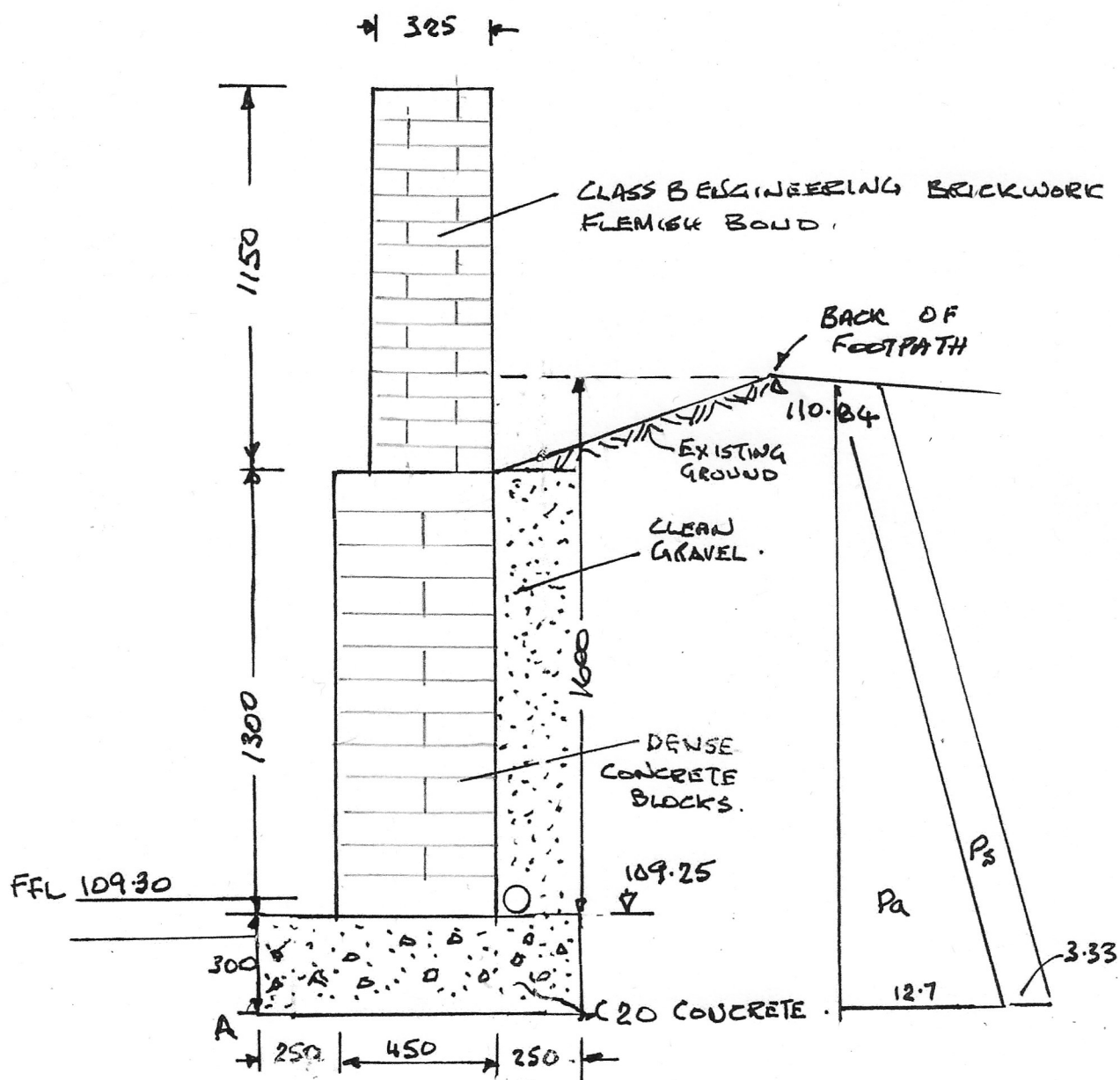


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NOTE: BACK OF WALL DRAINAGE
TO DISCHARGE TO EXISTING
SURFACE WATER MANHOLE
I.L. 108.01

$$\text{Active Pressure } P_a = 1.9 \times \frac{20}{3} = 12.67 \text{ kN/m}^2$$

$$\text{Surcharge Pressure } P_s = \frac{10}{3} = 3.33 \text{ kN/m}^2$$

Taking Moments about A

$$12.67 \times \frac{1.9^2}{2 \times 6} = 7.62 \text{ kNm}$$

$$\frac{1.9^2}{2} \times 3.33 = 6 \text{ kNm}$$

$$\text{Total} = 13.62 \text{ kNm}$$

Righting Moment

$$\text{Base} = \frac{9.5^2}{2} \times 3 \times 22 = 2.98 \text{ kNm}$$

$$\text{Lower Stem} = 1.3 \times 4.5 \times 20 \left(\frac{.45}{2} + .25 \right) = 5.56 \text{ kNm}$$

$$\text{Upper Stem} = 1.15 \times 3.25 \times 26 \left(\frac{.325}{2} + .375 \right) = 5.22 \text{ kNm}$$

$$\text{Free draining backfill} = 1.3 \times 2.5 \times 20 \left(-.7 + \frac{.25}{2} \right) = 5.36 \text{ kNm}$$

$$\text{Roof load} = 1.91 \times (-.7 - .05) = 1.33 \text{ kNm}$$

$$\text{Surcharge} = 10 \times .575 \times \left(.9 - \frac{.575}{2} \right) = 3.52 \text{ kNm}$$

$$\text{TOTAL} = 23.97 \text{ kNm}$$

$$\therefore F_o f_s = \frac{23.97}{13.62} = 1.76 \therefore \text{OK.}$$

Sliding

$$\text{Horizontal force} = 0.5 P_a h + p_s h$$

$$= 0.5 \times 12.67 \times 1.9 + 3.3 \times 1.9$$

$$= 12.04 + 6.27 \text{ kN}$$

$$= \underline{18.31 \text{ kN}}$$

Total weight of wall, backfill & surcharge.

$$\text{Base} \quad .95 \times .3 \times 22 = 6.27$$

$$\text{Lower stem} \quad 1.3 \times .45 \times 20 = 11.70$$

$$\text{Upper stem} \quad 1.15 \times .325 \times 26 = 9.72$$

$$\text{Backfill} \quad 1.3 \times .25 \times 20 = 6.50$$

$$\text{Roof load} = 1.91$$

$$\text{Surcharge} \quad 10 \times .575 = \underline{5.75}$$

$$41.85$$

Taking friction = 0.58 with $\phi = 30^\circ$ (ie. $\tan \phi$)

Then this equates to 24.27

Passive resistance of base 0.3m deep

$$= 1 \times 0.3^2 \times 3 \times 20$$

$$= 2.7 \text{ kN}$$

This is still insufficient, therefore modify the base to be 0.5m deep at the

rear face. This gives a passive resistance for 7.5kN giving a total resistance of $24.27 + 7.5 = 31.77 \text{ kN}$ and an FOS of 1.74 which is OK.

