Design. 29.1. *Design a reinforced concrete contilever type retaining wall having a 5 m tall stem. The wall* soil level with its top. *The soil weighs 18000 N/m³ and has an angle of repose of 30°. The safe bearing capacity of* is 200 kN/m² *Use M 20 concrete and Fe 415 steel.*

Solution:

Wall proportions.

Thickness of the stem of the top = 200 *mm*

Thickness of the stem at the bottom

Consider one *metre* run of the wall.

Maximum bending moment per *metre* run of the wall

$$= M = C_p \frac{wh^3}{6} = \frac{1}{3} \times 18000 \times \frac{5^3}{6} = 125000\ Nm$$

Ultimate moment

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

$0.138 f_{ck} bd^2 = 0.138 \times 20 \times 1000\ d^2 = 187500 \times 10^3$

$d = 261\ mm$

Effective cover to stem reinforcement = 40 *mm*

Total thickness of stem= 261 + 40 = 301 *mm*

The thickness may be increased by 30% to 35% for an economical design.

Provide a thickness of 400 mm at the bottom of the stem.

The base slab also will be made 400 *mm* thick.

Total height of the wall= $H = 5 + 0.40 = 5.40\ m$

Width of the base slab

$b = 0.5\ H$ to $0.6\ H$

$0.5\ H = 0.5 \times 5.4 = 2.70\ m$

$0.6\ H = 0.6 \times 5.4 = 3.24\ m$

Provide a base width of 3 m

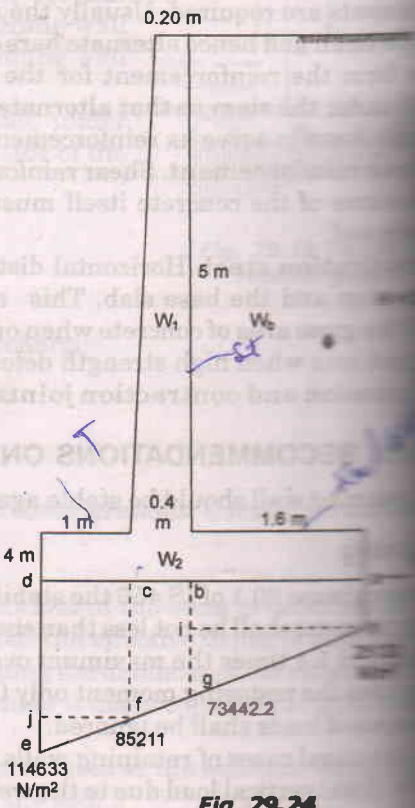

Fig. 29.24

Toe projection This may be made about one-third the base width.

Provide a toe projection of 1 m

Stability calculations See table below for stability calculations.

Load due to	*Magnitude of the load (N)*	*Distance from a (m)*	*Moment about a (Nm)*
W_1 $0.2 \times 5 \times 25000$	25000	1.7	42500
$\frac{0.2 \times 5}{2} \times 25000$	12500	$\frac{28}{15}$	23333.33
W_2 $3 \times 0.40 \times 25000$	30000	1.5	45000
W_b $1.6 \times 5 \times 18000$	144000	0.8	115200
Moment of lateral pressure $C_p w \frac{H^3}{6} = \frac{1}{3} \times 18000 \times \frac{5.4^3}{6}$			157464
Total	211500		383497.33

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

$$= Z = \frac{383497.33}{211500} = 1.813\ m$$

$$\therefore \text{ Eccentricity } e = Z - \frac{b}{2} = 1.813 - 1.50 = 0.313\ m$$

$$\frac{b}{6} = \frac{3}{6} = 0.5 \quad \therefore\ e < \frac{b}{6}$$