An update to the transition from IEC 60950-1 to IEC 62368-1

On a blog post back in March 2015, I mentioned that a Hazard-Based Safety Engineering (HBSE) IEC 62368-1 standard will be replacing IEC 60950-1 and IEC 60065, covering hazards and hazard prevention for ITE (Information Technology Equipment) and audio / visual equipment.

The transition date to EN 62368-1:2014 has now been extended 18 months to December 20th, 2020 for new submittals (or a significant modification of the existing 60950/60065 file) in the EU. UL has also announced that the UL 62368-1 Edition No. 2 date is now December 20th, 2020. A number of other countries have adopted the standard, including Australia, Singapore, Malaysia, Japan and Russia. No exact date has been published for other countries like China, Taiwan, South Korea and Argentina.

The new standard uses a Hazard Based Safety Engineering (HBSE) science discipline, and operates in four steps:

1. Identifying energy sources in the product
2. Classifying the energy for the potential of causing injury or harm
3. Identify the necessary safeguards needed to protect from those energy sources
4. Qualify the safeguards as effective

The Energy Source ES classification handles the effect on the body for a number of hazards. See Table 1 for example of the two most relevant to power supplies – electrical and thermal energy.

Energy Source class	Effect on the Body	Effect on combustible material
Class 1	Detectible, but not painful	Unlikely ignition
Class 2	Painful, but not an injury	Possible ignition, but limited
Class 3	An injury	Likely ignition, growth rapid & swift

Table 1 Energy Source classification

In addition, a three person scenario has been adopted for 62368-1 (see Table 2).

Person	Description (See standard for full details)
Ordinary Person	A person who is a user or is close by to the equipment
Instructed Person	A person that is trained to identify sources of pain causing energy and avoid them. Must not be exposed to injury causing energy sources, even during a single fault condition
Skilled Person	A person who has the training to recognize & avoid energy sources that could cause pain or injury. Must be protected against accidental contact with injury causing energy sources

Table 2: Description of types of person

Depending on the Person type and the Energy Class, Safeguards have to be in place to protect that Person. See Figure 1.

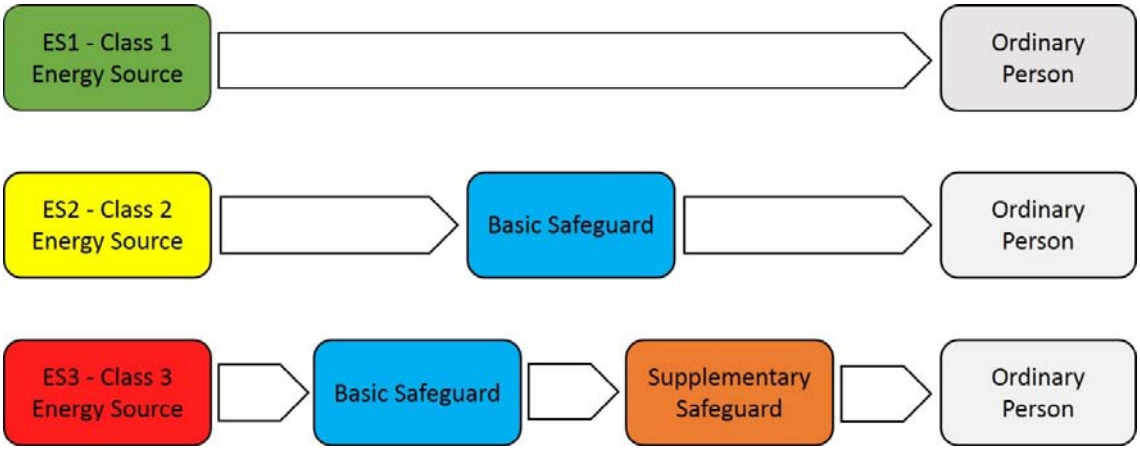

Figure 1: Protection for an Ordinary Person with different Energy Classes

As an example, one small change power supply manufacturers may have to make to their designs to meet IEC 62369-1, concerns “capacitance discharge” of the AC input.

Figure 2 shows the typical schematic of an EMI filter section of a power supply and the location of a resistor that discharges the Line to Neutral X capacitors after the AC has been removed. This avoids a user unplugging an AC plug, touching the pins and getting an electric shock.

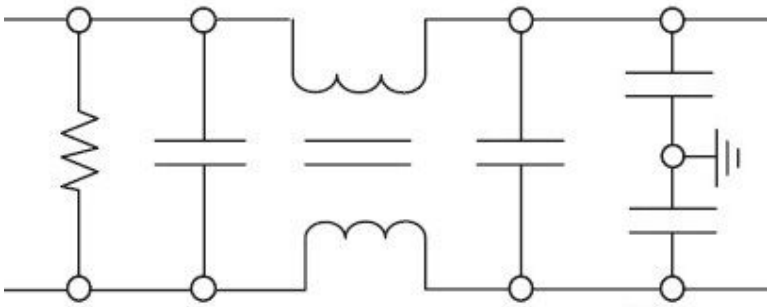

Fig 2: EMI Filter Schematic

If the line cord was removed from the AC plug at the peak of a 240V AC cycle, then the voltage would be 339Vdc. The time for that to decay to a safe voltage depends upon the values of the X capacitor(s), the Line to Neutral resistor and any loading of the power supply converter circuitry.

IEC 60950-1 states that after one second that voltage has to be at a maximum of 42.4Vpk. IEC 62368-1 states that for an X capacitance of 300nF or greater, after two seconds, the limit is 60Vpk in normal condition or 120Vpk in a single fault condition.

A 10W power phone charger will have a very small X capacitance and a high value discharge resistor. Under 62368-1, if that resistor failed (a single fault condition) the power supply

would probably still meet the 60Vpk condition after 2 seconds. From Figure 1, this still complies with no Basic Safeguard is needed, even for an “Ordinary Person”.

A higher wattage power supply on the other hand, will have a much larger X capacitance. With a single fault condition, the loss of the bleed resistor may result in a voltage of greater than 120Vpk after 2 seconds. That would then be an ES2 - Class 2 Energy Source - and from Figure 1, a Basic Safeguard would need to be in place. Instead of just one bleed resistor, a second one would need to be added, in parallel with the first. The values of the resistor would be sized accordingly to ensure that the loss of one, would still discharge the X capacitor to a maximum of 120Vdc after 2 seconds.

Supplementary Safeguards would be used in other parts of the power supply circuit in the same way as reinforced or double insulated is in 60950-1.

One side effect of the ES1 and ES2 limits is that IEC 62368-1 deems a 48V or even a 36V output power supply in hiccup mode over current as an AC output. The ES1 limits for DC are 60V, but for up to 1kHz that drops to 30Vrms or 42.2Vpk. IEC 60950-1 recognizes that as SELV, but under the new standard that would be ES2 and the output should not be made accessible to an Ordinary Person. Pins and connectors not accessible by a blunt probe are exempt.

Power Guy