safety standards, and accept a safety certification mark from a nationally recognized laboratory as evidence of compliance.

PRODUCT SAFETY STANDARDS

Safety standards are established by a consensus process wherein various industry, government and private organizations coordinate to provide a basis for evaluating safety in the design features of manufactured products. In the interest of user and operator safety, hundreds of

categories of industrial, commercial and consumer product standards have been introduced by standard writing organizations such as Underwriters Laboratories Inc. (UL), the American National Standards Institute (ANSI), the American Society for Testing and Materials (ASTM) and the International Electrotechnical Commission (IEC).

Although these groups sponsor the creation of standards, the certification process is a separate activity and is performed by independent, accredited laboratories. For example, computers and other information technology equipment are tested to ANSI/UL Standard No. 1950 by UL, ETL and other laboratories.

Ultimately, product safety standards are enforced by local code enforcement officials. These local officials have the responsibility to determine safety standard compliance and may actually perform safety testing themselves. It is standard practice, however, for code enforcement officials to rely on the familiar "UL Listed" or "ETL Listed" mark as assurance that a product complies to the applicable standards.

Compliance with product standards is a key requirement in the National Electric Code (NEC). The NEC has been adopted into law by most local governments for building codes and ordi-

nances, and is used by code enforcement officials to evaluate proper building wiring. The NEC states that all equipment connected to a building's electrical system must meet applicable safety standards.

MANY PLAYERS

Two widely known, nationally recognized safety certification laboratories are Underwriter's Laboratories (UL) and ETL Testing Laboratories (ETL). A number of other independent laboratories have the capabilities to perform safety testing and certification. Some of these are limited to specific product categories and geographic areas.

The Occupational Safety and Health Administration (OSHA) conducts a program to recognize the qualifications of certification laboratories for those standards operating under OSHA jurisdiction. Laboratories applying for this recognition, called the Nationally Recognized Testing Laboratory (NRTL) program, usually apply for a limited number of products and are recognized by code enforcement officials for certifying only those product types.

THE CERTIFICATION PROCESS

The testing laboratory first prepares a thorough proposal outlining the number of samples needed, as well as the applicable product safety standards. The evaluation also details the complexity of the necessary tests and the costs involved in the testing program.

Product samples, delivered to the laboratory by the manufac-

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turer, are then inspected for construction and design features, as well as operation under various conditions. Table 1 lists features of electrical business equipment, and other information technology equipment

which would be tested to UL Standard No. 1950.

Other tests cover wire routing, connections and power supply. In addition, physical requirements, such as stability, stress relief and resistance to fire, are also evaluated to determine how a product will hold up under extreme conditions. More complex tests, such as an earthing-continuity test and a dielectric voltage-withstand test, are performed during operation.

All accessory pieces must also be evaluated for construction and operational features to ensure that they will not decrease the safety level of the product.

FOLLOW-UP

When testing is successfully completed, the manufacturer and the testing laboratory sign a listing, labeling and follow-up service agreement. As part of the complete certification process, this agreement places limits on label use and specifies that laboratory inspectors make announced visits to the manufacturing plant four times each year. During these quarterly visits, random samples may be inspected and quality control procedures reviewed to ensure that the tested samples and manufactured products do not differ.

THE IMPORTANCE OF LISTING AND LABELING

Upon execution of the follow-up agreement, manufacturers receive permission to use the safety label. In addition, some laboratories provide directories of listed products to purchasers and code enforcement officials, who use them to verify product safety listing claims.

Protection against electric shock energy hazards
Electrical insulation
Safety extra-low voltage circuits
Provisions for protective earthing
Safety interlocks
Protection against overheating of components such as motors and transformers
Accessibility to moving parts

Table 1. Equipment Features Tested to UL Standard No. 1950.

This is especially helpful when, due to oversight or shipping damage, equipment reaches the field without a safety label.

FIELD TESTING

In the event of a missing label, a code enforcement official may "red tag" a product, rendering it illegal to be connected electrically until compliance to safety standards is proven. In many cases, field testing and field labeling by laboratory engineers provide the necessary assurance to the local inspector.

The resulting "Field Tested" label differs from the "Listed Label," however, because the product's compliance to safety standards applies to the tested unit and field installation only. This *one-time* testing program means that, even with duplicate units, each product and each installation must eventually be tested individually. Also, in the event of reconfiguration, the original label becomes invalid and the equipment must be retested. Because field tested products are site-specific, they do not appear in the directories of listed products.

PLAN AHEAD

Understanding listing, labeling and the benefits of early consultation helps to avoid costly design rework and schedule delays. Test laboratories sometimes discover features that do not conform to standards in manufacturers' tested samples. Examples are missing electrical grounding lugs, which can pose a shock hazard, or inadequately covered moving parts, such as fan blades. These problems are avoided by early planning and consideration of safety standard requirements in the design process.

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WORLDWIDE TELECOMMUNICATIONS COMPLIANCE

As a separate service, some laboratories offer a pre-testing construction review to evaluate the product to applicable standards prior to submitting the product for a full evaluation and listing program. Also, laboratories can participate in planning the testing schedule to avoid interference with project deadlines.

For this reason, a safety listing agency should be involved at the onset of a project for an early awareness of safety compliance issues. Continuous consideration of these safety issues can greatly ease the pressures involved in the design process -- eliminating costly time delays and helping to ensure the marketability of a product.

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