Extreme pressure intensity at the base

$$= \frac{W}{b}\left[1 \pm \frac{6e}{b}\right] = \frac{211500}{3}\left[1 \pm \frac{6 \times 0.313}{3}\right] \ N/m^2$$

$\therefore\ p_{max} = 114633\ N/m^2$ *and* $p_{min} = 26367\ N/m^2$

Safe bearing capacity of the soil = 200 kn/m^2 = 200000 N/m^2

Fig.29.23. Shows the pressure distribution at the base.

Design of the stem

Maximum *B.M* $= M = 125000\ Nm$

Ultimate moment $= M_u = 1.5 \times 125000 = 187500\ Nm$

Effective depth $= d = 400 - 40 = 360\ mm$

$$\frac{M_u}{bd^2} = \frac{18750 \times 10^3}{1000 \times 360^2} = 1.447$$

Percentage of steel

$$p_t = 50\left[\frac{1 - \sqrt{1 - \frac{4.6 \times 1.447}{20}}}{\frac{415}{20}}\right] = 0.441\%$$

$$A_{st} = \frac{0.441}{100}(1000 \times 360) = 1588\ mm^2$$

Spacing of 16 *mm* diameter bars $= \frac{201 \times 1000}{1588} = 126\ mm$

Provide 16 mm ϕ bars @ 120 mm c/c

Distribution steel $= \frac{0.12}{100}(1000 \times 400) = 480\ mm^2$

Spacing of 8 *mm* diameter bars $= \frac{50 \times 1000}{480} = 104\ mm$ *say* 100 *mm c/c*

If the distribution steel is provided near both the faces, the spacing of 8 mm diameter bars will be 200 mm near each

Design of the toe slab

The bending moment calculations for a 1 *metre* wide strip of the toe slab are shown in the table below.

B.M. Calculations for a 1 metre wide strip of the toe slab

Load due to	*Magnitude of the load (N)*	*Distance from c (m)*	*Moment about c (Nm)*
Upward pressure			
$c\,d\,j\,f$ 85211 × 1	85211	0.5	42605.50
$j\,f\,e\ \frac{1}{2} \times 1 \times 29422$	14711	$\frac{2}{3}$	9807.33
			52412.83
Deduct for self weight of toe slab			
1 × 0.40 × 25000	10000	0.5	5000
B.M. for toe slab			47412.83

B.M. for toe slab $= M = 47412.83\ Nm$

Ultimate moment $= M_u = 1.5 \times 47412.83 = 71119.245\ Nm$