Distance of the point of application of the resultant force from the heel end a

$$= z = \frac{598433.73}{292650} = 2.045\ m$$

Eccentricity $\quad e = z - \frac{b}{2} = 2.045 - 1.750 = 0.295$

$$\frac{b}{6} = \frac{3.5}{6} = 0.583$$

$$\therefore \quad e < \frac{b}{6}$$

Extreme pressure intensity at the base

$$\frac{W}{b}\left[1 \pm \frac{6e}{b}\right] = \frac{292650}{3.5}\left[1 \pm \frac{6 \times 0.295}{3.5}\right] N/m^2$$

$$p_{max} = 125900\ N/m^2 \text{ and } p_{min} = 41330\ N/m^2$$

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

Fig.29.28. shows the pressure distribution at the base.

Design of the stem

$$\text{Maximum B.M} = M = 170996.53\ Nm$$

$$\text{Ultimate moment} = M_u = 1.5 \times 170996.53 = 256494.79\ Nm$$

Effective depth $\quad d = 450 - 40 = 410\ mm$

$$\frac{M_u}{bd^2} = \frac{256494.79 \times 10^3}{1000 \times 410^2} = 1.526$$

Percentage of steel $\quad p_t = 50\left[\dfrac{1 - \sqrt{1 - \dfrac{4.6 \times 1.526}{20}}}{\dfrac{250}{20}}\right] = 0.778\%$

$$\therefore \quad A_{st} = \frac{0.778}{100} \times (1000 \times 310) = 2412\ mm^2$$

Spacing of 18 mm diameter bars $\quad = \dfrac{254 \times 1000}{2412} = 105\ mm$

Provide 18 mm ϕ bars @ 100 mm c/c

Distribution steel $\quad = \dfrac{0.15}{100} \times 1000 \times 450 = 675\ mm^2$

Spacing of 8 mm diameter bars $\quad = \dfrac{50 \times 1000}{675} = 74\ mm$ *say 70 mm*

Provide 8 mm ϕ bars @ 140 mm c/c near each face

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 *cdjf* 101737 × 1101737		0.5	50868.50
jfe $\frac{1}{2} \times 1 \times 24163$	12081.5	$\frac{2}{3}$	8054.33
			58922.83
Deduct for self weight of the toe slab 1 × 0.45 × 25000	11250	0.5	5625
B.M. for toe slab			53297.83