White Paper

Use of Extension Cords and Power Boards in Medical Locations

Most hospitals in New Zealand either have a ban or strict control on the use of extension cords and power boards (multi-plug boards) in their facilities. Why is this and should it also apply in other medical facilities?

Let's look for a start at the fundamentals for electrical safety from a medical perspective. There are two important principles: earthing and isolation.

Earthing is where the enclosure and other metal parts of a device are connected to Earth by a low resistance path. Appliances which are protected in this way are known as Class I electrical appliances. When all devices are similarly bonded, along with other conductive items in the environment (such as water pipes, metal bench tops, etc.), the risk of an unwanted electrical potential arising between (metal) objects is minimised.

Isolation involves providing a barrier (insulation) between dangerous voltages and parts of equipment that come into contact with an operator or patient. By providing two such levels of isolation an appliance is said to be 'double insulated' and is called a Class II appliance.

Isolation is also used, in both Class I and Class II appliances, to provide a barrier between parts that contact a patient and the electrical power source. Three classifications (B, BF and CF) are used to indicate the degree of isolation provided. We won't worry with a more detailed explanation here.

For medical appliances the requirements for earthing and isolation are more stringent than for other appliances in recognition of the higher risk even minor electric shocks pose in the medical environment. The discussion from here will focus on earthing as that is where the problem lies with extension cords and power boards

AS/NZS3551, which is the standard that sets the safety parameters for medical electrical appliances, states that the earth resistance for a Class I appliance may not exceed 0.2Ω (or 0.3Ω if it has a detachable power cord). This compares to compares to 1.0Ω for non-medical appliances (see AS/NZS3760). The lower level is calculated to ensure that transient currents that might flow from an appliance when in normal use are within safe levels as determined for a medical environment. Furthermore this calculation is based on the assumption that this is the total resistance from the wall outlet to the appliance.

It's important to note at this point that many electrical safety faults on Class I medical appliances involve problems with earth integrity and numerous appliances in use will have earth resistances that, while within the acceptable limit, may not be so by much.

Extension cords and power boards are designed for domestic or general purpose use and are only required to have an earth resistance of less than 1.0Ω. So there is the first problem; a brand new extension cord or power board can have an earth resistance that is greater than the allowable limit

Published November 2014 By Meditest Ltd.

for a medical electrical appliance. So how about we choose one and test it to make sure the earth resistance is really low? In fact because we know that the plug and socket will also have some earth resistance that will add to the cumulative total, let's test them both together. (Bear in mind that it's always good practice to minimise the number of joints in any electrical circuit.) We'll use the 0.3Ω ohm limit that is allowable for a detachable power cord. Is there a problem with that?

Well actually, yes there is. The problem is that there is no guarantee that the combination of appliance and extension cord or power board will always be the same. For example somebody might use a different extension cord without realising that only the 'special' tested one is safe with that appliance. Only by having a policy of not using extension cords or power boards can this risk be abated.

There is once special case where a 'power board' can be used, and that's in what is known as a medical electrical system. In recognising the problems that could result if standard 3-pin plugs and sockets are used, the standard requires alternative connectors that cannot be removed or repositioned without the use of tools. Furthermore there is a special procedure for testing such systems.

While there might be no risk using an extension cord or power board with a double insulated appliance that doesn't rely on a protective earth connection, there is a risk in not having consistency. Most non-technical staff will not recognise the difference between Class I & II appliances, and good practice is to ensure that the environment is safe under all circumstances.

Meditest's advice to customers is that extension cords and power boards should not be used with medical electrical appliances. In accordance with this advice our policy is not to test extension cords or power boards to the AS/NZS3551 standard. Our recommendation is that, depending on the situation, either the appliance should be fitted with a longer cord, or additional 3-pin socket outlets should be installed in suitable places.