CIE2012 Workshop on

Street Lighting – are the currently recommended lighting levels right?

Workshop Convener: Professor Steve Fotios, University of Sheffield School of Architecture, United Kingdom

Abstract

The aim of this workshop is to explore the factors that might be considered when selecting light levels for road lighting and thus to review light levels that are currently recommended.

For subsidiary roads EN 13201-2 (2003) and CIE report 115 (2010) suggest six lighting classes, these having average illuminances of 2,0 lx to 15 lx.

Previously, in the UK, there were three classes of lighting, with horizontal illuminances of 3,5 lx, 6,0 lx and 10,0 lx. It appears that these were derived primarily from one particular field study (Simons et al, 1987) in which a small group of observers were asked to rate lighting in different streets in which the average horizontal illuminances ranged from about 1,0 lx to 12,0 lx. A nine-point rating scale was used, with points labelled very poor (1), poor (3), adequate (5), good (7) and very good (9). Horizontal illuminances were subsequently proposed that corresponded to ratings of good, adequate and poor-to-adequate lighting. A problem with this approach is that there is a stimulus range bias: when observers are asked to make judgements about a range of stimuli they tend to rate the stimuli against each other rather than against a consistent reference stimulus. When rating lighting ranging in illuminance from 1,0 lx to 12,0 lx, it is not surprising to see lighting of 1,0 lx being rated near the bottom (very poor) end bottom end of the scale and lighting of 12,0 lx being rated near the top (very good) end of the scale. If, instead, the road lighting ratings of de Boer (1961) had been used to establish illuminances corresponding to ratings of good, adequate and poor-to-adequate, then these would have been 67 lx, 18 lx and 11 lx, much higher than those derived from Simons et al.

The guidance for selecting between the six S-classes in BS5489-1:2003 is based on little more than a ranking according to convenient categories of crime rate, environmental zone and traffic flow. It is not based on the need for defined minimum illuminance levels for specific tasks. Thus while it is true that, for example, areas of high crime rate may benefit from lighting at reasonably high illuminance levels, a simple rank order approach does not allow for the fact that the illuminance provided by the lower S-classes may already be sufficient to meet the demands of crime prevention.

Light levels are typically based on best engineering practice. Recommendations are not determined by visual needs alone but are subject to practical, financial and emotional forces. These forces are dynamic: at present in the UK there is a growing trend to switch off road lighting at certain times as an energy saving measure. If lighting levels should be based on maximizing the cost:benefit ratio do we yet have sufficient data with which to identify and evaluate the value of costs and benefits?

Discussion during the workshop might include:

- How were current light levels established and are they appropriate?
- Is a range needed or would a single lighting class suffice?
- How should light levels be established – what criteria should be included?
- Are there new data to support these levels or proposed alternatives?
- Is there solid evidence of the effect of lighting on crime and accidents?
- What parameters should be specified in guidance: average horizontal illuminance, minimum illuminance, average-minimum uniformity, vertical illuminance …?

Suggested reading:
Boyce P.R. Illuminance selection based on visual performance — and other fairy stories, *Journal of the Illuminating Engineering Society*, 1996;25(2); 41-49.

If you would like to give a brief presentation, or other contribution, during this session, please contact the workshop convenor, Steve Fotios (steve.fotios@sheffield.ac.uk).