Table 4.4. Radius of relative stiffness values (l) for different slab thicknesses and support conditions

Slab thickness: mm	Modulus of subgrade reaction K: N/mm^3			
	0·013	0·027	0·054	0·082
150	816	679	571	515
175	916	763	641	578
200	1012	843	709	639
225	1106	921	774	698
250	1196	997	838	755
275	1285	1071	900	811
300	1372	1143	961	865

4.8.1 Highway vehicle example using Meyerhof equations

Consider the same highway vehicle that was used as an example in Section 4.7. It has a rear axle load of 8000 kg. Assume a slab thickness of 200 mm on good ground ($K = 0{\cdot}054$ N/mm^3). The load is dynamic so a factor of 1·6 can be applied. In the case of a highway vehicle, this will take care of both dynamics and fatigue. The design axle load is 128 000 N (i.e. 80 000 N × dynamic/fatigue factor (1·6)) so the design wheel load is 64 000 N (64 kN). Note that in Section 4.7, the design load was 80 000 N since a factor of 2·0 was applied. However, in Westergaard-based design, the characteristic strength of the concrete is used in design unfactored. In Meyerhof, the characteristic strength of the concrete is divided by its Material Partial Safety Factor of 1·3.

Consider a slab of thickness 200 mm and try C40 concrete containing 40 kg/m^3 of anchored steel fibres. (This was the output from the example in Section 4.7.)

$$\text{Radius of patch load, } a = (64\,000/\pi 0{\cdot}7)^{1/2} = 170 \text{ mm}$$

From Table 4.2, characteristic strength of concrete = 3·2 N/mm^2. Apply the Material Partial Safety Factor of 1·3 to obtain design strength: 3·2/1·3 = 2·5 N/mm^2.

Now use:

$$M_{p,n} = f\left(\frac{h^2}{6}\right)$$

to obtain the ultimate positive and negative moments of resistance of the proposed slab:

$$M_p = M_n = 2{\cdot}5 \times 200^2/6 = 16\,667 \text{ Nmm per mm width of slab.}$$

From Table 4.4, the Radius of Relative Stiffness is 709 mm. Note that this is the distance from the centre of the load to where the bending moment in the slab changes from sagging to hogging.

Consider the situation where this single patch load is applied away from the slab edges or corners.

$$\boldsymbol{P}_u = 4\pi[M_p + M_n]/\left[1 - \frac{a}{3l}\right]$$