OC 559/9

Appendix 2 ultra-violet radiation exposure from compact fluorescent light bulbs (CFLs)

Introduction

This appendix describes the possible hazards presented CFLs when used under certain conditions. The information has been obtained from a research survey commissioned by the Health Protection Agency (HPA).

Findings of HPA research

New research* by the HPA has shown that some energy saving compact fluorescent lights can emit ultraviolet radiation at levels that, under certain conditions of use, can result in exposures higher than guideline levels.

* M Khazova and J B O'Hagan, Optical Radiation Emissions from Compact Fluorescent Lamps. Radiation Protection Dosimetry

The guideline levels referred to here are those recommended by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). The guideline spectrally-weighted limit is 30 J m^{-2} for the eye and skin measured over an 8-hour period, which is equivalent to a constant spectrally-weighted irradiance of 1 mW m^{-2} effective for 30,000 seconds or 8 hours, ie a normal working day. CFLs are too bright for people to comfortably stare at, so the main issue here is skin exposures from CFLs when they are used for close work on desks or work benches. The exposure limit for skin is conservative for the general population and, if it is exceeded, the immediate risk is for skin reddening, similar to sunburn. There is also a small increased risk of skin cancer associated with this, again similar to that from sunburn, but as the area of skin affected by exposure to CFLs is very small compared to sunbathing, so the risk is proportionately less.

HPA scientists assessed the time taken for CFLs to exceed the ICNIRP guidelines referred to above. At close proximity (2 cm or ¾ inch), the exposure limit would be exceeded in less than 10 minutes by about 20% of the CFLs tested. About half of the CFLs exceeded the exposure limit at this distance after 30 minutes. At a larger distance (20 cm or 8 inches) only 8% of those tested exceeded the ICNIRP guidelines after 8 hrs. Hence the advice given here is primarily aimed at avoiding very close exposures to CFLs.

The ICNIRP guideline levels for skin take account of wide variations in sensitivity of normal skin to UVR, but they do not take account of people whose medical conditions make them abnormally photosensitive. The Health Protection Agency has been discussing these findings with the Department of Health and patient groups, in particular Lupus sufferers whose condition may make them very photosensitive.

HPA scientists observed that a significant proportion of the CFLs tested had a flicker at about 100 Hz. Whilst a 100 Hz flicker will not be perceptible to most people, some will be aware of it if the light bulb is in the periphery of their vision. Lighting industry bodies were informed of this finding prior to publication and further research may be needed on this.

HPA scientists observed that the visible spectrum emissions from the tested CFLs consisted of a series of discreet narrow peaks with low or negligible emission between peaks. Visible light from the Sun is a broad spectrum so this feature of CFLs may compromise colour perception for some people and may require an increase of brightness to perform some visual tasks.

Recommendations

Some precautionary measures are recommended for the use of certain types of compact fluorescent light bulbs (CFLs). Open (or single envelope) CFLs shown in Fig. 1 should not be used where people are in close proximity – closer than 30 cm or one foot - with the bare light bulb for over one hour a day. For such situations open CFLs should be replaced by the doubly encapsulated type shown in Fig. 2. Alternatively, the lamp should be moved so that it is at least 30 cm or one foot away.

The research findings relate to ultraviolet radiation (UVR) emissions from open compact fluorescent light bulbs which have clearly visible small tubes with bends or twists in them (Fig.1). As a precaution, these types of open compact fluorescent light bulbs should not be used in situations where people can be in close proximity to the bulb (less than 30 cm or one foot) for long periods (more than one hour).

Not all open fluorescent light bulbs have significant UVR emissions but if people are in very close proximity to some of them, the exposure to bare skin is like being outside in direct sunlight. For example, scientists found that when very close (2 cm, less than one inch) to some open CFLs, the UVR level can be equivalent to that experienced outside on a sunny day in the summer and so some precaution is warranted. When further away (over 30 cm or one foot), the UVR level is much lower and less than being outside on a sunny day in winter, which is not a concern.

Encapsulated compact fluorescent light bulbs (see Fig. 2), which look similar to traditional domestic light bulbs, do not emit significant amounts of UVR. The larger long tube “strip lighting” design fluorescent lights, commonly used in offices, workplaces and homes for many years, can also be used without any special precautionary measures on ceilings.

People who suffer from Lupus and other light-sensitive conditions may be specifically affected by the emissions from compact fluorescent lights. They have to be very careful about their exposure to sunlight, so also need to be cautious about their use of compact fluorescent lights. No other groups have been identified as being particularly susceptible.

The precautionary advice arising from the HPA research is interim. Further research into the problem by others and the HPA may issue further advice when more information is available.

Fig 1 Typical designs of open (single envelope) fluorescent light bulbs for which HPA precautionary advice applies. They should not be used where people are likely to be in very close proximity to bulbs for prolonged periods.

Fig 2. A typical design of an encapsulated compact fluorescent light bulb for which precautionary measures are not needed. Ultraviolet radiation is absorbed by the outer glass container. They can be used anywhere in the home.