OC 559/9

Appendix 1 ultra-violet radiation exposure from tungsten halogen light sources

Introduction

This appendix describes the possible hazards presented by tungsten halogen light sources when used under certain conditions. The information has been obtained from a research survey commissioned by the Health and Safety Executive, and carried out by the National Radiological Protection Board (NRPB) into the use of tungsten halogen light sources in the occupational environment. The work was published in October in the HSE Contract Research Report series ‘Survey into the use of tungsten halogen light sources in occupational environments (Number 59)’.

Properties of tungsten halogen lamps

Tungsten halogen lamps are increasingly being used because they are small and highly efficient light sources. The filament operates at high temperature causing it to generate significant amounts of ultra-violet radiations (UVR) as well as visible light. To maintain operating efficiency the bulb wall must be hot (over 260oC), so it is made of quartz which withstands the heat better than glass, but absorbs less UVR.

Findings from the NRPB survey

NRPB sent a questionnaire to 500 firms asking how many lamps are used; 38% returned completed questionnaires, and of these more than half reported that some form of tungsten halogen light source is used. The majority of lamps were used as spotlights. Only 30 desktop lamps* with these bulbs were reported (less than 1% of total reported), and only 4 of these were provided with a filter. The replies also indicated that the time spent using desktop tungsten halogen lamps was up to 20 hours per week.

* The correct term for these lamps is desktop luminaires although for simplicity desktop lamps is used.

Hazards

Exposure of the skin to UVR increases the risk of developing skin cancer. The UVR exposure caused by some desktop tungsten halogen lamps can be comparable in some instances with levels of solar UVR in terms of its erythemal and potential carcinogenic effects. UVR exposures are likely to exceed exposure guidelines when unfiltered lamps are used close to people for extended periods.

Exposure depends greatly on how the lamps are used. The table below summarises NRPB's estimates from an earlier study of emissions on desktop lamps. Although generally the daily UVR dose will be modest compared with that received from a day spent out of doors on a clear summer day, the more regular nature of exposure to

radiation from desktop lamps may cause annual exposure comparable with the upper values likely to be reached in this country by people who spend most of their time out of doors.

Table 1: 1993 NRPB estimates of exposures from use of unfiltered tungsten halogen desktop lamps

Distance	% of desktop lamps exceeding UVR recommendations for usage		'Worst case' annual MED for 20 h per week use (1 MED = 300 Jm^{-2}
	10 h per week	20 h per week	
30 cm (1 ft)	25%	70%	550 MED

The values in the table can be compared to typical annual exposures to the sun in this country of between 40 and 400 MED.

A 'worst-case' situation exists when tungsten halogen light sources are used without filters, close to people (30 cm) for long periods (see table). However, it is unusual to find lamps used at such a close distance for such periods of time.

Where sources are used close to people, UVR emissions can be effectively reduced in either of the following 2 ways:

- an external glass envelope can surround the high-temperature quartz bulb; the glass envelope acts as a filter, absorbing UVR. These are relatively large and are usually fitted in standard light fittings. They are most often used where a high degree of illumination is required.

- a glass filter can be used in front of the quartz bulb, similar to those in automobile headlamps. (Such a filter also reduces the risk of burns from contact with the hot bulb.)

Increasing the distance from a source and reducing the exposure time can also help to mitigate exposure to UVR.