For some luminaires, notably those with a rapid rate of change in their intensity distributions, extra spacing-to-height ratio information may be given. This can be provided in the form of a graph showing acceptable combinations of axial and transverse spacing.

The mid-area is defined for a 4 × 4 array of luminaires as the rectangular (or square) area on the horizontal plane with corners directly below the centres of the four central luminaires. The mid-area ratio (MAR) is the ratio of the minimum direct illuminance to the maximum direct illuminance calculated over the mid-area. This is obtained by calculating the direct illuminance at every point on a regular 9 × 9 grid with the corner points of the grid at the corners of the area, i.e. one under the centre of each of the four luminaires. This is the general method described in *TM5* and is now preferred to the simpler mid-point ratio (MPR) method, which is also included in *TM5*.

These spacing rules are provided as a guide for general design work, and give approximate advice. Where computer programs are available, these can be used to check that correct uniformity has been achieved over task areas.

The SHR data and the majority of lighting programs take no account of obstructions or obstruction losses, or of shadows or modelling. **Designers should not design installations close to their maximum spacing without considering the implications of doing so in terms of shadows, modelling, obstructions and the effect of lamp failures or local switching.**

Note: The use of SHR to control uniformity is only applicable when using regular arrays of luminaires.

3.8.3.5 Calculation procedure

The following procedure gives guidance on the sequence of calculations to be performed when calculating the number of luminaires necessary to obtain a chosen average illuminance on the horizontal reference plane by the lumen method.

(*a*) Calculate the room index K, the floor cavity index CI_F and the ceiling cavity index CF_C (see sections 3.8.3.2, Room index, and 3.8.3.3, Effective reflectance).

(*b*) Calculate the effective reflectances of the ceiling cavity, walls and floor cavity. Remember to include the effect of desks or machines in the latter (see section 3.8.3.3, Effective reflectance).

(*c*) Determine the utilisation factor value from the manufacturer's data for the luminaire, using the room index and effective reflectances calculated as above. Apply any correction factors (given in the utilisation factor table) for lamp type or mounting position to the utilisation factor (UF) value.

(*d*) Determine the maintenance factor (see section 3.8.2, Maintained illuminance).

(*e*) Insert the appropriate variables into the lumen method formula to obtain the number of luminaires required:

$$N = \frac{E_F \times A_F}{F \times n \times \mathrm{MF} \times \mathrm{UF_F}}$$

where E_F is the average illuminance to be provided on the working plane (lux); A_F is the area of the working plane (m^2); F is the initial bare lamp luminous flux (lumens); n is