

GKCL07 - Testing to Confirm Product Safety Compliance #1

In this article we shall begin to tackle some of the issues, problems and techniques involved with basic Product Safety Testing. This is not only a mine-field that requires detailed specialist and encyclopaedic knowledge - it is the 'last ditch' attempt to ensure that our well engineered product meets the wide-ranging and detailed safety requirements of our Harmonised standards.

Therefore, it is essential that we reflect upon what we must do and how we must undertake this - perhaps the most awesome job in the design process.

The Golden Rules

I am always asked - "You've been doing this for years - there must be some simple tips and methods....."

During the early nineties I tried to produce an 'expert system' to help in product safety analysis - I tried for many weeks to develop a simple structure, after several months I would have been pleased to find any structure that would work - eventually, years later, I gave up.

Through the following chapters I shall show some simple techniques to ease design, product safety proving (compliance verification) and to help you conduct physical reviews. But there are no short-cuts or panaceas that replace understanding, knowledge and experience.

However, I have learnt a few 'golden rules' over the years (mostly they result from bitter experience), here are a few of them:

1. When we Review or Test we are trying to make the product FAIL! We are not trying to prove that it will PASS. - See the following section "The Right Mind-Side".
2. Always have a copy of the relevant standard with you and use this book to aid your understanding of it.
3. Never review a product, or use a Product Safety Review Checklist unless you are confident of your understanding, competence and ability. (You could be placing yourself at considerable personal risk - physically and financially - if you make a mistake.)
4. If in doubt, always err on the side of caution - when standards are revised the changes are usually to make them clearer or the conditions more severe
5. If you find part of the product is 'marginal' but the interpretation of the standard allows you to accept the design consider (and explain to your manager) the business implications if that marginal PASS becomes a marginal FAILURE!
6. Remember that critical parameters are specified as MINIMUM or MAXIMUM. If we use these as nominal design parameters we will automatically guarantee that 50% of all our products will be non-compliant and potentially illegal.
7. Never be pressurised into allowing a dubious product to be supplied to a customer - samples and refurbished items must meet the latest standards of safety.
8. Always correct a non-compliance. To place the CE Mark to a product knowing it to be non-compliant is a Criminal Offence. You may be prosecuted, fined, and imprisoned.
9. Always proceed methodically and record each step. This will allow others to follow your path - this will be essential when someone needs to answer a detailed question about the product or to re-specify a critical component.
10. Always get a copy of a safety certificate for each Safety Critical Item before you are committed to use that component.
11. NEVER ASSUME.
12. ALWAYS DEMAND PROOF.

13. NEVER ACCEPT **VERBAL** ASSURANCES.

The Right Mind-Set

As design engineers we expect our products to be right and to work correctly - if we thought that there was less than a 95% chance that they won't then we would not start the design process. This expectation of 'correct' performance is the biggest single problem that we must overcome. We must attempt to make it fail - and analyse how it could create a hazard; then, with this knowledge, we add modifications and/or (where permissible) warnings.

Before we start - remember that someone, somewhere will do something that we thought would be unlikely, unreasonable or just plain stupid - and if they are injured then at the very least we will have to defend our product. At the other extreme we may be forced to recall every product from the entire European Economic Area.

Mechanical Tests

These tests are usually designed to check that the "Operator" cannot be hurt. The tests will usually consider two possibilities:-

?? the product injures the "Operator" [Stability (Topple) Tests]

?? the "Operator" injures himself (or herself) on the equipment
[Accessibility, Sharp Edges, Mechanical Strength]

PLEASE NOTE: The following tests are not authoritative but are intended to give an outline of some of the mechanical testing that is necessary - yet often overlooked during the design proving phase - please refer to the requirements detailed throughout the safety standard appropriate to your product.

Tilt Test

During these tests any feet, wheels or other configurable parts are placed in the worst configuration.

Purpose: To ensure that the Unit Under Test (UUT) will not topple during transport or manual handling.

Method: Tilt the UUT to 10 ° from the vertical in all directions (Backwards - Forwards - Left and Right) the UUT must return to the vertical when the tilting force is removed.

Operator Push

Purpose: To ensure that the UUT will not topple when it is leaned upon in normal use.

Method: Apply the appropriate test force to any surface in any direction (except upwards) - up to a maximum height specified by the standards. Prevent the UUT from sliding on the floor - if the UUT begins to tilt maintain the force to the point applied - the UUT shall not fall over.

Open any door, fixing, drawer or tray - that the "Operator" can access - and repeat the test in ALL configurations.

Service Push

Purpose: To ensure that the UUT will not topple when it is leaned upon during servicing.

Method: Open any door, fixing, drawer or tray that “Service” personnel can access - install stabilising mechanisms in accordance with the “Service Instructions” and apply the appropriate test force to any surface in any direction (except upwards) - up to a maximum height specified by the standards. Prevent the UUT from sliding on the floor - if the UUT begins to tilt maintain the force to the point applied - the UUT shall not fall over.

Step Test

Purpose: To ensure that the UUT will not collapse or create a hazard during foreseeable misuse.

Method: Apply a 800N force downward on any surface up to the height specified in the standard. The UUT shall not topple or present any other mechanical hazard. The Creepage and Clearance distances within the UUT shall not be compromised.

Force Test for Internal Structures

Purpose: To ensure that normal servicing does not create a hazard

Method: Apply the specified (Usually 30 N) force to internal surfaces in all directions. Creepage and Clearance distances shall not be compromised - the operation of safety devices (such as interlocks and overload devices) shall not be compromised.

Accessibility

Purpose: To verify that the “Operator” cannot contact any hazards.

Method: Use the Test Finger and Test Pin to all openings (there will usually be special requirements for Bottom opening of “Fixed” equipment. The Test implement shall not contact any hazardous part.

This usually means recording all parts that can be contacted and conducting additional test to ensure that they are comply with the safety requirements - see later issues.

Open any door, fixing, drawer or tray - that the “Operator” can access - and repeat the test in ALL configurations.

If any tools are made “Operator” accessible then undo ANY fixing (misusing the tool if necessary) and repeat the tests.

Impact Test

Purpose: To ensure that the UUT has appropriate strength.

Method: Drop a 500gm Steel Ball (or use the impact hammer- if specified) on all surfaces that provide a Mechanical, Fire, or Electrical Enclosure. The

Surface shall not break sufficient to allow a Test Finger to penetrate. Nor shall Creepage or Clearance Distances be compromised.

Sharp Edge Test

Purpose: To ensure that external and internal surfaces will not present a hazard to the “Operator”, “Service” personnel or to electrical insulation.

Method: Most of the harmonised standards do not specify test equipment for this - physical examination is usually accepted. It is a good idea to check this with your finger.

Please remember that different standards require different test - and different acceptance criteria. Therefore check with the standard appropriate to your product, its use and its application.