A BUYER'S GUIDE TO AUSTRALIAN COMPLIANCE REGULATIONS

With the bewildering array of electrical and electronic appliances on sale in this country, you might be forgiven for thinking that there's an "anything goes" policy regarding the importing of manufactured goods.

This is far from the truth, in fact there are strict laws regarding adherence to safety and other standards. While there will always be a certain level of "Grey Market" activity, where dodgy merchandise slips through the net, the penalties for selling non-compliant equipment are severe enough to deter most retailers. When non-compliant equipment does make it to the marketplace, it's more likely to be the result of ignorance than an outright attempt to deceive.

Under Australian consumer laws, (and those of most countries now), the person or company who imported the item is deemed to be the manufacturer, and must themselves make good any deficiency and/or provide compensation for any incidental damage caused. The days when the customer could be made the ball in a game of ping-pong between the wholesaler and the retailer are long gone!

It's OK to give the customer the option of dealing with the local supplier in an effort to speed things up, but it has to be quite clear that that is just an option; under Australian Consumer law, the customer always has the right to return a product to the point of sale. Retailers are specifically prohibited from:

A. Making statements like "DO NOT RETURN TO STORE; CONTACT …"

B. Referring customers to a website or phone number as the only return option.

C. Attempting to override the minimum warranty requirements under Federal Consumer Protection laws.

While most retailers sign formal contracts with their local suppliers, effectively making the suppliers liable for any damage caused by their products, it is still the retailer who has to compensate the customer, and then seek whatever compensation he sees fit from the supplier. There is also the very real possibility that the supplier might decide it is more cost-effective to simply go bankrupt; but that is of no relevance; the retailer is still liable.

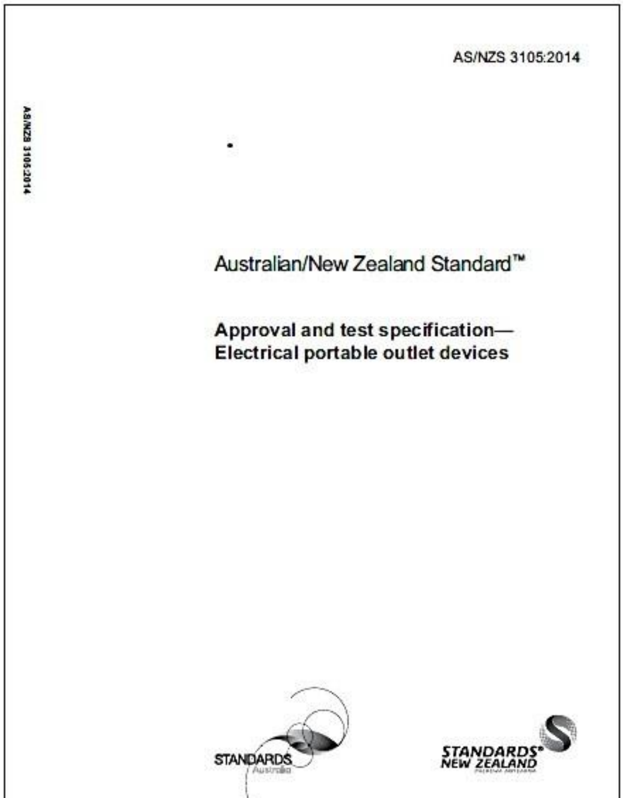
Apart from this, if somebody is killed or injured by a product, it is the retailer who faces any resultant criminal negligence charges; regardless of any contracts they made the supplier sign. So, regardless of how a product is sourced, the retailer still needs to do his "Due Diligence".

In other words, the various State and Federal regulators are asking this question more and more, and not always as the result of an incident:

"How *exactly* did you determine that this product was actually safe and compliant with local safety standards; and: 'The supplier signed a piece of paper assuring me it was' is *not* an acceptable answer…"

STANDARDS DOCUMENTS

Virtually all the standards used in this country are combined Australian/New Zealand documents, with an "AS/NZS" prefix. The bulk of these are based on European Union (EU) Standards - in most cases virtually a word-for-word copy. In general the identification number of the AS/NZS standard is also derived from the European one. For example, AS/NZS CISPR13, the electrical interference standard for AV equipment, is a modified version of the European CISPR13, which in its turn is a modified version of the alternative EN50013.


AS/NZS 3105:2014

AS/NZS 3105:2014

Australian/New Zealand Standard™

Approval and test specification—
Electrical portable outlet devices

STANDARDS Australia

STANDARDS NEW ZEALAND

Typical standard document from SAi Global

Originally, local product standards were devised and maintained a not-for-profit organization called the Standards Association of Australia, (SAA). More recently this was restructured and renamed Standards Australia.

Currently Standards Australia is still responsible for maintaining the standards, while a separate division, SAI Global, now takes care of distribution and publicity etc.

(In Asia, people almost universally refer to electrical safety reports as "SAA reports, and Electrical Approval Certificates as "SAA certificates", although by that logic, any document based on an AS/NZS standard could arguably be referred to as an "SAA" report! More about this later).

The SAI Global website carries a huge compendium of Australian Standards documents in PDF format, on every conceivable subject (not just electrical). The example shown here is the cover page of the 2014 edition of AS/NZS 3105, which mostly covers things like 240V Powerboards.

All of them have to be purchased, (unless you take out an expensive subscription), and many of them are just about incomprehensible to the casual reader! Other countries either use their own versions of the EU standards, or US standards. However, the US standards, while broadly similar in scope to the European ones, are sufficiently different that they are normally not recognized in Australia.

It's important to understand that these standards are not legally enforceable regulations in themselves; they're more a professional opinion of what is required for a safe or workable product. Standards Australia is more like a Think Tank that the governments consult from time to time. It is only when a government (either state or federal) passes regulations based on a particular standard that it becomes legally enforceable.

In the EU, their standards are a subset of a much larger raft of so-called "directives" which, again, are not regulations in themselves, they're more like guidelines for drafting individual member countries' laws, in an attempt to simplify interactions between them ("Harmonize" is the term used). Directives cover every conceivable subject, from human rights, to food labeling, banking, and of course, consumer safety. The list is endless, but there are two sections we're mainly interested in here:

- **The Low Voltage Directive ("LVD")** which confusingly, means "between 50 Volts and 1,000 Volts AC" or "between 75 Volts and 1,500 Volts DC". Standards for "low voltage" equipment cover 240V and 415V AC appliances!

- **The Electromagnetic Compatibility Directive ("EMC")**. This is the catch-all directive for standards relating to anything concerned with electromagnetic radiation, intentional or unintentional, transmitted or received. And yes, "electromagnetic radiation" does include light!

In general, most standards tend to be a rambling mess of statements, not laid out in any particularly logical order, (not one that would make sense to the average electronics technician or engineer at any rate!). The text will regularly refer the reader to tables, clauses and diagrams, without giving any clue to what page they're on. (OR, you have to look them up in a completely different standard!) Physical values (dimensions etc) often have to be divined from "one-size-fits-all" tables that are sometimes baffling in their complexity. And quite apart from the boiler-plate bureaucratic impenetrability, in many cases the PDF pages of Australian/NZ standards are effectively "images" of pages scanned from the original European documents, with the result that the document page numbers seen on the screen rarely match the PDF page numbers! (Any parts that aren't applicable to Australia are simply "ruled out", ~~like this!~~)

In a few cases the only section that has been entered electronically is the preamble and the subject index, the rest effectively consisting of a scan of a paper document! So, apart from the first few pages, some documents are not electronically searchable!

That is not all. Subscription PDF downloads from the SAI website are programmed to "expire" from your hard drive after two days. After that the Acrobat reader can no longer open them. You are allowed to print them out beforehand, but then you lose the search capability.

Most standards are updated every few years, with a "sunset" date for the standard replaced. If a manufacturer has a test report (see below) that was made to a now-expired standard, in most cases it is no longer considered valid, and a new report has to be generated, at extra cost!

STANDARDS FOR MAINS-POWERED AUDIO-VISUAL ELECTRONIC EQUIPMENT

The "Generic" European standard for this is EN60065 and the Australian version is AS/NZS60065. The only real differences refer to the particular mains plugs used in Australia and New Zealand, plus a few other "National Differences" mostly to do with plastic flammability (presumably because it gets a lot hotter here than in Europe) . There is also AS/NZS60950, which although it specifically refers to IT and telecommunications Equipment, is often

AS/NZS 3105:2014 16

TABLE 2

TESTS TO BE APPLIED AND ORDER OF APPLICATION

Example of a typical "One Size Fits All" Table. Notice how AS/NZS 3105 refers you to AS/NZS 3100 and AS/NZS 60335.1…

Test No.	Description of test	Clause reference for test procedure and criteria	Sample identification
1	Insulation resistance	'Insulation resistance' stated in AS/NZS 3100	A
2	High voltage [illegible]	[illegible]	[illegible]
3	Earthing con[illegible]	[illegible]	[illegible]
4	Cord anchorage	10.2 herein	A
5	Screw threads and fixings	'Test for screw threads and fixings' stated in AS/NZS 3100	A
6	Temperature rise during normal operation	10.3 herein	A
7	Leakage current	'Leakage current' stated in AS/NZS 3100	A
8	Insulation resistance	'Insulation resistance' stated in AS/NZS 3100	A
9	High voltage	'High voltage (electric strength) test' stated in AS/NZS 3100	A
10	Mechanical strength	10.4 herein	B, C
11	Overload test	10.5 herein	D
12	Overload protection	10.6 herein	A
13	Over-temperature protection	10.7 herein	A
14	Abnormal operation	10.8 herein	E
15	Insulation resistance	'Insulation resistance' stated in AS/NZS 3100	E
16	High voltage	'High voltage (electric strength) test' stated in AS/NZS 3100	E
17	Additional tests for integrally moulded EPODs and EPODs provided with a junction	10.9 herein	F, G, H, I (see Note 1)
18	Test of cord entry (for EPODs incorporating a reeling or coiling arrangement)	10.10 herein	A
19	Test of automatic recoiling device	Requirements and tests for automatic cord reels stated in AS/NZS 60335.1	A
20	Determination of ignitability and combustion propagation	10.11 herein	Any (see Note 2)
21	Test of electronic components (for EPODs incorporating electronic components)	'Abnormal operation' stated in AS/NZS 3100	J (see Note 3)

NOTES:

1 The additional samples for Test No. 17 are required only for integrally moulded EPODs. An unmoulded sample will be required for these tests.

2 Test No. 20 may require an additional sample in new and clean condition.

3 Test No. 21 may require several samples.

4 Sample A can be used to verify the general requirements and dimensional requirements of this Standard.

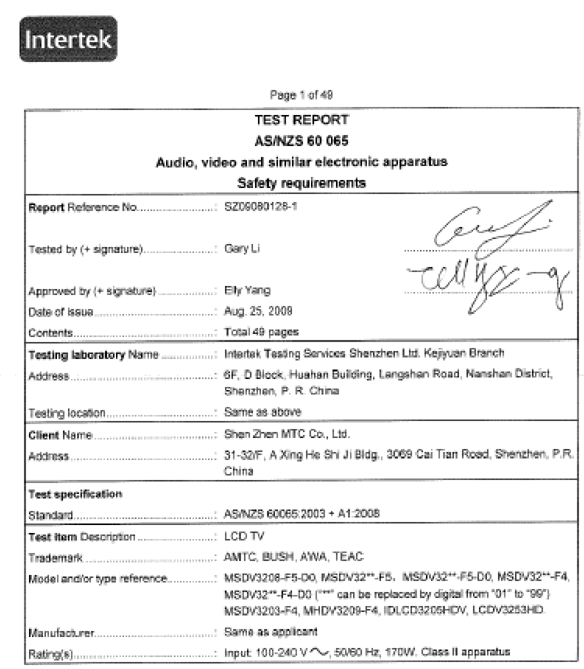
acceptable in place of AS/NZS60065.

These standards are mainly concerned with such things as the type and quality of insulation required, and the means of testing for breakdown voltages. For example, where it is necessary for components to bridge between active and neutral and/or the "hot" and "cold" parts of switchmode power supplies, special components are mandatory. Specifically labeled capacitors ("X-" and "Y-" rated) are required, and other components such as switching transformers and opto-isolators have to be constructed to similar standards, using approved insulating materials. And quite apart from the dangers posed by electrical breakdown of insulation, there are considerations of flammability of plastics and so on.

There are more specialized safety standards for things like electronic lighting ballasts, but in many cases the basic safety requirements are either identical to AS/NZS 60065 or very similar, and again it is possible to interchange the standards to a certain extent. This also means that a test report made to an EU standard is acceptable in Australia, as long as either all the sections relevant to the testing are identical in the Australian version, or the "Australian Deviations" are mentioned. Thus a test report for a switchmode power supply done to EN60065 or IEC60065 will quite likely be acceptable in place of one to AS/NZS60065.

TEST LABS

But how is the safety or otherwise of an appliance actually determined? And who decides whether the level of interference it radiates is acceptable and so on? This is where compliance testing laboratories come into the picture. Take an everyday example such as a 240V switchmode plugpack power supply. Getting the device designed and manufactured is only the first step in a sometimes very long process before it can be licensed for sale in most countries (well in theory anyway). To start with, the manufacturer will have to produce test reports from an accredited test laboratory that it is electrically safe – "LVD testing" - and that it does not radiate excessive levels of interference – "EMC testing".



Intertek

Page 1 of 49

TEST REPORT
AS/NZS 60 065
Audio, video and similar electronic apparatus
Safety requirements

Report Reference No.	SZ09080128-1
Tested by (+ signature)	Gary Li
Approved by (+ signature)	Elly Yang
Date of issue	Aug. 25, 2009
Contents	Total 49 pages
Testing laboratory Name	Intertek Testing Services Shenzhen Ltd. Kejiyuan Branch
Address	6F, D Block, Huahan Building, Langshan Road, Nanshan District, Shenzhen, P. R. China
Testing location	Same as above
Client Name	Shen Zhen MTC Co., Ltd.
Address	31-32/F, A Xing He Shi Ji Bldg., 3069 Cai Tian Road, Shenzhen, P.R. China
Test specification	
Standard	AS/NZS 60065:2003 + A1:2008
Test item Description	LCD TV
Trademark	AMTC, BUSH, AWA, TEAC
Model and/or type reference	MSDV3208-F5-D0, MSDV32**-F5, MSDV32**-F5-D0, MSDV32**-F4, MSDV32**-F4-D0 ("**" can be replaced by digital from "01" to "99") MSDV3203-F4, MHDV3209-F4, IDLCD3206HDV, LCDV3253HD
Manufacturer	Same as applicant
Rating(s)	Input: 100-240 V ~, 50/60 Hz, 170W, Class II apparatus

An example of the cover page of a typical Electrical Safety Report from an Intertek Test Lab, in this case to AS/NZS 60065, for an LCD TV set.

TRF No: AS60065_a/Eeffective date: 22 July 2008
Intertek Testing Services Shenzhen Ltd. Kejiyuan Branch
6F, D Block, Huahan Building, Langshan Road, Nanshan District, Shenzhen, P. R. China
Tel: (86 755) 8601 6288 Fax: (86 755) 8601 6751 Website: www.china.intertek-etlsemko.com

Many countries (including Australia) now include a third test category for detachable power supplies, TV sets, Digital Set Top Boxes lamps, Refrigerators, and a few other categories, commonly referred to as "MEPS" which stands for "Minimum Efficiency Performance Standard."

(In Australia, this was recently re-invented as "GEMS" - Greenhouse and Energy Minimum Standards).

MEPS/GEMS will eventually apply to all mains-powered electrical appliances, and essentially specifies how much energy an appliance is allowed to waste as heat. (You will already have seen "Energy Star" labels on TV sets and other appliances, which are now mandatory under current legislation).

Most manufacturers and some importers have access to some sort of basic test facilities for safety, EMC and MEPS testing, but usually these are only intended to give them some indication that the sample they want to submit to a proper test lab is likely to pass. Accredited testing is quite an expensive process and you normally have to pay each time, pass or not! Although it is theoretically possible for an unaccredited in-house facility to generate its own rest reports, if their tests fail to detect a potentially illegal deficiency in a device they are selling, and the seller is prosecuted under state or federal laws, their reports will not stand up terribly well in court!

CRITICAL COMPONENTS

The most important part of an Electrical Safety report for any mains-driven power supply is the so-called "List of Critical Components and materials" - a listing of all the parts likely to present a significant safety hazard if they were to go faulty. Apart from the risk of fires, components that bridge the "hot" and "cold" parts of the power supply would make the DC output plug live if they were to go short-circuit. Since most electronic equipment these days is not earthed, this is obviously very important.

Manufacturers try to have as few components as possible that bridge the hot and cold zones. In most modern switchmode power supplies, the only things that really need to do this are the switching transformer, an opto-isolator for voltage feedback, and interference suppression ("Y") capacitor, all of which can be made to reliably withstand over 8,000V DC, although the

Intertek

Typical Critical Component list

Page 43 of 49 Report No.: SZ09080128-1

14 TABLE: list of critical components and materials (Cont'd) P

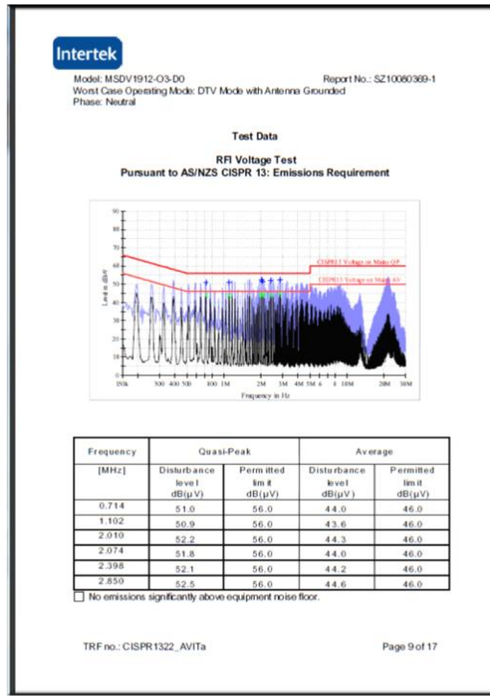
Component	Manufacturer/ trademark	Type/model	Value / rating	Standard	Approval/ Reference
LCD Panel	Chi Mei Optoelectronics Corp	V320B1-XXX; V315B1-XXX; V315B3-XXX; V315B6-XXX ("X" may be 0-9 or A-Z or blank)	32"	AS/NZS 60065	Tested with appliance
LCD Panel (alternative)	AU Optronics Corporation	T315XWYY T315HWYY ("Y" may be 0-9 or A-Z or blank)	32"	AS/NZS 60065	Tested with appliance
LCD Panel (alternative)	Sharp Corporation	Lx315Txxxxx ("x" may be 0-9 or A-Z or blank)	32"	AS/NZS 60065	Tested with appliance
LCD Panel (alternative)	Hitachi	BM080Axxx ("x" may be 0-9 or A-Z or blank)	32"	AS/NZS 60065	Tested with appliance
LCD Panel (alternative)	LG Philips LCD Co., Ltd	LC320W# * ("#" may be "0" or "x"; "*" is any digital)	32"	AS/NZS 60065	Tested with appliance
Fuse FUSE1	Hollyland Co., Ltd	50CT	T5AH/250Vac	EN 60127-1, EN 60127-2	[D-mark]
Fuse FUSE1 (alternative)	Walter Electronic Co., Ltd	TSC	T5AH/250Vac	EN 60127-1, EN 60127-2	[D-mark]
Fuse FUSE1 (alternative)	Various	Various	T5AH/250Vac	EN 60127-1, EN 60127-2	S & other EU cert. marks
X2 capacitor CX1	Xiamen Faratronic Co., Ltd	MKP62	AC 275V 0,68μF, X2	IEC 60384-14	[D-mark]
X2 capacitor CX1 (alternative)	Europtronic (Taiwan) Industrial Corp	MPX	AC 275V 0,68μF, X2	IEC 60384-14	[D-mark]
Y1 Capacitor CY1, CY2, CY3	TDK Xiamen Co., Ltd	CD	470pF, AC 250V	IEC 60384-14	[D-mark]

TRF No: AS60065_a/Eeffective date: 22 July 2008
Intertek Testing Services Shenzhen Ltd. Kejiyuan Branch
6F, D Block, Huahan Building, Langshan Road, Nanshan District, Shenzhen, P. R. China
Tel: (86 755) 8601 6288 Fax: (86 755) 8601 6751 Website: www.china.intertek-etlsemko.com

usual standard test is 4,250V DC.

High voltage 50Hz AC testing is not usual for switchmode power supplies, as the current passing through the interference suppression capacitors can be difficult to distinguish from actual breakdown leakage. And that brings up the thorny subject of conflicting requirements….

Apart from being electrically safe, the device must also be electrically "quiet" – it has to meet "Electromagnetic Compatibility" (EMC) requirements. This requires the fitting of EMC chokes, bypass capacitors and sometimes shielding groundplanes. On the right is an example of a page from the EMC report for the same TV set.



Intertek

Model: MSDV1912-O3-D0 Report No.: SZ10060369-1
Worst Case Operating Mode: DTV Mode with Antenna Grounded
Phase: Neutral

Test Data

RFI Voltage Test
Pursuant to AS/NZS CISPR 13: Emissions Requirement

Frequency	Quasi-Peak		Average	
[MHz]	Disturbance level dB(μV)	Permitted limit dB(μV)	Disturbance level dB(μV)	Permitted limit dB(μV)
0.714	51.0	56.0	44.0	46.0
1.102	50.9	56.0	43.6	46.0
2.010	52.2	56.0	44.3	46.0
2.074	51.8	56.0	44.0	46.0
2.398	52.1	56.0	44.2	46.0
2.850	52.5	56.0	44.6	46.0

☐ No emissions significantly above equipment noise floor.

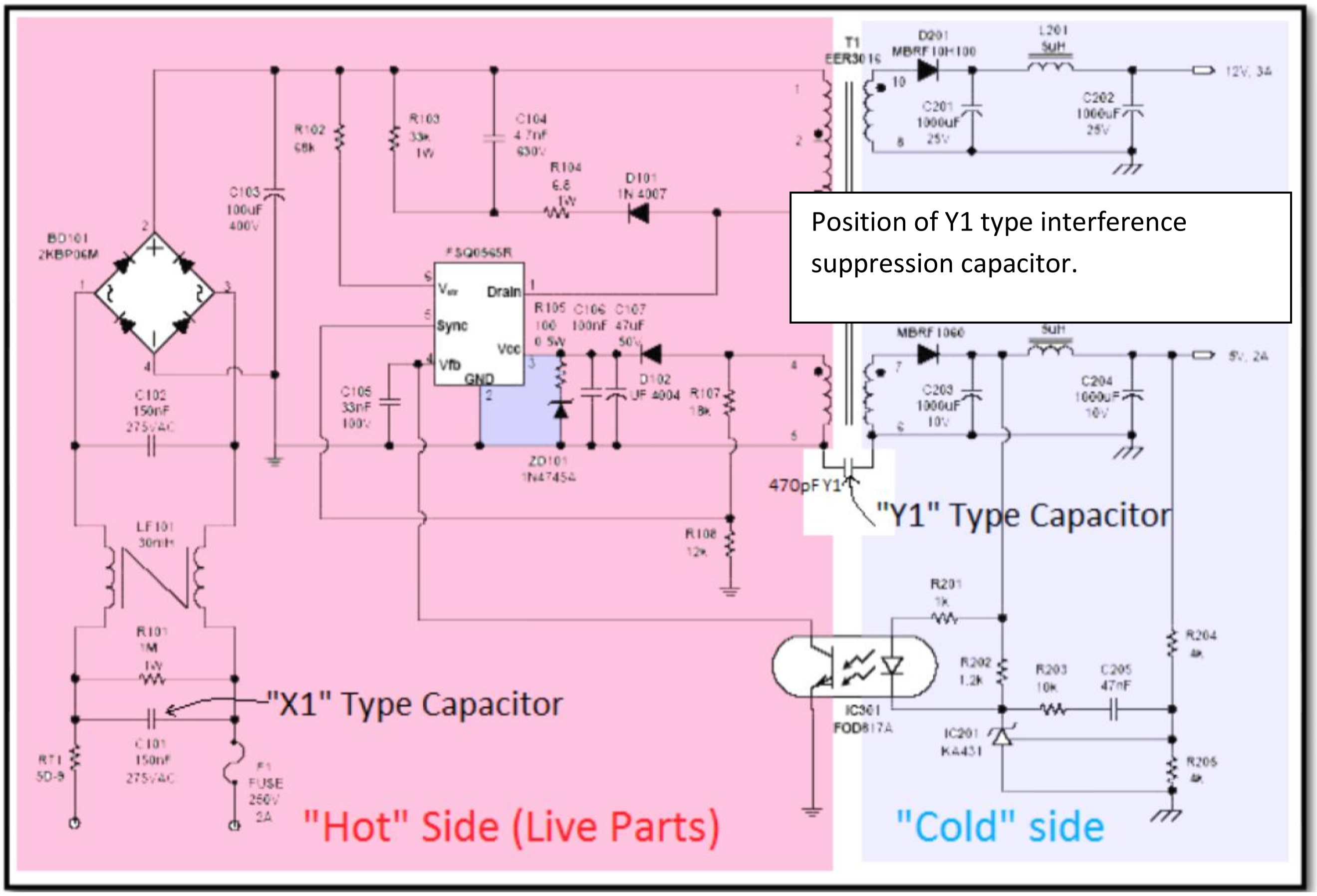
TRF no.: CISPR1322_AVITa Page 9 of 17

Switchmode power supplies have a particular problem in that they involve a transformer whose primary winding has a high-voltage, high frequency squarewave applied to it. This squarewave can easily have a peak-to-peak amplitude of 350V, with a very fast risetime. Even a tiny amount of capacitive coupling between the primary and secondary windings will make the DC output cable a very effective radiator of electromagnetic interference.

The most effective solution is to provide an electrostatic shield between the primary and secondary windings, connected to the input side ground. However this is problematic in that it reduces the efficiency of the transformer due to eddy current heating, (thus upsetting MEPS) and also makes the transformer more complicated to produce. Instead, most manufacturers simply fit a small "Y-rated" ceramic capacitor (see below) between the input and output grounds. This diverts the switching hash back into the mains wires where it gets absorbed.

In itself this is no problem for the manufacturer, since the cost involved is usually small; the trouble is that the extra components fitted for EMC can then compromise electrical safety. It's not at all unusual for a device to pass LVD testing but fail EMC testing, and then, after being modified so that it passes EMC, fail LVD testing! (Assuming they actually bother to get it tested again, which is not always the case!)

And here we come to one of the most misunderstood aspects of LVD and EMC test



reports, misunderstood by both manufacturers and importers: Once a report of any sort has been issued, the manufacturer is thereafter expressly prohibited from using that report if there have been any significant changes to the construction of the device, and most specifically, if any of the components on a Critical Components List have been changed. Production units are supposed to be "constructed identically" to the original unit that was submitted for testing, and the critical components used can only be either the exact same type and brand, or be one of the approved alternatives on the list.

While in theory, every single component should be identical to those used in the sample unit(s) tested; some leeway is allowable with minor details such as the brands of low-power passive components used in non-critical applications. However, they must still be direct equivalents, with the same value, voltage rating and physical size.

In general, changes to the PC board layout and to the dimensions of heatsinks etc are also specifically prohibited. If there are any changes of that type, a sample of the new version has to be submitted to the lab and a new report issued, (or at the very least an "addendum" to the original report issued by the same lab, on an official letterhead). An email from the manufacturer saying "The test lab said it was OK" is not sufficient! In the case of EMC compliance, minor changes to the design can be accepted without further testing if, in the opinion of the importer, the change is unlikely to significantly affect EMC, but they have to write out and sign a “variant” declaration to this effect.

In theory, the compliance test lab has to carry out exhaustive testing on all the Critical Components supplied. The appliance manufacturer has to provide data sheets, and samples of any alternative parts they may consider using. In practice, most labs will already have encountered the more common components in earlier products, so a lot of the “testing” amounts to simple visual confirmation.

If manufacturers make any of the parts themselves (such as transformers), construction details and samples of the materials used will be required. The lab will dismantle the transformers and check that they have been constructed properly; using the correct grade of that yellow mylar tape that you will see on just about all transformers these days.

Other components may not directly present a shock hazard, but they could cause fires. Dual-wound input filter chokes must be constructed to minimize the possibility of the live and neutral windings touching, and all components must be constructed from flame retardant materials.

Safety-critical capacitors come in two types:

1. “X” rated, which usually have fairly high capacitance (47nF ~ 470nF) and can only be used where their going short-circuit is not likely to present a shock hazard. They are most commonly seen connected between the mains active and neutral connections for EMC filtering. Somewhat counter-intuitively, “X2” capacitors are rated to withstand voltage spikes up to 2.5kV, while “X1” type are rated at 4.5kV. (Just remember, you need TWO X2's to equal ONE X1!)

Typical X-Capacitor

2. “Y” rated capacitors, which are the thick (usually blue) ceramic types seen in all switchmode power supplies. These are designed to connect directly between the live side of a switchmode supply and its low-voltage output, so

Typical Y-Capacitor

clearly they need to be ultra-reliable. They are nominally rated at 250VAC and the largest permissible value that be connected between the “hot” and “cold” sections is 2.2nF, which allows a maximum current of flow from live to ground of 150 microamps at 240V AC. The same types of capacitors are often used even if the appliance uses an earth wire, since you can’t absolutely guarantee the earth connection will be present. Again, the possibly counter-intuitive rating system: ONE “Y1” is acceptable between “hot” and “cold”, while TWO “Y2s” will be needed in series for the same job. For safety-critical applications, some manufacturers use two Y1 types in series.

(Actually, Y2 and X2 capacitors are really designed for 110V AC operation).

Y-rated capacitors obviously need to be made as reliable as any electronic component can be made, able to withstand things like lightning hitting the power lines, or trees falling on power poles carrying both 240V domestic and high voltage distribution lines (up to 6.6kV) and so on. Because of their largely inorganic construction, if a Y-rated capacitor initially passes a high-voltage test, there is no reason to expect it will fail at a later date. Although they are not specifically designed for it, most Y1 capacitors will withstand at least 10,000 Volts DC for short periods. (They could go even higher, but sparks tend to jump across their connecting wires!)

You can identify a Y-rated capacitor simply by the fact that it should have “Y1” or “Y2” marked on its case (although it can be extremely hard to read sometimes!). Y-rated capacitors are also acceptable for “X” service, and you will sometimes see them marked “X1Y1” or similar. The blue one above is rated 400VAC for X1 operation and 250VAC for Y1 operation.

TOUCH CURRENT

As mentioned earlier, for 240V operation, Y-rated capacitors can be no larger than 2.2nF, a value which will allow a current flow of no more than 150 microamps from active to earth. This value is known as the “Touch Current”, meaning the maximum current that will flow through a person’s body if they are standing barefoot on wet ground and “touch” the cold side of the unearthed appliance.

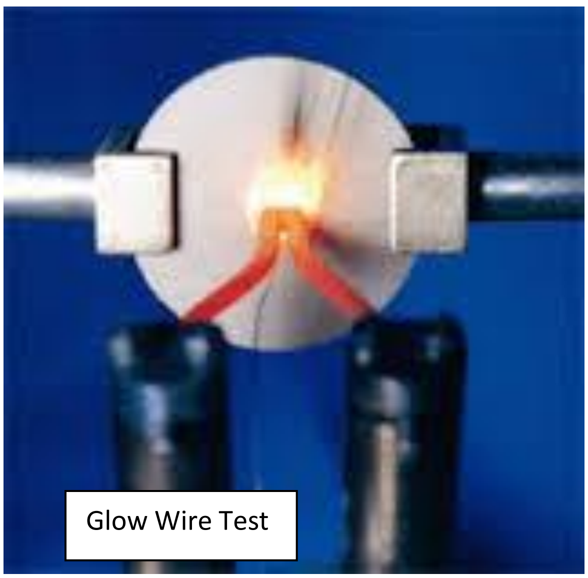
You are most likely to encounter touch currents when plugging an outside TV antenna into a double-insulated TV, PVR/VCR or digital Set Top Box, since the antenna braid is normally earthed. If you are holding the antenna plug in one hand while feeling around for the TV’s antenna socket with the other, you will normally experience a distinct tingle or “nip”. Since this can potentially damage the electronics, manufacturers usually recommend the appliance be unplugged from the AC power before connecting the antenna. (Unfortunately a lot of people mistake "standby" for "off"; the AC power must be completely disconnected).

The actual quantitative measurement for touch current is a fairly complex procedure, requiring a precision R-C network designed to simulate an “average” human body. This is because the touch current waveform is rarely a simple sinewave, and the shape of the waveform has a considerable influence on its effect on living organisms.

FLAMMABILITY

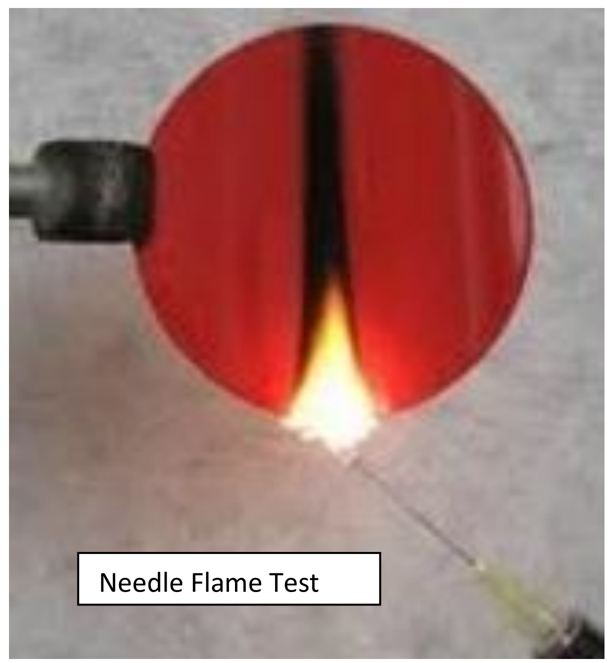
Any part of a device that could be subject to excessive heating in the case of an electrical fault must be tested to see how it reacts to this.

Two different types of test are widely used for flammability. The "Glow Wire" test requires a temperature-controlled electrically-heated wire



to be pushed a specified number of millimetres into the plastic body of the device, for a specified number of seconds (depending on what is being tested). When the wire is withdrawn, any flame produced must self-extinguish within a specified number of seconds. Some tests require that a special type of tissue paper must be placed under the device being tested, and any droplets of molten plastic must not result in ignition of the paper. The temperature required for the glow wire is again dependent on what is being tested, and to what standard, but a typical temperature is 960°C.

A second type of test is the "Needle Flame Test", more often used for materials that are unlikely to melt, such printed circuit board material. PCB material (and other plastic construction materials) usually carries a flammability rating from V0 to V5, which is not actually based on a European or Australian standard, but the US Underwriters UL94 standard. (In the US, the bulk of the safety testing is carried out by insurance companies, who instead of fining you for non-compliance, may simply not pay out on insurance claims….)



A small-diameter gas flame is produced, typically by fitting a hypodermic syringe needle to a standard butane blowtorch, and this is applied to the PCB material for a specified number of seconds. As with the Glow Wire Test, after the flame is removed, any flame on the PCB material must self-extinguish in the specified number of seconds.

V0 and V1 materials are more expensive, but extremely resistant to burning and so are required for mains-rated operation. V5, at the other end of the scale, is cheap, but with poor flammability resistance. V5 (or unrated) PCB material, is really only suitable for battery-operated equipment. To be acceptable for compliance testing, the flammability rating ideally is impressed into the PCB insulation material when the blank PCB material is manufactured. However it's not unknown for dodgy (or ignorant) manufacturers to simply screen-print the "V0" logo onto inferior unmarked boards, so verification of the flammability rating is vital!

For high-risk devices such as 240V power boards, as well as the Glow Wire test, there is an additional requirement for a needle-flame test if the product passes a 960°C Glow-Wire test, but the plastic continues to burn for more than 2 seconds after the wire is withdrawn.

TEMPERATURE RISE OF TRANSFORMERS AND INDUCTORS

Where 50Hz mains transformers are used, it is important that the temperature of the primary winding not be allowed to exceed the ratings of its insulation enamel or the bobbin material it's wound on. Although it is possible to measure the temperature directly, it is usually more accurate to infer the temperature rise by measuring the change in DC resistance of the wire. For a simple transformer-type plugpack, the specified procedure is to measure the primary resistance when cold, apply a resistive load that draws the rated output current at 240V, use a Variac to increase the input to 254.4V (240V + 6%), and then periodically unplug the device and measure the DC resistance of the primary winding until this stabilizes (normally after 3 hours). The temperature rise above ambient (in Celsius, for standard copper wire) can then be calculated by the formula:

Temp Rise = (Ambient Temperature + 234.5) x (R Hot - R cold) ÷ R cold.

As an example, assuming a worst-case ambient of 45°C, with a winding temperature rise of 65 °C, the insulating materials would need to be rated at least 110 °C. A thermal fuse rated 20% higher than this would also need to be fitted to the primary winding.

Special fibreglass-reinforced nylon bobbin materials are available, rated up to 175 °C. Under most standards, with a temperature rise of 60 °C or less, there is no requirement for special insulation materials.

For transformers used in small stereos and similar appliances, the "test load" often used is to operate the appliance at 110% of its rated mains voltage, and run it for several hours at maximum volume, with either a continuous test tone, or very loud continuous music. (Running an amplifier "flat out" for long periods is considered a fault condition by regulators!)

The insulation on winding wire itself may also be subject to flammability tests, normally by passing a heavy current through a sample of it.

POTENTIAL IGNITION SOURCES

Any join between two electrical conductors (soldered, crimped or whatever) that would produce more than 50VRMS across the join if it is open-circuited, and is intended to feed a circuit drawing 15 VA or more, is regarded as a "Potential Ignition Source." Under the wrong circumstances (bad soldering or crimping, corrosion etc) this figure is regarded as the minimum that could produce enough localized heating to cause a fire. Most electrical safety standards have provisions for this, requiring low-flammability materials to be used adjacent to such joints.

Now, this would ordinarily be of fairly minor interest, except that the AS/NZS versions of most safety standards have additional requirements for such situations, known is Test Report parlance as: "Regional Deviations". Failure to address the Australian Flammability variations can and often does render an otherwise perfectly acceptable overseas test report invalid.

The European standards generally require that any materials closer than "13mm to the side and below", and "50mm above" a Potential Ignition Source must be made from suitably flame-retardant materials, or the Ignition source itself can be surrounded by a suitably flame-retardant barrier. That is, if the Ignition Source is enclosed in say, V-0 or V-1 material, it is permissible to use non-flame-retardant plastic within the critical distances. So for example, it would be OK to have a TV set cabinet made of non-flame-retardant plastic where the soldered mains switch terminals are physically located within 13mm of the cabinet, as long as the switch itself is enclosed in a suitably non-flammable material.

It is very important to note that AS/NZS standards specifically exclude this allowance. If a potential ignition source is inside the critical distance, the enclosure material must be V-0 or V-1 rated, even if the intervening gap is filled with fireproof cement!

Flammability is a particular source of grief, because manufacturers routinely supply test reports stating that cabinet materials are such-and-such brand, type so-and-so V-0 or V-1, and supply cabinets that clearly are not! You don't need a fancy needle-flame test either; one touch with a cigarette lighter is often enough to start a cheery conflagration!

INSULATION QUALITY OF APPLIANCES

Generally, there are two categories of mains-operated appliance: "Class I" which means earthed with a three-wire mains lead ("grounded" in North America) and "Class II" - double insulated, which means it has a two wire mains lead with no earth connection).

Many (but by no means all) appliances with a metal cover have a mains earth wire connected to it. The rationale is that if the active mains wire should come adrift and touch the metal case, this will immediately blow the mains fuse and protect the user from electrocution.

While this is fine in theory, it can be problematic if consumers have access to replacement mains plugs, which they do in most countries. It's all too easy for an inexperienced person to inadvertently connect the earth wire to the active mains pin, making the case live, a lethal situation. A more subtle problem occurs if they interchange the neutral and earth wires. The appliance will work more or less normally in a correctly wired wall socket, but if the live and neutral connectors are reversed in the socket (or through an incorrectly wired extension cord), the appliance will not only not work, its case will be connected to the live side of the mains!

To overcome this problem, double insulated appliances with no earth wire are preferred for things like electric power tools, precisely because they are the sort of appliance used by people more likely to attempt their own electrical repairs! No matter what pins the two power wires get connected to, there is no way of making the appliance dangerous.

As the name suggests, a Class II double insulated appliance has to have two separate sets of 240V insulation (or the equivalent of two) on the basis that if one happens to fail, the other will still provide adequate protection, and the likelihood of both failing is considered negligible. The symbol for a double insulated appliance is the familiar "square within a square" logo.

However, not all appliances with an earth wire are actually Class I. In some cases the metal case is earthed, but the circuitry inside is has no DC connection to it. A common example is DC power supplies and other test equipment where it is more convenient to have the negative terminal floating. Obviously in such cases the insulation quality has to be the same as for a Class II appliance. In other cases the earth is required for purposes other than safety, and is referred to as a "functional" earth, although this is fairly rare. The most common application is where the earth is needed for interference shielding, although this is more likely to take the form of a separate earthing screw. In practice, it is actually quite unusual for a Class I appliance not to be able to pass Class II insulation testing, since they all tend to be made using the same materials

CLASSES OF INSULATION

There are basically four classes of insulation: Functional, Basic, Supplementary and Reinforced.

"Functional" insulation, as the name suggests, is insulation that is required simply to make a device work, rather than for safety purposes. A common example is the enamel applied to transformer winding wire. In some cases functional insulation may also be part of the safety insulation. For example, special triple-insulated winding wire can be used for the construction of the secondary of a switchmode mains transformer, providing both functional and safety insulation. (While this may sound disturbing at first glance, most modern switchmode secondary windings have only a few turns, so it's easy to cover the wire in thick insulating sleeving for the third layer).

The lowest level of safety insulation, as required for an ordinary earthed appliance, is called "Basic" insulation. Basic Insulation has to be able to withstand 1.5kV AC for at least 60 seconds without breaking down. The material used also has to be suitable for the physical environment it is used in. For example PVC plastic is almost universally used for insulation of mains cables as it is flexible and resistant to chemical attack. However it is entirely unsuitable for other applications such as transformer winding bobbins which don't need flexibility but need to be resistant to heat. Various grades of high-temperature plastic (often nylon) are usually specified for this.

For a double insulated appliance, a second - "Supplementary" - layer of insulation is required. That can simply mean a second layer of basic-standard insulation similar to the first, or something quite different, as the construction dictates. A common example of the first situation is a double-wound 240V transformer bobbin. The primary winding is insulated from the iron core by one half of the bobbin and the secondary is wound on the second half. The second half can be either a completely separate bobbin of the same thickness plastic, or part of the same moulding but with a double thickness of insulation between the two sections. This puts two thicknesses of basic insulation between the mains input and the output.

Another example is an ordinary mains lead. This has to consist of two (or three) wires each coated with their own individual layer of PVC insulation, and then a second layer of PVC is moulded over all three. The rationale is not so much that this makes the insulation tougher, but rather than the odds against a void or other defect appearing in the same place in two separately applied layers of insulation are astronomical!

A double insulated appliance needs to be able to withstand 3kV AC for at least 60 seconds, between the mains input pins and any metal part which can be touched by the user. That is, 1.5kV for each layer of insulation. Any intermediate metal parts, even ones that are not meant to be accessible to the user (such as the iron core of a transformer) require a similar level of breakdown insulation. For an all-plastic device such as a plugpack power supply, the normal test procedure is to cover the plastic case with metal foil and test the breakdown voltage between that and the mains input, and the DC output plug.

It is permissible to use a single layer of extra-thick insulating material for some purposes. This is referred to as "reinforced" insulation, and generally needs to be of higher quality materials than used for basic insulation. A common example is a "Y1" rated capacitor, which can be considered a "reinforced" version of two "Y2" capacitors.

CREEPAGE AND CLEARANCE DISTANCES

Apart from verifying the insulating credentials of the actual components that bridge the hot and cold regions, there has to be a specified minimum physical distance between any "hot" and "cold" conductors that are not covered with solid insulating material. With simple 240V 50Hz AC devices these distances are easy to determine, while with switchmode power supplies, it is more complex, the size of the distance being determined from the peak-to-peak voltage appearing across the primary of the switching transformer, superimposed on the peak of the mains voltage.

Figure 1: Clearance (In Air)

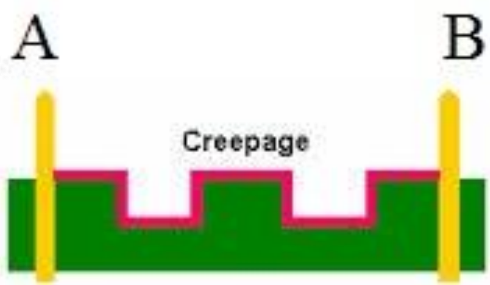
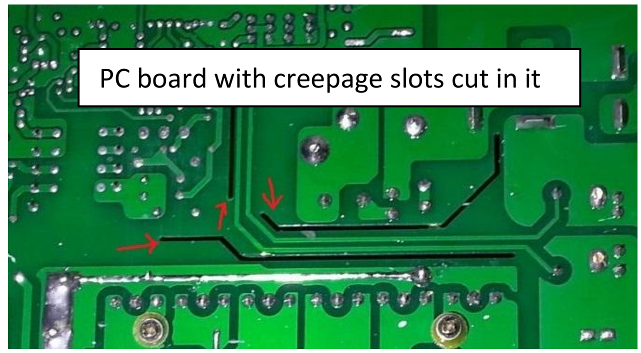


Figure 2: Creepage (Along Surface)

Unwanted electrical discharges can happen in two ways. Consider two points A and B on a printed circuit board. If the voltage between them is high enough, a spark can simply jump through the air immediately above the insulating surface. The distance such a spark would have to jump is referred to as the “Clearance Distance” and is exactly the same whether the conductors are on a circuit board, or mounted in midair.

On a printed circuit board or a similar solid insulating surface, moisture or other contamination could also allow an unwanted current to flow across the insulating surface between A and B, at a somewhat lower voltage. This is referred to as “Creepage” and the physical distance such a creepage current would have to travel is referred to as the “Creepage Distance”.

Generally, a spark discharge cannot occur between the ends of two creepage paths, it can only jump between two metallic conductors. So if you cut even a small gap in a potential creepage path, any creepage current will then have to take the “long way round,” effectively lengthening the creepage distance. The clearance measurement is unaffected, since the spark would be jumping the same distance through the air between A and B in either case.



On the other hand, if there is an unbroken solid insulating surface between the two conductors, (such as PCB material) then the creepage and clearance measurements are the same figure.

One way of visualizing the difference between Creepage and Clearance is the “Crow and Snail” analogy: If a crow wants to get from A to B it just flies directly “as the crow flies”. Similarly, if the voltage between A and B is high enough, a spark will simply jump directly across the shortest intervening air gap. A snail on the other hand can’t fly; it has to “creep” along whatever unbroken surfaces lie between points A and B. (Real snails can actually cross gaps; so you need to imagine a very tiny snail!)

While the initial creepage current in itself is not necessarily a hazard, if there are significant levels of contamination, (salt spray for example) the surface of the plastic may eventually become carbonized, producing a permanent and more dangerous conduction path. Approved insulating materials carry “Category” ratings denoting how prone they are to such degradation. Glass, ceramics and other chemically inert materials have a “Cat 1” rating, certain approved “pure” plastic materials such as polythene or polypropylene are “Cat 2”, and most composite materials such as PC board laminate are “Cat 3”. The tests for Cat 2 are so difficult to perform that most manufacturers simply assume Cat 3, as it’s not all that difficult to comply with and, (as mentioned earlier) creepage paths are easily broken simply by cutting a narrow slot in the PC Board. Any creepage conduction will then (like the snail) have to find another, longer, path between A and B, greatly increasing the resistance.

A different example of the same principle is the corrugated ceramic insulator on a spark plug. By introducing ripples into the ceramic surface, the creepage path is greatly lengthened, lessening the likelihood of a flashover if the plug gets contaminated or wet. A similar technique is used for high-voltage insulators on power lines.

Obviously the minimum allowable creepage distance has to be greater than would be required where there is an actual air gap, since air cannot become permanently contaminated! For measurement purposes, a 4mm “clearance” can mean an actual air gap of 4mm, or a spacing of 4mm between two conductors on a PC board with or without an air gap cut in it.

POLLUTION DEGREE

Another complicating factor is called “Pollution Degree”, which as the name suggests is a measure of the amount of contamination the circuit board might be exposed to. A hermetically sealed device that is unlikely to be subject to any sort of contamination has a pollution degree of 1. Devices that are not absolutely airtight but unlikely to allow significant contamination to enter have a pollution degree of 2. Devices that have open ventilation slots (which covers just about all common electrical and electronic appliances) have a pollution degree of 3. Devices which are likely to generate their own internal contamination (photocopiers, devices with brushed motors etc) have a pollution degree of 4. Obviously the greater the pollution degree, greater the creepage and clearance distances must be, for a particular mains voltage.

In typical switchmode power supplies, the most vulnerable area is the part of the board holding the optocoupler that provides voltage feedback information between the hot and cold sections. Manufacturers often cut a slot in the board to increase the effective creepage distance. If a Y1-rated capacitor is fitted, it often bridges the same air gap. (See diagram on Page 9).

Typical minimum figures for 240V operation are 4mm Clearance and 5mm Creepage, but as mentioned earlier, this is dependent on the peak-to-peak voltage appearing on the board, whether mains AC or high frequency switching. All the creepage, clearance and other parameters have to be divined from the relevant (and often incomprehensible) standards. Many manufacturers take the easy way out and simply make their creepage and clearance figures as large as possible! For 240V operation, a gap of at least 4.5mm will exceed most creepage and clearance requirements for A-V and similar low-pollution-degree equipment.

DISTANCE THROUGH INSULATION (DTI)

Where 50Hz transformers are used, insulation standards obviously have to be maintained between the primary and secondary, and the primary and the iron core. Anywhere the clearance is less than the specified minimum, (which depends on the voltage applied to a particular winding), one or more layers of approved high-quality insulation film are required (most often that crackly yellow tape you see on just about all mains transformers). In this case the clearance is referred to as “Distance Through Insulation” (DTI).

Although at first glance it may seem unlikely that such a thin layer of insulation could do much insulating; the reality is that 0.25mm of just about any common plastic can withstand upwards of 10,000 Volts for brief periods. The reason it needs to be thicker in most cases is simply to make it resistant to physical damage which might produce pinholes. Generally, the DTI figure refers to insulation that is physically protected from the possibility of such damage by being mounted inside an air gap.

Another common situation occurs with the switchmode power supplies fitted to AV devices with metal cases, such as DVD players and Digital Set Top Boxes. The preferred method of mounting these is on plastic pillars 10mm or so off the metal case, which gives them a large margin of clearance. However many manufacturers simply mount them on “dimples” pressed into the metal from the underside. For this to be acceptable, a sheet of approved insulating plastic must be fitted underneath the circuit board, and all creepage, clearance and DTI parameters must be strictly adhered to. In this case there is usually plenty of room for generous clearances, but not all PCB designers seem to understand the need for this!

When an inspection lab is examining a transformer, apart from the physical measurements and high voltage breakdown tests, they are supposed to carry out tests to verify that any yellow tape used is actually what the manufacturer of the device says it is! A single layer of ordinary PVC insulation tape will easily withstand 10kV DC when it’s fresh. However PVC is soft and easily punctures under pressure. The proper tape is hard and crackly like cellophane, and doesn’t melt or stretch easily. Although it would be very difficult to absolutely guarantee that a sample of tape came from a particular manufacturer, if it behaves the way that manufacturer’s data sheet says it should, chances are it’s the real thing, and if not, it will be a close equivalent. (In the real world, most testing of this sort is really designed to pick up cases where a manufacturer has substituted something totally unsuitable, such as yellow PVC tape or even yellow Teflon gas plumbing tape)!

MEPS/GEMS TESTING

MEPS (“Minimum Energy Performance Standard”, recently re-invented as “GEMS”- Greenhouse and Energy Minimum Standards) is a relatively new development. The currently used AS/NZS standards are largely based on those developed for California, at the behest of yes, Arnold Swarzenegger! There are MEPS standards for every type of electrical and electronic appliance, all concerned with eliminating electrically inefficient designs.

With small electronic appliances, the main target is devices with a "standby" mode, since in days gone by, this was often pretty much just for show. In all too many cases the only difference in power consumption between "On" and "Standby" appears to be the tiny amount of LED current drawn by the display!

With devices that incorporate a 50Hz power transformer, a simple way to achieve MEPS compliance is to have a small, highly efficient transformer that supplies the power for the remote control, and using a relay to switch the main transformer into circuit when required. At the moment, most non-TV appliances are exempt from MEPS regulations in Australia, but you will often see provision for the extra transformer and relay on the circuit board.

For TV sets, for decades the standard design has been to have a single switchmode power supply that runs all the time. On standby it only powers the remote control receiver, and uses a relay to switch the main HT line to the horizontal output stage in the "operate" mode. This is nowhere good enough for MEPS compliance, and modern TVs are required to have power supplies that almost completely shut down on standby, many achieving standby powers of 300 milliwatts or less. (TV MEPS is a separate subject, and is discussed below).

In Australia the first main target was plugpack power supplies, since these can too easily be left switched on but not connected to anything.

Plugpack MEPS ratings currently come in three main categories: "Level III", "Level IV" and "Level V", the rating being denoted by the Roman numerals "III" or "IV" or "V" in a circle. (Level V devices used to be fairly rare, but are becoming more common).

(Most manufacturers seem convinced that you need "Times New Roman" for the font, because they're "Roman" numerals, but actually you can use any font).

The actual rating and measurement procedure is fairly complex. There are actually two parts to a MEPS evaluation. The first and easiest is the standby power measurement, which simply requires plugging the unloaded power supply into an AC power meter, letting it warm up, and then measuring its standby power at the AC voltage indicated on its label.

Complications arise because plugpacks may variously be labelled "240V", "230-240V" or in the case of the increasingly more common switchmode devices "115 – 230V". For devices only labelled for use around 240V, testing is done at the lowest voltage of the specified range. For 115-230V switchmode devices, originally tests had to be done at both ends of the specified range and the worst result used. However, current regulations require 230V testing only.

All MEPS limits and calculations are based on the stated voltage and current ratings the manufacturer prints on the label. For Level III devices rated at less than 10 Watts (or 10VA), the maximum standby power permitted is 500 milliwatts. For devices rated at 10W or higher, the limit is 750 milliwatts.

For Level IV devices, the maximum standby power is 500 milliwatts for all devices, and 300 milliwatts for all Level V devices.

The actual operating efficiency is calculated in a somewhat complex manner. First of all, four efficiency tests are done by loading the device at 100%, 75%, 50% and 25% of its stated current rating. In each case, the resulting output voltage is then multiplied by that test current figure to give a load dissipation figure. This is then divided by the measured AC input power for each loading to calculate the efficiency. (So in the example shown here, if it was outputting 17V @ 3A which equals 51 Watts, and the AC input power while doing this was 60 Watts, it would have an efficiency of 51 ÷ 6 = 0.85 or 85%) The four

Universal MEPS Calculator

Password is unimeps

Don't unprotect the sheet unless you really need to!

MAKE		
MODEL		
EV #		
DATE	CLICK TO SET DATE	31 July 2015

RATED OUTPUT VOLTAGE	17	TEST V	17
RATED OUTPUT CURRENT (A)	3	TEST A	3
RATED OUTPUT POWER (W)	0	TEST W	51

Note: you can't directly access these three cells.

	No load	25% Load	50% Load	75% Load	100% Load
Target OP Current		0.75	1.5	2.25	3
Meas'd OP Current		0.75	1.5	2.25	3
DC Volts	22	21	19	18	17
Load Power (W)	0.00	15.75	28.50	40.50	51.00
Input Power (W)	0.7	18	32	44	60
Efficiency		87.50%	89.06%	92.05%	85.00%

CLEAR INPUTS

	LEVEL II	LEVEL III	LEVEL IV	LEVEL V
REQUIRED EFFICIENCY	NA:>49W	84.00%	85.00%	87.00%
AV MEASURED EFFICIENCY	88.40%	88.40%	88.40%	88.40%
PASS MARGIN (Negative = fail)	NA	4.40%	3.40%	1.40%
DC POWER SUPPLIES				
MAX PERMISSIBLE ST'BY WATTS	1.00	0.75	0.50	0.50
MEASURED STANDBY WATTS	0.7	0.7	0.7	0.7
PASS MARGIN W (Negative = Fail)	0.30	0.05	-0.20	-0.20
AC POWER SUPPLIES				
MAX PERMISSIBLE ST'BY WATTS	NA	NA	NA	0.50
MEASURED STANDBY WATTS				0.7
PASS MARGIN W (Negative = Fail)				-0.20

efficiency figures are then averaged.

The minimum acceptable percentage efficiency figure is determined by the formulae:

(0.09 x LN(Rated volts x Rated Current)+0.49) x 100 for Level III devices and

(0.09 x LN(Rated volts * Rated Current)+0.5) x 100 for Level IV devices.

("LN" means the Natural Logarithm, which is available on all scientific calculators, as well as most spreadsheets).

The calculation for Level V devices is so complicated it won't be shown here!

The result in the spreadsheet shown above indicates that the device can be sold labelled level III, but not Level or IV or V, as it fails the permissible standby power test.

Apart from power losses in the power supply itself, substantial amounts of power can be lost in the DC output lead. You may have noticed that some plugpacks are now fitted with a socket rather than a captive lead. This can make the difference between passing or failing MEPS!

Apart from obtaining a valid MEPS Test Report (to AS/NZS4665) manufacturers are also required to register their products on the www.EnergyRating.gov website, which of course costs money!

Currently (Sept 2015) all these registrations cost $440:

- All types of 240V Lighting Products
- Clothes Dryers
- Dishwashers
- External Power Supplies (Plugpacks etc)
- Televisions
- Set TopBoxes
- Clothes Washers
- Computers
- Computer Monitors

Other categories of appliance cost considerably more!

Supposedly, green-conscious consumers are meant to be able to consult that website to make an informed selection about the appliances they may be considering buying. So far, there seems to be very little evidence that any significant number of people actually do this, or are even aware that they can do this.

Basically, you have to get a MEPS/GEMS report to AS/NZS 4665 (there is no overseas equivalent), enter the details on that into the registration page, supply credit card details (no other form of payment is currently accepted), and at some point you will receive confirmation by email and ordinary post

Registration is by both Model number and Brand. It's very important to note that if the same model number is imported by different people under different brands, then each brand/model combination is considered a different product and separate registrations are required (at $440 per pop). So if a company called Chung Hang makes a plugpack model 12-500-XYZ and they register it under that name, and you want to market the same model, but labeled as "Jaysmith 12-500-XYZ", the fact that "Chung Hang 12-500-XYZ" is already registered is irrelevant; you still have to register "Jaysmith 12-500-XYZ" as well. And so does anybody else in the same situation….

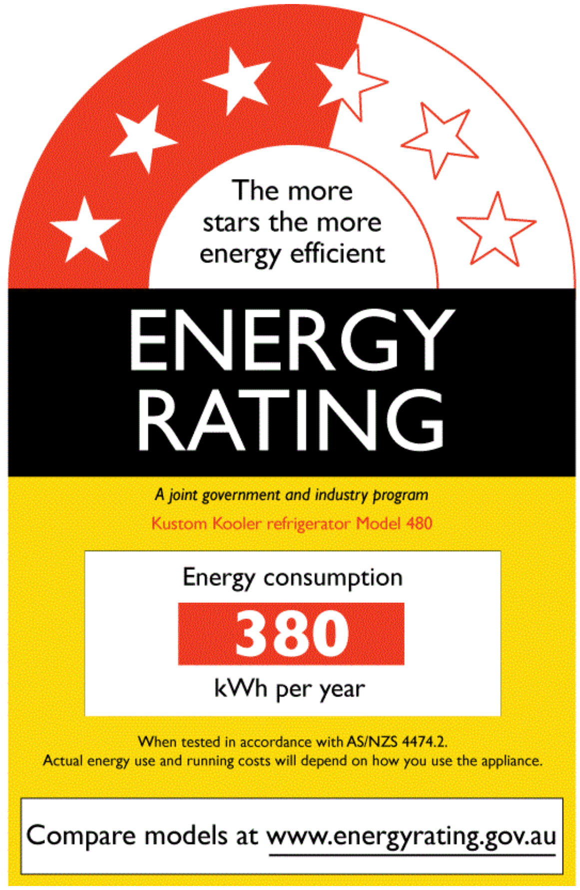
TV MEPS/GEMS

No doubt you have all seen "Energy Star" labels on TV sets. These are the result of Federal Government angst that by the mid 2000s a large percentage of Australian households would be sporting huge-screen Plasma TVs guzzling up zillions of Watts.

The Energy Star label was originally an attempt to persuade consumers to seek out more energy-efficient models, by giving some indication of how much it was going to cost them per year.

Then in 2008 new regulations were introduced that required a minimum energy star rating and mandatory registration of the model on the www.energyrating.gov website (for a fee of course).

Ironically both LCD and Plasma technologies improved so much in the intervening years that even huge LCD screens typically consume less power than much smaller CRT designs ever did, so the "threat" has pretty much disappeared.



However, as their wont, the bureaucrats are still busily finding ways to justify their existence. In 2013 new regulations will come into force, creating even tighter minimum efficiency standards, (and a near-doubling of the registration fees!)

Apart from that, they revamped the star rating system, so that basically 3 stars were removed from the earlier rating. So for example, a fridge or TV efficiency figure that previously earned 6 stars, suddenly entitled it to only three! But the labels were identical: There originally was going to be nothing on the label that pointed out that this was a new rating system. So a retailer could have old stock with a higher number of stars than more efficient new stock with fewer stars. The original "solution" was that retailers would have to fit new stickers to all their old stock, but after a near-mutiny by the industry, the GEMS bureaucrats finally allowed the new, improved labels to carry a note to the effect of: "Equivalent to so-and-so stars under the earlier rating system".

Like Plugpack MEPS testing, TV MEPS is a rather complex process, worked out with an intricate formula involving screen dimensions, maximum brightness levels and standby power. Applying for TV MEPS registration is also a long and painful process, requiring measurement accuracy to two decimal places, but based on a fixed assumption that all TVs will spend exactly 14.0000 hours a day off, and 10.0000 hours on standby!

The actual Standard for TV set MEPS is AS/NZS 62087.2.2: Power Consumption of Audio Video and Related Equipment; Minimum energy performance standards (MEPS) and energy rating label requirements for television sets.

There is a different standard for Set Top Boxes, with somewhat simpler calculations:

AS/NZS 62087.2.1:2008+A1+A2: Power consumption of audio, video and related equipment - Minimum energy performance standards (MEPS) requirements for digital television set-top boxes

The registration procedure is much the same as for most of the other standards; a sample of the product is submitted to a test lab, who generate a Test report that must be uploaded to the energyrating.gov website.

Note that in the case of TV sets and Set Top Boxes that use a separate plugpack power supply, completely separate MEPS reports must be obtained for both the TV/STB and plugpack! And yes, completely $eparate regi$tration$ are required….

OTHER MEPS/GEMS

The following products also currently require MEPS/GEMS testing and registration. The procedures are essentially the same as shown above. Note that all these products require energy star labelling. Originally there were separate standards for energy performance and labelling, but later standards tend to combine the two.

- AS/NZS 2007.1:2005: Performance of household electrical appliances - Dishwashers - Methods for measuring performance, energy and water consumption
- AS/NZS 2007.2:2005: Performance of household electrical appliances - Dishwashers - Energy efficiency labelling requirements
- AS/NZS 2442.1:1996+A1+A2+A3+A4: Performance of household electrical appliances - Rotary clothes dryers - Energy consumption and performance.
- AS/NZS 2442.2:2000 Performance of household electrical appliances - Rotary clothes dryers - Energy labelling requirements
- AS/NZS 2823.2:2013: Performance of electrical appliances - Air conditioners and heat pumps - Energy labelling and minimum

energy performance standards (MEPS) requirements

• AS/NZS 3823.1.1:2012: Performance of electrical appliances - Airconditioners and heat pumps - Non-ducted airconditioners and heat pumps - Testing and rating for performance (ISO 5151:2010, MOD)

• AS/NZS 3823.1.2:2012: Performance of electrical appliances - Airconditioners and heat pumps - Ducted airconditioners and air-to-air heat pumps—Testing and rating for performance (ISO 13253:2011, MOD

• AS/NZS 3823.1.3:2011: Performance of electrical appliances - Airconditioners and heat pumps - Water-source heat pumps - Water-to-air and brine-to-air heat pumps - Testing and rating of performance (ISO 13256-1, Ed. 01 (1998) MOD)

• AS/NZS 3823.2:2013: Performance of electrical appliances - Air conditioners and heat pumps - Energy labelling and minimum energy performance standards (MEPS) requirements

• AS/NZS 4474.1:2007: Performance of household electrical appliances - Refrigerating appliances - Energy consumption and performance

• AS/NZS 4474.2:2009: Performance of household electrical appliances - Refrigerating appliances - Energy labelling and minimum energy performance standard requirements

PLUGPACK DIMENSIONS

One of the biggest stumbling blocks for unwary manufacturers is AS/NZS 3112. This specifies among other things, the permissible dimensions for plugs designed to fit into Australian Power Points, which includes plugpacks with integral AC pins.

Because plugpack cases are not necessarily symmetrical in their dimensions, AS/NZS 3112 specifies measurements taken from the centre of the plug face. One of the most confusing is the specification for the measurement from the centre to the vertical sides of the case. It has to be either "less then 21.9mm" or "more than 27mm". The reason for this is quite straightforward once you understand it, which usually only happens when people stumble on the explanatory footnote!

Quite simply, if plugpack cases are less than 43.8mm wide (ie 2 x 21.9mm), two of them can be comfortably fitted side-by-side in a standard 44mm-separation Australian dual power point or power board. If they are more than 54mm wide (2 x 27mm) it is simply not possible to do this, no matter how you try to jam them in. However, if the width is in the "forbidden zone" – between 43.8mm and 54 mm – it IS possible to force two plugpacks into adjacent sockets, although not safely or reliably.

You may have noticed some plugpacks fitted with odd-looking "ears". These are a quick fix often employed to make plugpacks width-compliant. Clearly, many manufacturers still don't understand exactly what this is for, since they are

also seen fitted to small plugpacks which were already perfectly compliant with AS/NZS 3112!

EMC TESTING AND COMPLIANCE

EMC compliance is a Federal Government requirement, currently enforced by the Australian Communications and Media Authority (ACMA). Like many other Federally enforced requirements, the onus is theoretically on the importer to ensure that the equipment they sell is EMC compliant. It's not like getting a pink slip for your car, where you can take the appliance to a testing authority and have them verify that is roadworthy. Supposedly, if you get "audited" by the ACMA, you will have to demonstrate that you sincerely believed the device you were importing was EMC compliant, and be able to demonstrate that you understand what that means. It's rather like tax evasion: eventually you'll make a mistake, and then you'll get audited. If you didn't keep adequate records or you simply didn't do your homework, you'll be in trouble.

In reality, this almost never happens; these days EMC violation investigations are conducted almost entirely on complaint-driven basis. (Recently New Zealand have started doing random audits, but how long this will last remains to be seen.)

Note that unlike safety requirements, EMC compliance only applies to the actual importer of the goods, not the retailer, (unless the retailer is also the importer). Most retailers work through a so-called "Radiocommunications Agency Agreement" with their local suppliers, where responsibility for EMC compliance lies solely with the supplier.

It's entirely possible that a retailer could sell thousands of a particular non-compliant item without them or the ACMA ever realizing it. The philosophy here is that if nobody ever complains, then there is no problem! This is a quite different situation from electrical safety: With RF interference, once the offending device is switched off, the problem disappears; if someone gets electrocuted, they tend to remain dead….

The principles of testing for adherence to the Electromagnetic Compatibility Directive ("EMC compliance") are broadly similar to those for electrical safety testing, except of course they are concerned with measuring how much interference escapes from the device, rather than safety issues. Most accredited test labs can issue both types of report, although there is no specific requirement that they do so.

An actual sample unit has to be submitted for testing with an accredited lab, and a report generated. As with the LVD report, any subsequent production units that are asserted to be EMC compliant on the basis of that report, must be constructed identically to the one depicted in the report, or else the report is invalid.

In general there are two types of emissions: "Radiated" emissions, which as the name suggests are spurious radio signals transmitted through the air, and "Conducted" emissions, which are injected back into the mains or any other physical electrical connection. In the case of a switchmode power supply, most of the concern will be with high frequency "hash" generated by the high-voltage switching transistor(s) and rectifier diodes.

Devices such as RF modulators and TV tuners have their own special set of parameters for how much spurious signal is allowed to leak back into the antenna system.

Spurious emissions are measured with a special ultra-wideband radio receiver such as those made by Rhode & Swartz. Their principle of operation is similar to that of a common radio scanner, in that tuning is controlled by a digital frequency synthesizer. However in most cases the control is done with attached PC using custom software. This allows a selection of software "profiles" to be selected for different types of test, and allows results to be saved on the hard drive, printed out, or exported to spreadsheets and so on.

Most EMC scanners will tune from below 10 kHz to above 3GHz, so obviously there is more than one radio receiver in them. (You will hear various coaxial relays clunking in and out as the scan progresses). Rather than a continuous sweep, most EMC receivers are designed to scan the band of interest in a series of discrete steps, which allows the attached computer to "take its time", reducing the problem of single isolated bursts of interference being recorded as a major peak, simply because it coincided with a measurement taken at that frequency. Most scans are done in two passes. The first scan will detect the largest peaks. (The actual number counted is set in software, but it is usually eight). A second sweep is then taken, just looking at those particular frequencies, and taking a much more detailed analysis for each one.

Normally, EMC testing is done with the appliance under test in an electrically shielded room to avoid "contamination" by external electromagnetic radiation.

Conducted emissions are measured by fitting a special box into the AC power line. The box is more or less a heavy-duty line filter, except that instead of connecting to earth, the bypass capacitors are connected to the input of the EMC test receiver. The usual test range is 10kHz to 30MHz, since frequencies outside that range will not normally propagate far down mains cable.

Radiated emissions are much harder to measure accurately. The principle is simple enough; instead of using the line filter box, the EMC receiver is connected to a calibrated antenna placed near the device being tested.

The biggest hurdle to overcome is that any standing waves generated by radio waves bouncing off the metal walls of the shielded room can seriously affect the accuracy of the measurements. One way to overcome this is to line the room with soft-ferrite-coated RF absorbent cones (which look like the stuff they make trays for eggs out of), but this is very expensive, and not always 100% accurate.

The ideal way of doing this is to set up a test facility out in the country somewhere, far from other sources of interference. EMC Technologies of Sydney have such an installation in a remote valley up in the Blue Mountains. Although it is not practical to eliminate all sources of RF contamination, a pre-scan ”profile” can be taken first, which allows the scanning computer to subtract those frequencies from the results.

For rough in-house testing most companies will first do an EMC scan in a shielded room to determine which actual frequencies are being radiated (without worrying about amplitudes so much), and then repeat the measurements out in an open area or rooftop. All of the local radio and TV stations (and a good deal more) will appear in the scan of course, but these can be ignored to a large extent by just concentrating on the frequencies detected in the first scan in the shielded room.

Again, this is not a legally valid test, it is usually only intended to determine whether a device will pass an “official” (and more expensive) test.

LOW-POWER TRANSMITTERS AND “CLASS” LICENCES

The proliferation low-powered transmitters such as those used for remote controls, Bluetooth and so on, might at first glance seem to be a regulatory nightmare. Fortunately, regulatory bodies in most countries have taken the easy way out and introduced the concept of “Class” licensing. That just means that any device which meets the parameters of the standards for its particular “class” (power output and so on) is automatically licensed; there is no actual license document.

In this case, the compliance is actually referred to as “Radiocommunications” (Radcomms) rather then “EMC”, because here we are dealing with devices that are *intended* to emit electromagnetic radiation, (as opposed to EMC testing, where the subject is devices that are not intended to emit any electromagnetic radiation, and the less the better).

The most common standard used here is

AS/NZS 4268:2012

Radio equipment and systems - Short range devices - Limits and methods of measurement.

There is no European version of AS/NZS 4268, (in fact EN 4268 is concerned with metal aircraft parts!) In Europe “ETSI” standards are most often used. In most cases ETSI reports are acceptable in both Australia and New Zealand as an alternative to AS/NZS 4268. The major exception is that in Australia 27MHz devices cannot use ETSI reports, only AS/NZS 4268 is acceptable.

Radiocommunications also applies to Infrared remote controls, believe it or not! As long as the remote only has a single IR emitter, though, it automatically falls within the started class.

THE C-TICK

The C-tick symbol is rather like the Copyright © or Registered Trademark™ symbol; it’s essentially a shorthand way of saying “I hereby assert that this appliance meets all the EMC standards relevant to it." The C-Tick symbol is most often followed by a "N" number eg ("N12345"). That number is the supplier's registration number on the list of companies licensed to sell electronic goods to the public. You sometimes see very short numbers such as "N18"; that just means the company involved was one of the very early applicants to the scheme You don't have to have an "N" number by the way; you can use your ABN or ACN, or just your name.

If an ACMA inspector discovers a non-EMC-Compliant appliance with a C-Tick (after investigating a complaint about interference for example), in theory all he has to do is look up the "N" number (or whatever) in the register to find what company sold it, knock on their door, and demand to see the EMC compliance folder for that item. If they can't produce a proper compliance folder, (or one at all) the proprietor is supposed be in big trouble (Although this rarely happens in practice, if at all).

Basically N1500 means: "The Company holding the ID number N1500 has a compliance folder containing all necessary EMC documentation for this product."

One of the many problems these days is that a large percentage of importing companies are "broom-closet" affairs run by just a couple of people, often with limited English skills. A lot of them simply do not understand what a C-Tick is for, and it can be very difficult to explain that when a distributor says it needs a C-Tick, he doesn't mean he just wants them to print up a label with a C-tick – it actually has to be EMC compliant!

Perversely some manufacturers are so anxious to show how EMC-savvy they are that they print C-ticks on everything, including so-called "low-risk" appliances that don't need one. But if they do that, the importer is then theoretically required to either pay somebody to put stickers on the entire shipment to cover up the C-ticks, or spend $1,500 or so to get an EMC report done! If the manufacturer puts a C-tick on the item, there MUST be compliance documentation, even for a pocket flashlight!

TELECOMMUNICATIONS

This category was originally concerned with communications equipment designed to be attached to phone lines. Apart from actual telephones, this included telephone cables and accessories, Fax machines, and basically anything else that is meant to be connected to a phone socket. The "catch-all" standard for this is:

AS/NZS 60950.1:2011

Information technology equipment - Safety - General requirements

This also covers plugpacks used with telecommunications equipment, although that part of the standard is virtually identical to the corresponding sections of AS/NZS 60065.

More recently, AS/NZS60950 has been expanded to cover computers and their monitors, and other IT equipment.

The telephone and similar equipment version of the C-Tick is the A-Tick:

However this is also being superseded by the RCM.

EMC and TELECOMMUNICATIONS SDocs

Part of the EMC and Telecommunications compliance procedure is that the importer is required to not just have Test Reports available, but to fill out and sign an "SDoc" (Statutory Declaration of Compliance) that they have actually examined the product and confirmed that the report is actually valid for that product. However, the document is not submitted anywhere, it is simply meant to be kept on file on the importer's premises, or a copy kept on their database.

RADIOCOMMUNICATIONS AGENCY AGREEMENTS

As an alternative to the importer signing the EMC declaration themselves, this can be done on their behalf by a suitably qualified person, particularly when the importer has neither the facilities nor the technical knowledge to do this for themselves.

In this case a contract is drawn up between the importer and the Agency, and this is kept on file by the importer in place of the signed SDoc. That way, if an ACMA inspector has a query about a particular product, it will be directed to the Agent rather than the importer.

The reason for the obscure C-tick ID number option is that if a Radiocommunications Agency Agreement has been set up, the agency will not be identifiable to the user, so the customers won't try contacting them over usage issues not related to compliance.

The C-tick is currently being replaced by the RCM (Regulatory Compliance Mark) which basically does the same thing as the C-tick, but applies to electrical safety as well.

ELECTRICAL APPROVALS AND DECLARED ARTICLES

Getting back to the hypothetical plugpack, suppose the manufacturer has now got his production prototypes up and running and successfully obtained valid EMC, LVD and MEPS certification. The next step gets rather complicated, at least for importing into Australia and New Zealand.

All states require a special "license" to be issued for the category of mains-powered devices that are referred to as "Declared Articles" (we'll explain what that means shortly). The license is properly called an "Approval Certificate", but it's usually just shortened to "Approval". Approvals usually have a lifespan of five years, and then they have to be renewed, rather like a driver's license.

(Once again, most Asian manufacturers seem convinced that this is called an "SAA Certificate", even though it never had anything whatever to do with the SAA, which no longer exists anyway!)

The procedure for obtaining approvals is in theory is quite straightforward: The manufacturer (or more often, his local agent) submits a copy of the LVD report, (along with actual samples if required), to the relevant Licensing Authority, along with the prescribed fee, and in due course a certificate is issued (assuming the device passes, of course). In NSW these are issued by the Department of Fair Trading, in Victoria they are issued by EnergySafe Victoria and so on. Older approvals usually consisted of a single prefix letter that indicated the State ("N" for NSW, "V" for Victoria etc) and a number which is simply the approval ID number, for example "V12345."

SGS

Certificate No: SGS/100687

CERTIFICATE OF APPROVAL

This certificate is issued to confirm that **SGS Systems & Services Certification Pty Ltd** (Electrical Product Certification Services (EPCS) Australia) as accredited by JAS-ANZ in accordance with ISO/IEC Guide 65 has certified the equipment / appliance / accessory described hereunder to comply with the minimum safety standards for which the Application has been made by :-

ORIENTAL PACIFIC INTERNATIONAL LTD
Unit 602-604, 6th Floor, CAC Tower
165 Hoi Bun Road, Kwun Tong, Kowloon
P. R. CHINA

DESCRIPTION OF ELECTRICAL EQUIPMENT

Class:	Kitchen Machine
Product:	Liquid Blender (milkshake maker)
Trade Name / Manufacturer:	Homemaker
Catalogue / Model No(s):	CM2558
Ratings:	230-240 V a.c., 50 Hz, 65 W, Class II Max. operating time: 3 min
Standard No.:	AS/NZS 60335.2.14:2007 +A1 with AS/NZS 60335.1:2002 +A1 +A2 +A3

REQUIRED MARK NO:	SGSEA/100687
EXPIRY DATE:	14 October 2015
DATE OF CERTIFICATION:	15 October 2010

JAS-ANZ

For and On Behalf of
SGS Systems & Services Certification Pty Ltd

SGS EPCS Australia, 480 Princes Highway, NOBLE PARK VIC 3174, AUSTRALIA

More recent approvals use the same system, but with an expanded state prefix eg “NSW12345”. (Mainly because C-Tick reference numbers also start with “N”, which caused endless confusion).

More recently, the various State governments have allowed private testing laboratories such as UL, SGS and SAA Approvals to issue approval certificates.

Throughout Australia and New Zealand, approvals are all interchangeable, so an approval granted in NSW for example is valid in Queensland and vice versa.

SAA

Certificate of Approval

Certificate No.: SAA122035

Date of Issue: 8 October 2012

Brand Name: CHUHAN

CERTIFIED

WHAT EXACTLY *IS* AN APPROVAL CERTIFICATE?

One thing that seems to be rarely appreciated is that, all an Approval Certificate really is, is some suitably authorized person examining your Safety Report and basically stating in writing:

“I hereby confirm that, products ***constructed identically*** *to those depicted in Safety Report [ABC12345] , will meet the safety requirements of AS/NZS XXXXXXXX and are therefore safe to sell”.*

If the product you actually wind up selling is NOT “constructed identically” then that Approval Certificate is not applicable to it. Unless you get a new or amended Approval that addresses these changes, then you are effectively selling a declared Article without an Approval Certificate!

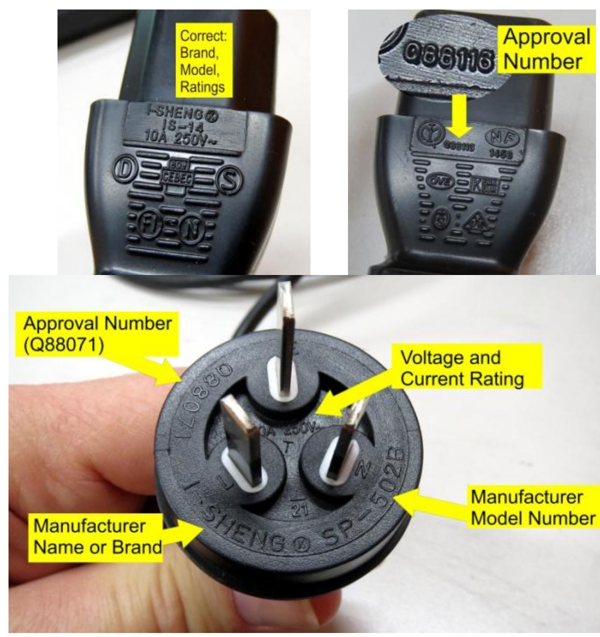
DECLARED ARTICLES

And just what IS a “Declared Article”? In all seriousness, a Declared Article might best be defined as: “An item which appears on the list of Declared Articles”!

Some examples are quite straightforward; all mains plugs, 240V wall sockets and 240V lampholders are declared articles. Most household electrical appliances such as heaters, toasters, hair dryers and so on are declared articles. CRT-based TV sets and monitors are declared articles, but LCD and Plasma-based units are not. Mains powered radios, VCRs, DVD players and stereo systems (no matter how humungous!) are not! Plugpack power supplies and battery chargers are declared articles, but a workshop type power supply is not.

Probably the declared articles that most approvals are issued for are mains plugs, mains cable and detachable appliance connectors. Virtually all 240V plugs and connectors used these days are injection moulded directly onto the mains cable, and the mouldings must include the following information:

- Approval number (or RCM)
- Voltage and current rating
- Manufacturer’s Name or Brand
- Manufacturer’s model number.
- For cords, intended usage rating (Light Duty, heavy duty etc).



The mains cable itself must have its own approval certificate, and similar information must be printed or embossed onto it as well. Other countries have similar approval regimens, but using different coding systems, which explains the seemingly endless string of letters and numbers you will see on most mains leads! (Most countries have their own particular types of AC plugs so they will normally only need the approval markings peculiar to them, but they mostly all use the same sort of cable).

Generally an approval for a mains plug will specify that it must be moulded onto a specific approved cable, or one of a selection of approved types that will be listed on the approval for the plug. Exactly the same applies for the appliance connector on the other end, if it's a detachable lead. As with a critical components list, the manufacturer is specifically prohibited from substituting any other type of cable, (even if it has a perfectly good Australian approval number).

Most approvals allow for variants of the plug and connector, for example there can be 2-pin and 3-pin versions of the plugs and cable, but all versions need to be submitted for testing. Experienced manufacturers will make sure that their approval application covers as many alternative types as possible, which gives them some backup if one brand of cable becomes unobtainable. Most issuing authorities will now allow "generalized" statements, basically: "any cable with such-and-such characteristics that has a current Australian approval number". Inexperienced local importers sometimes apply for an approval and only specify the components that make up the particular assembly they have been sent as a sample. As long as the manufacturer can continue to source the same cable there will be no problem, but if he suddenly needs to use a substitute, the approval will no longer be valid!

For legal purposes in Australia and New Zealand, a detachable power lead is considered to be made up made of three separate components: The plug, the cable and the appliance connector.

They must all have their own currently valid approval certificates, and the mains plug and appliance connector certificates must specifically state that they can be moulded onto the particular mains cable used. An importer or retailer is supposed to keep copies of all three certificates on file, and when placing subsequent orders, check their expiry dates.

In the case of non-detachable power leads, only the mains plug and cable need certificates, but if the appliance it's attached to is a declared article, it will need its own approval certificate, and this must mention the plug and cord approval numbers. Appliances that are not declared articles are still required to be electrically safe, but as with EMC compliance, the onus is on the supplier to ensure that it is, rather than relying on an official testing system. This is entirely separate from the State approval system which will only apply to the power cable and mains plug. Any number of different types of non-declared appliances could use the same approval certificates for the mains lead and plug.

This brings up an issue that has caused a lot of problems in the past. Obviously, with a made-up detachable power lead, the maximum current it can legally carry will be determined by whatever component has the lowest current rating. In the case of 2-pin “figure 8” appliance connectors, (as used by the million in portable radio/CD players), this is usually 2.5 Amps. In some cases the “helpful” manufacturer has re-labeled the 10A 240V mains plug as also “2.5A”. This is completely wrong and invalidates the approval. All such parts must be labeled according to their approval certificates. “10A” simply indicates the maximum current the plug can carry; no other components are taken into account.

The approval procedure for a declared appliance is basically the same as for a mains lead: A safety test report from an accredited laboratory is submitted to the relevant authority along a sample (or samples) of the article if required. The Authorizing person then provides a certificate stating that products constructed identically to what is depicted in the supplied Safety Report will be safe and compliant for sale in Australia.

If the manufacturer wants to make significant changes to a declared article, exactly the same principle applies to the Approval certificate as it does the safety report: Any change from the originally submitted design automatically invalidates the Approval, as well as the safety report. To rectify this, a new safety report must be obtained for the revised design, and this must be submitted to the regulator (along with the appropriate fee of course) to get the approval updated. The update must mention the changes, and the new safety report number.

In the case of electric kettles and similar declared appliances with detachable leads, in theory only an approval for the appliance itself is required, as long as the appliance is sold without an AC lead. However since most appliances are packed and sealed ready for sale at the point of manufacture, supplying the AC lead separately is likely to be more expensive than getting the manufacturer to take care of it.

So it’s entirely possible for an appliance to need four separate electrical approval certificates, plus an LVD report, plus an EMC report (if it includes a brushed motor or similar) and sometime soon, a MEPS report!

The absolutely worst-case compliance scenario is probably the case of a portable electronic appliance (eg a portable DVD player) that incorporates a lithium battery and uses a separate AC power supply with a detachable power lead. Normally, appliances themselves powered from low voltage DC don’t need electrical safety reports, only their AC adaptors. However, because of the hazardous nature of lithium batteries, an electrical safety report that specifically addresses lithium batteries is required, plus a data sheet for the lithium battery itself.

An EMC report for the player is also required, as well as a declaration that its remote control meets the requirements of its class license.

Then we come to the AC power supply! Unless the manufacturer of the DVD player has had the whole assembly tested at once (player plus power supply, which is pretty rare), separate EMC, LVD and MEPS reports will be needed for the actual power supply used. The power supply will also need its own electrical approval certificate, and if it has a detachable power lead, three more certificates will be needed for its plug, cord and appliance connector!

If the DVD player incorporates a TV tuner, it is deemed to be a TV set, and is also subject to the MEPS compliance regimen for TV receivers (which includes set top boxes and the like), and is quite separate from the MEPS requirements of the AC adaptor!

In most cases the player and its separate power supply come from different manufacturers, so you may need all the following documentation for legal sale in Australia:

- EMC report for the Player
- EMC Report for the Power Supply
- Electrical Safety report for the player
- Electrical Safety report for the Power Supply
- Current State Electrical Approval for the Power Supply
- If the power supply is not a plugpack type
- Current State Electrical Approval for the AC Plug
- Current State Electrical Approval for the AC Lead
- Current State Electrical Approval for the appliance connector (if a detachable lead)
- MEPS report for the Power Supply
- MEPS Report for the TV
- Energy Star label for the TV
- Data sheet for any Lithium Ion Battery used.

Because the high energy density and potential instability of Lithium-ion batteries, most of the electrical safety testing for portable devices themselves is centered around the battery charging system. The charging system and battery pack are required to have their own entirely independent over-voltage and over-current protections, rather in the manner of a double insulated appliance. The likelihood of both systems failing at the same time is considered remote. However you have to be wary of dodgy manufacturers who may suddenly decide “one is enough”, so it is normal procedure to verify that both systems actually work on production samples!

“DUE DILIGENCE” AND QUALITY CONTROL

The various State regulators and the ACCC are becoming increasingly concerned about the number of dangerous electrical products coming onto the market, mostly from small importers with little or no knowledge of local compliance regulations.

As mentioned at the start, as far as regulators are concerned, the person who sells the product to the general public is deemed to be the manufacturer and is solely responsible for making good any damage inflicted on the customer by their product. Retailers are free to sign any agreements they like with their suppliers, to make their suppliers liable for compensation for any monetary loss the retailer incurs as a result of having to compensate their customer, but, compensation to the customer must *always* come via the retailer.

The fact that the retailer might be waiting for the supplier to come up with compensation is of no relevance; as far as the courts are concerned, that is the retailer's problem, NOT the customer's….

Moreover, when it comes to actual injury or death of the customer, retailers are held responsible for any criminal negligence charges; they cannot push that onto the supplier either, (although the supplier can face similar charges in severe cases).

The regulators are asking the question more and more: "Yes, yes, never mind the contract you had your supplier sign, and how much you love, trust and cherish your supplier, and what a great guy he is, and how many years he's been supplying you and how you've never had a problem with any of his products and so on; HOW do actually know the products he is supplying and you are selling, are actually safe and compliant?"

On Page 37 is a sort of "Flowchart" of how this is supposed to be done:

ERAC (ELECTRICAL REGULATORY AUTHORITIES COUNCIL)

Over the past few years, there has been a move to replace the current multi-State Based Approval marking system with a new centralized database known as ERAC.

NB: As the NSW Dept of Fair Trading keep emphasizing, ERAC is NOT a government body and has no authority to enforce anything, regardless of how their website is worded. It's only when a government regulator references ERAC in their legislation, that it has any legal standing.

Currently, registration with this scheme is only mandatory in for selling products in Queensland, but unfortunately, since most retail chains operate stores in Queensland, it effectively makes it "de facto" mandatory for everybody.

The basic idea is that all high-risk Electrical products are registered on the ERAC database (for a fee of course!), and any such products are marked with the Regulatory Compliance Mark (RCM).

Every organization importing the same product (a so-called "Responsible Supplier") is required to register it, so the same product could be registered under several different names.

Currently items are divided into "Level 2" which basically means 240V products that are not declared articles, and "Level 3" which are declared articles. The fee structure is as follows (Note: There is no GST applicable on these fees).

Registration as a Responsible Supplier: $200.00 (per year)
Registration of level 2 or 3 equipment for:

1 year:	$75.00
2 years:	$150.00
5 years:	$375.00

Originally, companies were supposed to either add an ERAC Identification number (eg E123) or their name and contact details. However, now, the ID number is no longer required.

This causes problems where the same model product is imported by more than one company (plugpacks are a common example), since there is no easy way to determine which particular company actually imported the item being investigated.

Currently the NSW regulators have not agreed to fully participate in this scheme, so it has stalled somewhat.

The general idea was that for Declared Articles, all the private companies and Government Departments who issue approvals would upload their entire list of approvals onto the ERAC database, where anybody could view them.

Any company importing any product covered by one of those approvals would then be required to register that product on the ERAC database, and either upload a "compliance folder" containing all the necessary compliance files (EMC, Safety etc), or keep them on hand, to be produced in less than 10 days if required.

However, (as at Sept 2015) the NSW Dept of Fair Trading has still not chosen to participate, so "N" and "NSW" approvals are not stored on the ERAC database.

Because it was not a participant in the scheme, any products approved by the NSW Dept of Fair Trading could not be sold in NSW with just an RCM; they still had to carry the NSW Approval number. The NSW Dept of Fair Trading does however allow the sale of RCM-Marked products approved by participants to the ERAC scheme, as long as the approval is traceable. As a result, many companies simply put on the RCM logo with their RCM ID number, AS WELL AS the approval number, on the rating label. (There is nothing that says you can't do this; the rating label only has to have all the "mandatory marking" information in place; after that you can pretty much put anything you like on there).

NEW ZEALAND SDOC (ELECTRICAL SAFETY) New Zealand has a system broadly similar to ERAC, however unlike ERAC it *is* an official government requirement, and it's more like an EMC declaration, where the supplier/retailer is expected to hold copies of safety documentation and a signed SDoc. (Note: *Not* the importer; the person actually selling the item, unless the importer is also the retailer).

For all "Medium Risk" electrical items, which in NZ basically means "mains powered", the "responsible person" is required to keep copies of safety test reports, or in the case of declared articles, a copy of the approval certificate.

Unlike in Australia, the test reports do not have to be issued by a certified test lab, they can simply be a record of safety test procedures carried out by a person qualified to work on mains powered equipment, Generally however, proper test lab reports are preferred.

The signed SDoc must contain a list of the documents used to demonstrate compliance (Test reports, approvals etc) plus a description of what procedures the company uses to confirm continued compliance. That can mean pre-shipment inspections, DC inspections, random check s of store stock etc.

The SDoc must be signed by a person resident in New Zealand, and theoretically kept on file there. However many Australian companies selling in NZ often just get someone in NZ to sign the SDoc and keep the documents on a "Cloud" server.

Any member of the public can demand a copy of the SDoc for any "medium risk" electrical item offered for sale in New Zealand. A government official can also demand to see copies of the compliance documentation, which must be produced within 10 days. More information is available here:
NZ SDoc information

IDEALIZED OVERSEAS SOURCING/MANUFACTURING QA PROCESS