= contact stress between wheel and floor $= 0{\cdot}7\,\mathrm{N/mm^2}$

= radius of contact area $= (\boldsymbol{W}/\pi p)^{1/2}$

= $(80\,000/0{\cdot}7)^{1/2}$

= 191 mm.

ng known values into Equation (4.9):

$$_x = 0{\cdot}529(1 + 0{\cdot}54 \times 0{\cdot}15)\frac{80\,000}{200^2}\log\left(0{\cdot}2\frac{20\,000 \times 200^3}{0{\cdot}054 \times 191^4}\right)$$

$_x = 3{\cdot}03\ \mathrm{N/mm^2}$ beneath one wheel.

hat the wheel at the other end of the axle is 2·7m away ($S = 2700$ mm). The relative stiffness (l), using Equation (4.11) is:

$$\left(\frac{20\,000 \times 200^3}{12(1 - 0{\cdot}15^2)0{\cdot}054}\right)^{0{\cdot}25}$$

709 mm

$$\frac{2700}{709} = 3{\cdot}8$$

. 4.1:

$= 0{\cdot}005$

;, using Equation (4.12):

$$= \frac{M_t}{\boldsymbol{P}}\frac{6}{h^2}\boldsymbol{P}_2$$

$$= 0{\cdot}005\left(\frac{6}{200^2}\right)80\,000$$

$$= 0{\cdot}06\ \mathrm{N/mm^2}$$

stress is 3·03 + 0·06 $\mathrm{N/mm^2} = 3{\cdot}09\ \mathrm{N/mm^2}$.

mparing this stress with the characteristic strength of C40 concrete reinforced kg/m^3 steel fibres (3·2 $\mathrm{N/mm^2}$), it can be seen that the proposed mix is ry. A C40 concrete incorporating 40 kg/m^2 60 mm long 1 mm diameter steel fibres is inadequate for this design. However, the inclusion of a 250 mm ular sub-base would enhance K from 0·054 to 0·073 which would reduce the below the characteristic value.

some combinations of similar patch loads. Meyerhof developed his equations by considering how a concrete slab would fail. His initial work related to suspended slabs but he later applied the method to ground bearing slabs. He considered the way in which a slab would ultimately fail and equated the potential energy lost when the load moved downwards to the strain energy absorbed along the cracks that form at the time of failure.

Consider a patch load applied to a ground bearing slab gradually increasing in magnitude. The slab directly beneath the load sags and develops tension towards the underside of the slab. Further away from the patch load, tension develops in the upper part of the slab as the bending transforms from sagging to hogging. For failure to occur, the concrete has to crack in these tension zones. The yield line method assumes that at failure, the slab breaks into a series of plates and that sufficient cracks (or 'plastic hinges') need to form to generate a collection of hinged plates. Figure 4.2 shows typical patterns of hinges generated by one, two and four patch loads.

The following are the Meyerhof equations for point loads.

(*a*) Single point load applied within the body of the slab:

$$\boldsymbol{P}_\mathrm{u} = 2\pi[M_\mathrm{p} + M_\mathrm{n}] \tag{4.13}$$

(*b*) Single point load applied along a free edge of a slab:

$$\boldsymbol{P}_\mathrm{u} = (\pi[M_\mathrm{p} + M_\mathrm{n}]/2) + 2M_\mathrm{n} \tag{4.14}$$

(*c*) Single point load applied at a corner of a slab:

$$\boldsymbol{P}_\mathrm{u} = 2M_\mathrm{n} \tag{4.15}$$

(*d*) Two similar point loads spaced x apart and away from edges or corners of the slab:

$$\boldsymbol{P}_\mathrm{u} = \left[2\pi + \frac{1{\cdot}8x}{l}\right][M_\mathrm{p} + M_\mathrm{n}] \tag{4.16}$$

(*e*) Four similar point loads applied at corners of a rectangle of side lengths x and y, all four loads away from edges or corners of the slab:

$$\boldsymbol{P}_\mathrm{u} = \left[2\pi + \frac{1{\cdot}8(x+y)}{l}\right][M_\mathrm{p} + M_\mathrm{n}] \tag{4.17}$$

The corresponding equations for patch loading are as follows.

(*a*) Single patch load applied within the body of the slab:

$$\boldsymbol{P}_\mathrm{u} = 4\pi[M_\mathrm{p} + M_\mathrm{n}]\Big/\left[1 - \frac{a}{3l}\right] \tag{4.18}$$