

The values in Table 6.2 are for general guidance only and may need to be adjusted for specific circumstances. For example, the criteria given under zone E1 would not preclude the installation of lighting to meet health and safety requirements. As for the maximum building luminance, this is given to avoid overlighting but should be adjusted according to the general district brightness. An alternative approach based on limiting light crossing a property's boundary is the outdoor site-lighting performance (OSP) method (Brons et al, 2008). This method has the advantage that it deals with the site the designer is responsible for and does not require detailed knowledge of areas outside the site.

Sky glow is more diffuse than light trespass in that it can affect people over great distances. Sky glow is caused by the multiple scattering of light in the atmosphere, resulting in a diffuse distribution of luminance. The problem this causes is that it reduces the luminance contrast of all the features of the night sky thereby reducing the number of stars and other astronomical phenomena that can be seen. Sky glow has two components, one natural and one due to human activity. Natural sky glow is light from the moon, planets and stars that is scattered by interplanetary dust, and by air molecules, dust particles, water vapour and aerosols in the Earth's atmosphere, and light produced by a chemical reaction of the upper atmosphere with ultra-violet radiation from the sun. The luminance of the natural sky glow at zenith is of the order of 0.0002 cd/m<sup>2</sup>. The contribution of human activity is produced by light traversing the atmosphere and being scattered by dust and aerosols in the atmosphere. The magnitude of the contribution of city lights to sky glow at a specific remote location can be crudely estimated by Walker's Law. This can be stated as

$$I = 0.01 P d^{-2.5}$$

where:  $I$  = the proportional increase in sky luminance relative to the natural sky luminance, for viewing 45° above the horizon in the direction of the city (e.g.  $I = 0.1 = 10$  percent increase)  
 $P$  = the population of the city  
 $d$  = distance to the city (km)

This empirical formula assumes a certain use of light per head of population. Experience suggests the predictions are reasonable for cities where the number of lumens per person is between 500 and 1000 lumens. Sky glow can be reduced by limiting the amount of light used for exterior lighting, by using full-cutoff luminaires that have no upward component (see Table 4.9) and by adopting a curfew in which the exterior lighting is either extinguished or reduced to a lower level when there are few people using it. For each environmental zone the maximum installed upward light output ratio of the luminaires used should be limited as shown in Table 6.3. Again, this is general guidance only and may need to be overturned in specific circumstances. The OSP method (Brons et al, 2008) again provides an alternative and more comprehensive approach in that it takes the whole installation and covers reflected light as well as direct upward light.