

Creating a landscape design, in general, requires the overlay all of the previously mentioned parameters. The aim of achieving a harmonious view together with an attractive landscape design including all functions will requires compromise.

4.2.4 Integration with Daylight

Daylight is only in some parts of the exterior lighting design, a matter for which integration or coordination is possible; like street tunnels entrances and exits, pedestrian underpasses or underground car-park facilities entrances and exits. One of the very important topics, besides providing the right light levels and other technical parameters as per local standards, are the controls of such lighting systems. These controls should be able to provide artificial light levels in correlation with the daylight levels outside. This means the people, drivers and/or cyclists should have no fear when walking or driving into a 'dark' hole or when approaching a street tunnel which may cause problems of adaption for the eyes of the driver. All tunnel lighting is therefore designed with adaption zones and brightness management to make sure that in relation to the daylight the internal lighting of the tunnel is well balanced.

The control elements (sensors) are shall be placed in safe areas, where no problems are caused for the function or for the programming because of vandalism or planting. Control elements (daylight sensors) are to be placed carefully to make sure operation of sensors and tunnel light will follow the designed parameters. If such sen-

sors are not working correctly, which could be caused by shadows of buildings or trees nearby, the tunnel lighting will service a wrong set-up and supply higher light levels as required. This may result on one side in huge additional amounts of energy costs, but more important is the fact that the safety of the tunnel is not anymore guaranteed. Additionally the maintenance may require more efforts and additional costs.

If daylight sensors in connection with astronomical-time controllers are used for example to light up pedestrian underpasses, during day and night times, reductions on energy bills may be achieved.

Automatic photo-electric controls can be used to switch-control electric lighting in response to daylight. Figure 165 shows the percentage of a normal year during which the luminaires would be off, as a function of the orientation-weighted daylight factor and of the illuminance at which the luminaires are control-switched; known as the 'design' illuminance. These curves assume that 'on' and 'off' switching will occur at the same illuminance levels. Where this is not the case, and the luminaires are switched-off at an illuminance level considerably greater than that at which they are switched -on, the mean of the two illuminances should be taken as the 'design' illuminance. Such scenarios are to be developed with care and by applying all parameters which are important to allowing the maximum reduction of energy and maintenance but at the same time to providing maximum safety to the users.