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TOS

① Design a Cantilever retaining wall retain on soil upto 4m above ground level the soil density is 16 Kn/m angle of repose is 30 degree coefficient of friction is 0.6 Soil bearing capacity is 150 Kn/m2 if grade of concrete as m 25 and grade of steel as Fe415 draw detail digram showing reinforcement details.

Data M25 σ_{abc} = 8.5, Fe415, σ_{st} = 230 N/mm² ϕ=30

Solution : Step 1

→ $ka = \frac{1-\sin\phi}{1+\sin\phi} = \frac{1-\sin 30}{1+\sin 30} = 0.33$ or 1/3

→ $DF = \frac{SBC}{YS} \times ka^2 = \frac{150}{16} \times \left(\frac{1}{3}\right)^2 = 1.04$ or 1.5m

→ Total ht (H) = Hsoil + DF = 4 + 1.5 = 5.5m

Step 2 preliminary sizing

Width of Base Slab (B) = 0.6(H) to 0.7(H)

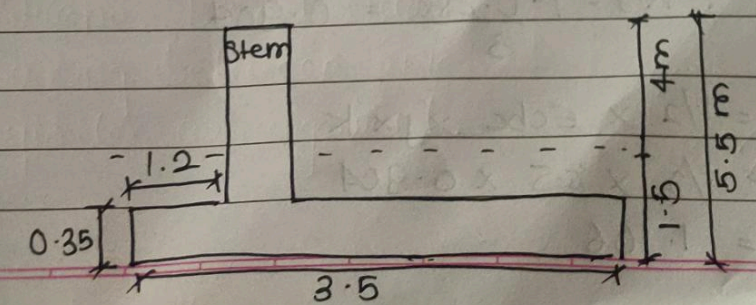
$= 5.5 \times \frac{60}{100}$ to $5.5 \times \frac{70}{100}$

= ~~3.85~~ to

= 3.3 to 3.85 = 3.5

→ THK of Base Slab = B/10 = 0.35

→ Toe width = 1/3 × B = 1/3 × 0.35 = 1.2m



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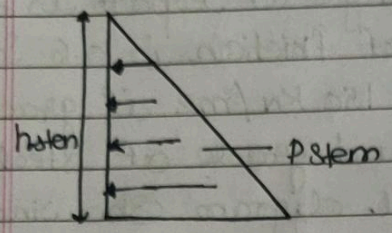
→ Calculation of latual pressure and Bending moment



hstem = H - thk of base slab
= 6.8 - 0.35
= 5.15

→ $p = 1/2 \times Base \times ht - 1/2 \times (ka \times ys \times hstem) \times hstem$
$= 1/2 \times (27.46) \times 5.15.$
$= 70.725\ KN$

→ Bm of Stem - Force x 1x distance $= p \times \frac{Hstem}{3}$
$= 70.725 \times \frac{5.15}{3} = 121.41$

→ $\sigma cbc = 8.5\ N/mm^2$, $\sigma st = 230\ N/mm^2$

Step3 Finding the constants.

→ $m = \frac{280}{3 \sigma cbc} = \frac{280}{3 \times 8.5} = 10.980$

$k = \frac{1}{1 + \frac{\sigma st}{m \cdot \sigma cbc}} = \frac{1}{1 + \frac{230}{10.98 \times 8.5}} = 0.285$

$j = 1 - k/3 = 1 - \frac{0.288}{3} = 0.904$

$Q = 1/2 \times \sigma cbc \times j \times k$
$= 1/2 \times 8.5 \times 0.904$
$= 1.106$

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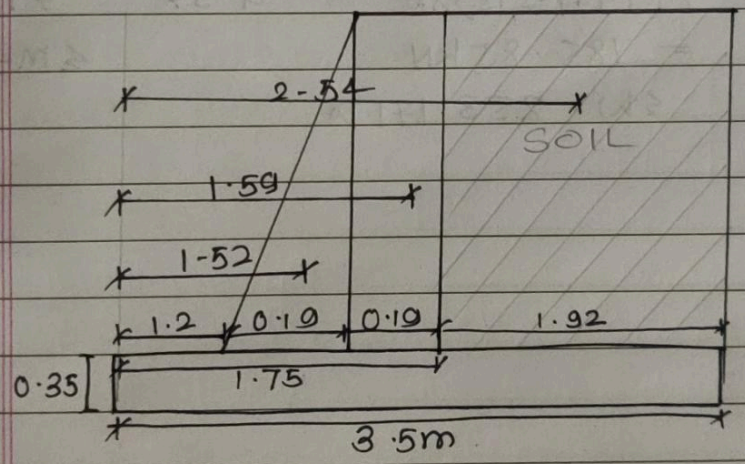
Step 4 Calculation of Stem Depth (thickness)

$$d = \sqrt{\frac{Bm}{Q \times b}} = \sqrt{\frac{1214 \times 10^3}{1.106 \times 1000}} = 331.4\ mm$$

D = d + clear cores (50mm) = 381.4 ≈ 380 mm

B = 3.5m, thk of base slab = 0.35

Thk of toe width = 1.2m



Step 5. Centroids (w_3) = $1.2 + 2(h/3) = 1.2 + 2\left(\frac{0.19}{3}\right) = 0.132$

Centroids for other side = $1.2 + 0.19 + \frac{0.19}{2} = 1.485 \approx 1.59$

Centroids of Soil = $1.2 + 0.19 + 0.19 = \frac{1.9^2}{2} = 2.54$

Step 6 Stability check

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Components	Weight (KN)	CG from toe	moments
- Base slab →	(3.5 × 0.35) × 2.5 = 30.625 KN	1.58	48.3
- Steam Root →	(0.19 × 5.16) × 25 = 24.465 KN	1.59	38.8
- Steam Root A →	(1/2 × 0.19 × 5.15) × 25 = 12.23 KN	1.32	18.58
- Soil →	(1.92 × 5.15) × 16 (50) = 185.85 KN	2.54	472.059
	≤W = 253.171 W		≤M = 575