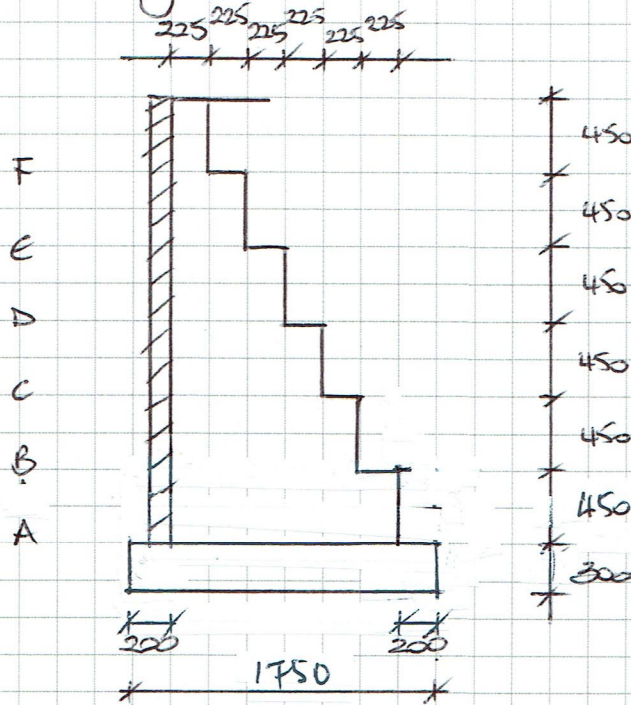


Retaining Wall - Plot 22 Clos Dewi Sant

The wall will be constructed in a series of heights comprising 225 mm thickness in 450 mm height risers.

Max^m Wall Height = 2700 mm.



$$K_a = 0.27$$

$$\rho_{\text{back}} = 20 \text{ kN/m}^3$$

$$\rho_{\text{cone}} = 24 \text{ kN/m}^3$$

$$\rho_{\text{backfill}} = 18 \text{ kN/m}^3$$

$$\mu = 0.5 \quad \phi = 35^\circ$$

• Check Wall above F

$$\text{Hor. thrust} = \frac{1}{2} w h^2 K_a = 0.49 \text{ kN}$$

$$\text{o/T. Moment} = \frac{0.49 h}{3} = 0.074 \text{ kN.m}$$

$$\text{Restoring Moment} = 0.45 \times 0.225 \times 20 = \frac{2.025 \times 0.225}{2} = 0.23 \text{ kN/m}$$

$$\text{Resultant} = \frac{0.23 - 0.074}{2.025} = 0.07 \text{ m from C}$$

(ie) Within Middle 3rd ✓ OK.

• Cheek Wall above E

$$\text{Hor. Thrust} = \frac{1}{2} w h^2 K_a = 1.97 \text{ kN}$$

$$\text{o/T Moment} = 1.97 \cdot \frac{h}{3} = 0.59 \text{ kNm}$$

Restoring Moments	$0.45 \times 0.45 \times 20 = 4.05 \times 0.225 = 0.911$
	$0.225 \times 0.45 \times 18 = 1.82 \times 0.337 = 0.613$
	<u>2.025</u>

$$\Sigma = 7.895 \text{ kN} \quad \Sigma = 1.754 \text{ kNm}$$

$$\text{Resultant} = \frac{1.754 - 0.59}{7.895} = 0.147 \text{ from E}$$

(ie) 3mm o/s Middle 3rd ✓ OK.

• Cheek Wall above D

$$\text{Hor. Thrust} = \frac{1}{2} w h^2 K_a = 4.43 \text{ kN}$$

$$\text{o/T Moment} = 4.43 \cdot \frac{h}{3} = 1.99 \text{ kNm}$$

Restoring Moments	$0.45 \times 0.675 \times 20 = 6.075 \times 0.3375 = 2.05$
	$0.225 \times 0.9 \times 18 = 3.645 \times 0.562 = 2.05$
	<u>7.895</u>

$$\Sigma = 17.615 \quad \Sigma = 5.854 \text{ kNm}$$

$$\text{Resultant} = \frac{5.854 - 1.99}{17.615} = 0.219 \text{ from D}$$

(ie) 6mm o/s Middle 3rd ✓ OK.

• Cheek Wall above C

$$\text{Hor. Thrust} = \frac{1}{2} w h^2 K_a = 7.87 \text{ kN}$$

$$\text{o/T Moment} = 7.87 \times \frac{h}{3} = 4.72 \text{ kNm}$$

Restoring Moments	$0.45 \times 0.9 \times 20 = 8.10 \times 0.45 = 3.645$
	$0.225 \times 1.35 \times 18 = 5.47 \times 0.787 = 4.303$
	<u>17.615</u>

$$\Sigma = 31.185 \text{ kN} \quad \Sigma = 13.80 \text{ kNm}$$

$$\text{Resultant} = \frac{13.8 - 4.72}{31.185} = 0.291 \text{ m from C}$$

(ii) 9mm o/s Middle 3rd ✓ OK.

• Check Wall above B.

$$\text{Hor. Thrust} = \frac{1}{2} w h^2 \cdot K_a = 12.3 \text{ kN}$$

$$\text{o/T Moment} = 12.3 \frac{h}{3} = 9.23 \text{ kNm}$$

$$\begin{array}{l} \text{Restoring Moments} \\ 0.45 \times 1.125 \times 20 = 10.125 \times 0.562 = 5.69 \\ 0.225 \times 1.8 \times 18 = 7.29 \times 0.9 = 6.56 \end{array}$$

$$\Sigma \frac{31.185}{48.4} \text{ kN} \quad Z = \frac{13.8}{26.05} \text{ kNm}$$

$$\text{Resultant} = \frac{26.05 - 9.23}{48.4} = 0.344 \text{ m from B.}$$

(ii) 29mm o/s Middle 3rd ✓ OK.

• Check Wall above A

$$\text{Hor. Thrust} = \frac{1}{2} w h^2 \cdot K_a = 17.72 \text{ kN}$$

$$\text{o/T Moment} = 17.72 \frac{h}{3} = 15.94 \text{ kNm}$$

Restoring Moments

$$\begin{array}{l} 0.45 \times 1.35 \times 20 = 12.15 \times 0.675 = 8.20 \\ 0.20 \times 2.70 \times 18 = 9.72 \times 1.237 = 12.02 \end{array}$$

$$\Sigma = \frac{48.6}{70.47} \text{ kN} \quad Z = \frac{26.05}{46.27} \text{ kNm}$$

$$\text{Resultant} = \frac{46.27 - 17.72}{70.47} = 0.405 \text{ from A.}$$

(ii) 45mm o/s Middle 3rd ✓ OK.

For wall height checks where Resultant falls o/s Middle 3rd
Stability Check is OK as Restoring Mom > 1.5 < o/T Mom.

• Check Whole Wall including Base

$$\text{Hor. thrust} = \frac{1}{2} w h^2 K_a = 21.87 \text{ N}$$

$$\text{o/T Moment} = 21.87 \frac{h}{3} = 21.87 \text{ kNm}$$

Restoring Moments

$0.225 \times 2.70 \times 20 = 12.15$	$\times 0.3125 = 3.80$
$0.225 \times 2.25 \times 20 = 10.125$	$\times 0.5375 = 5.44$
$0.225 \times 1.80 \times 20 = 8.10$	$\times 0.7625 = 6.18$
$0.225 \times 1.35 \times 20 = 6.075$	$\times 0.9875 = 6.00$
$0.225 \times 0.90 \times 20 = 4.05$	$\times 1.2125 = 4.91$
$0.225 \times 0.45 \times 20 = 2.025$	$\times 1.4375 = 2.91$
$0.200 \times 2.70 \times 18 = 9.72$	$\times 1.650 = 16.04$
$0.225 \times 2.25 \times 18 = 9.11$	$\times 1.4375 = 13.10$
$0.225 \times 1.80 \times 18 = 7.29$	$\times 1.2125 = 8.84$
$0.225 \times 1.35 \times 18 = 5.47$	$\times 0.9875 = 5.40$
$0.225 \times 0.90 \times 18 = 3.65$	$\times 0.7625 = 2.78$
$0.225 \times 0.45 \times 18 = 1.82$	$\times 0.5375 = 0.98$
$0.30 \times 1.75 \times 24 = 12.6$	$\times 0.875 = 11.03$
$\Sigma = 92.18 \text{ kN}$	$\Sigma = 87.41 \text{ kNm}$

$$\text{Resultant} = \frac{87.41 - 21.87}{92.18} = 0.711 \checkmark$$

$\therefore$ (ie) Within Middle 3rd $\checkmark$ OK

Sliding $\# \text{ of } S = \frac{92.18 \times \mu(0.5)}{21.87} = 2.11 \checkmark \text{ OK}$

Bearing Pressure

$$\frac{P}{A} \pm \frac{Pe}{Z}$$

$$Z = \frac{BD^2}{6} = \frac{1.0 \times 1.75^2}{6}$$

$$Z = 0.51$$

$$B.P = \frac{92.18}{1.75} \pm \frac{92.18 \times 0.131}{0.51}$$

$$e = 0.875 - 0.744 = 0.131$$

$$\therefore \text{Max}^m \text{ BP} = 76.35 < 100 \text{ kN/m}^2 \checkmark \text{ OK}$$

END