The representative British road surface is characterised as $Q_o = 0.07$ and $S1 = 0.97$. For concrete road surfaces the corresponding values are $Q_o = 0.10$ and $S1 = 0.24$. There are other r-tables available for different pavement materials. Where it is required to design for a frequently wet road, the calculations described below should be made using *r*-tables for both dry and wet surfaces.

Calculation of design spacing

The design of road lighting for traffic routes to meet the selected criteria uses information on the luminous intensity distribution of the luminaire, the layout of the luminaires relative to the carriageway and the reflection properties of the road surface.

The luminous intensity distribution of the luminaire is supplied by the manufacturer.

The layout of the luminaires for two-way roads is usually single-sided, staggered or opposite. In a single sided installation all the luminaires are located on one side of the carriageway. The single-sided layout is used when the width of the carriageway is equal to or less than the mounting height of the luminaires. The luminance of the lane on the far side of the carriageway is usually less than that on the near side. In a staggered layout, alternate luminaires are arranged on opposite sides of the carriageway. Staggered layouts are typically used where the width of the carriageway is between 1 to 1.5 times the mounting height of the luminaires. With this layout, care should be taken that the luminance uniformity criteria are met. In the opposite layout, pairs of luminaires are located opposite each other. This layout is typically used when the width of the carriageway is more then 1.5 times the mounting height of the luminaires.

The layout of luminaires for dual carriageways and motorways is usually central twin, central twin and opposite or catenary. In a central twin layout, pairs of luminaires are located on a single column in the central reservation. This layout can be considered as a single-sided layout for the two carriageways. Where the overall width of the road is wider, either because the central reservation is wider or there are more lanes, the central twin and opposite layout can be used. In this, the central twin luminaires alternate with the opposite luminaires to form a staggered layout. In the catenary layout, luminaires are suspended from a catenary cable along the central reservation. The catenary layout offers good luminance uniformity, less glare because the luminaires are viewed axially, and excellent visual guidance.

With an *r*-table matched to the pavement material, the luminous intensity distribution for the luminaire and the layout of the luminaires relative to the carriageway, the luminance produced by a single luminaire at any point P on the road surface can be calculated using the equation:

$$L = \frac{I\,r}{h^2}$$

where: L = luminance at the point P produced by the luminaire (cd/m^2)
I = luminous intensity in the direction from the luminaire to the point P (cd)
r = reduced luminance coefficient at point P
h = mounting height of luminaire (m)

This process can then be repeated for adjacent luminaires and the contributions from all luminaires summed to get the luminance at that point for the whole lighting installation. This process can then be repeated over an array of points on the road so as to get the luminance metrics used to characterise the road lighting for traffic routes.