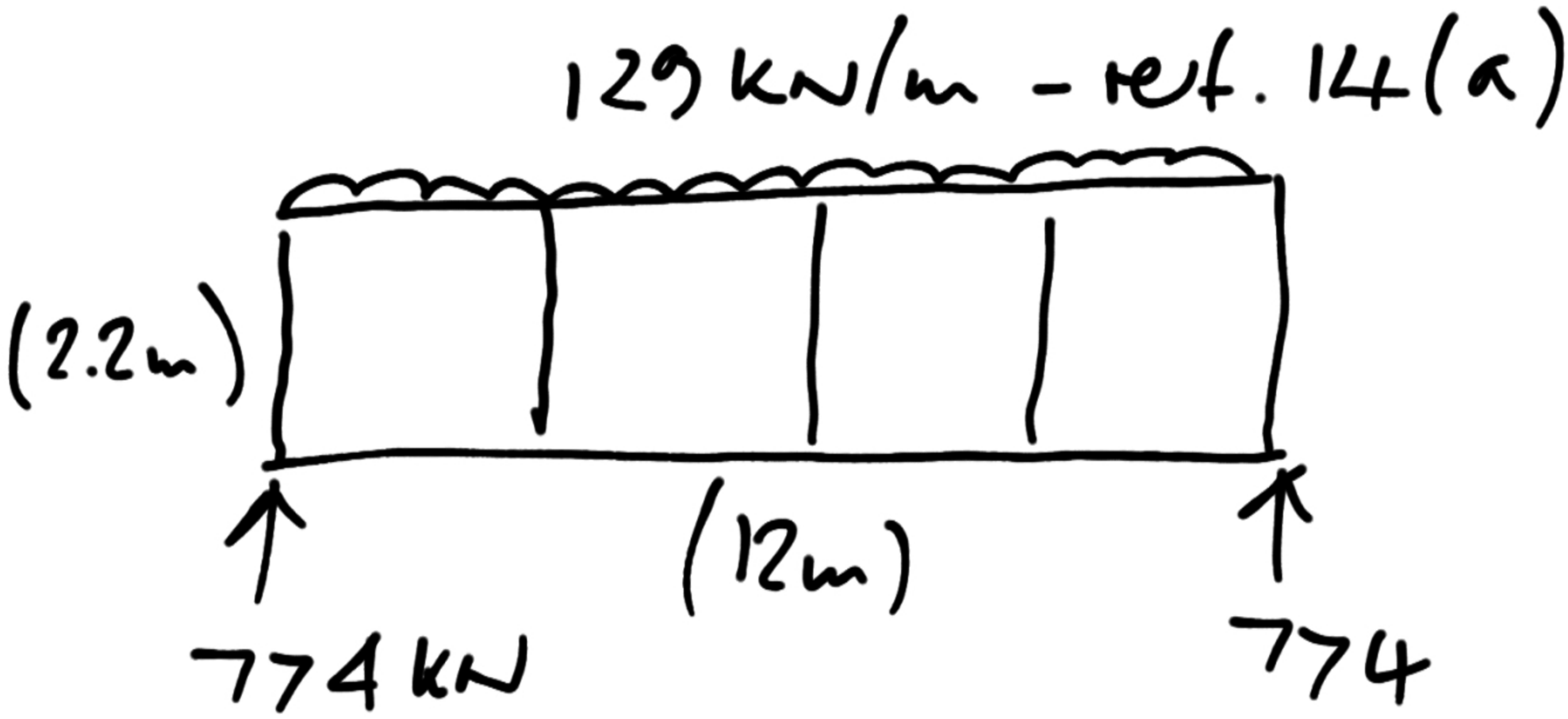
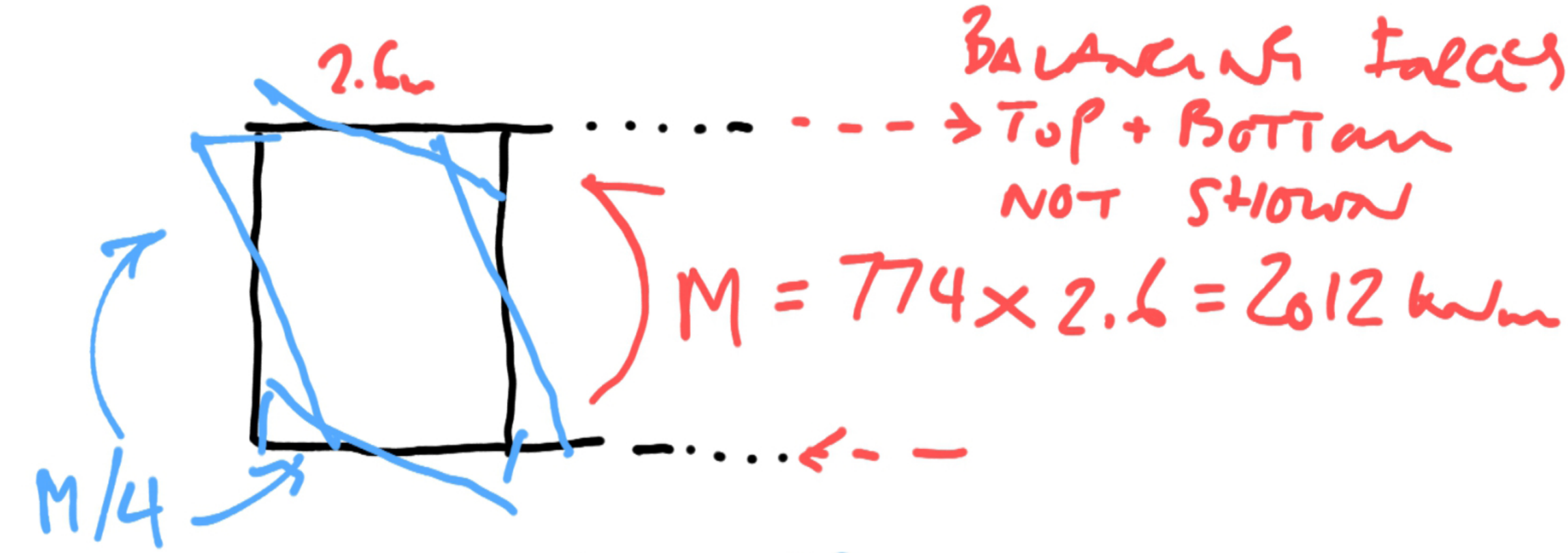
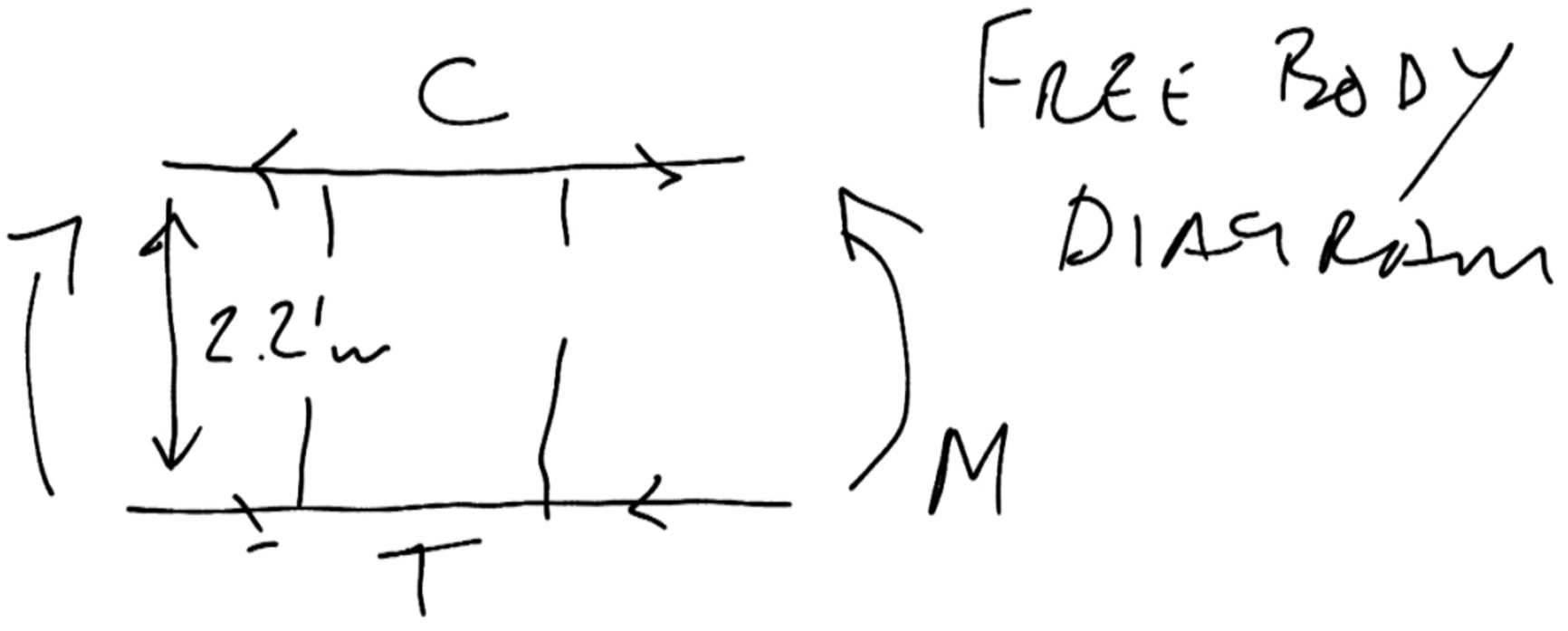
QUESTION 15(a)



FREE BODY DIAGRAM AT SUPPORT



QUESTION 15(b)



FREE BODY DIAGRAM

$C = -T$ (compression top)

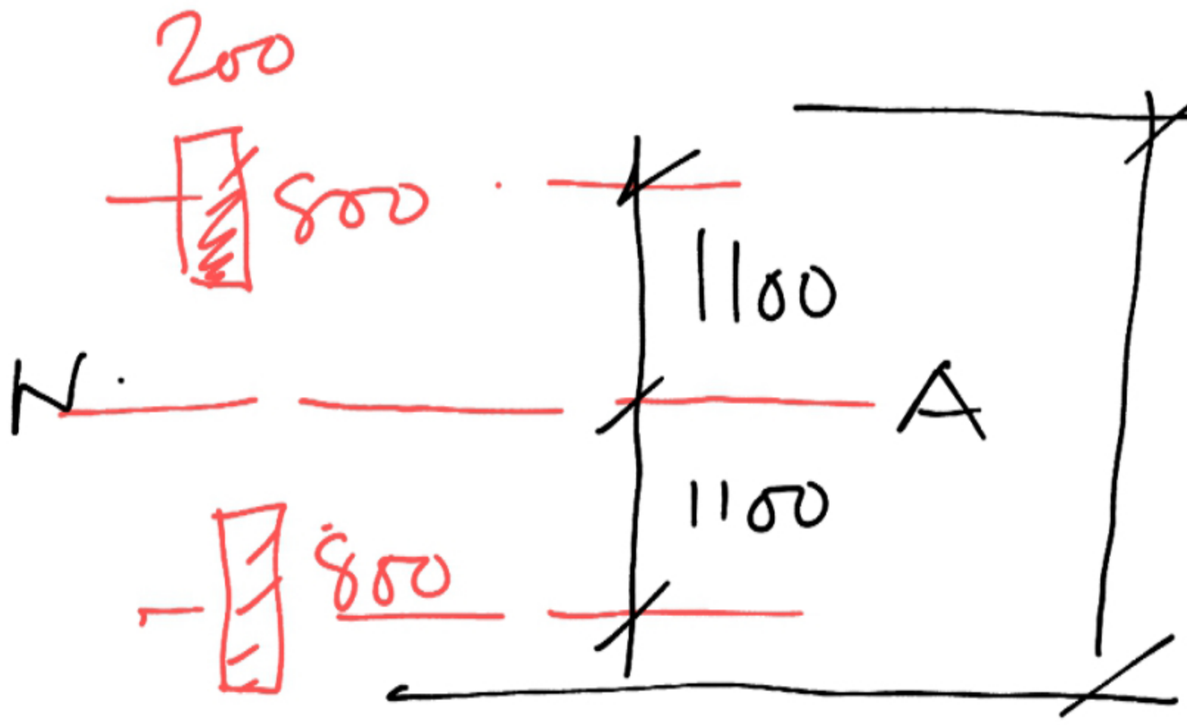
$M = 2322$ kNm (ref. 14(a))

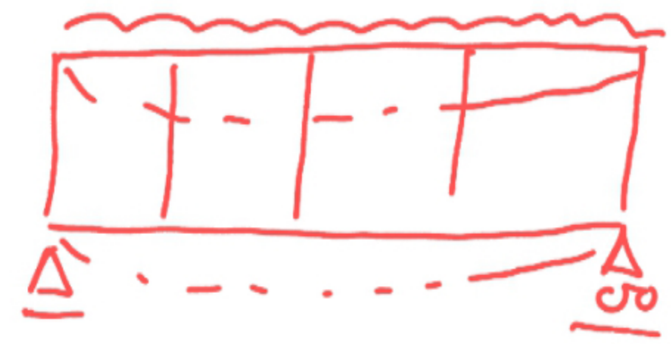
$\therefore C = -T = 2322 / 2.2$

$= 1055$ kN

Make sure if modelling computer that support is allowed to slide sideways to compare.

QUESTION 15(C)





COMPUTER MODEL
$\Delta_m \sim 18mm > 5$
ACTS MORE AS FRAME (CHECK NOT RELIABLE)

SECTION

$I_{SECTION} \sim 2A\bar{y}^2 \sim$ ← Ch.2.6/54-55

$= 2 \times 80cm \times 20cm \times 110cm$

$= 39 \times 10^6 cm^4$

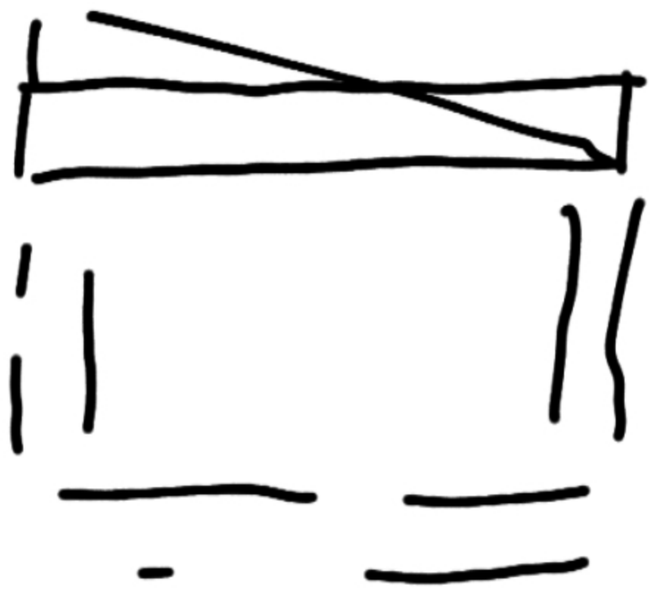
figure 2.2.3

$\Delta_m = \frac{5wL^4}{384EI}$ — E(concrete) as advised $12 \times 10^3 N/mm^2$ (mPa)

$= \frac{5 \times 129/1.5 \times 12000^4}{384 \times 12E3 \times 390E9}$

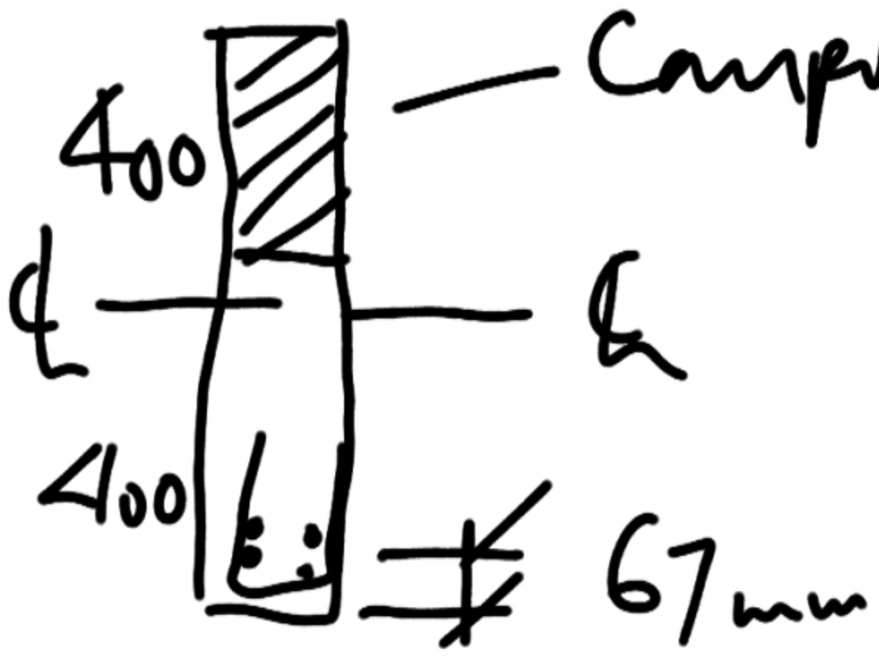
$= \boxed{5mm}$

QUESTION 15(d)



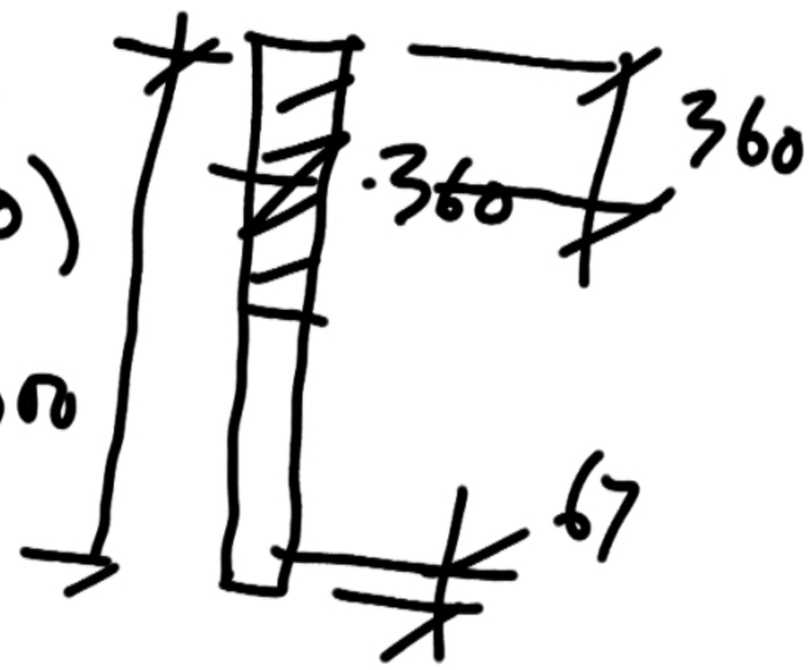
- ref. Q15(a)

M = 505kNm



Compression zone

(0.9 × 400 = 360)



$L_a = 800 - 360/2 - 67 : 553\,mm$

Tension bars = $503E3/553 = 909\,kN$

Area bars 490, Area required = $909E3/500$

$= 1818\,mm^2$ 4x25 diameter bars

$= 4 \times 490 = 1960\,mm^2 > 1818$

↑2T12 ≡ 113x2 : 226 > 208

Shear Stress $V_s = \dfrac{774 \times 10^3}{2 \times 200 \times (860 - 67)} = 2.6\,N/mm^2$

Area req. ~ $\gamma_v . V_s . w / f_y$

$= 200 \times 200 \times 2.6 / 500 = 208\,mm^2$

QUESTION 15(a)

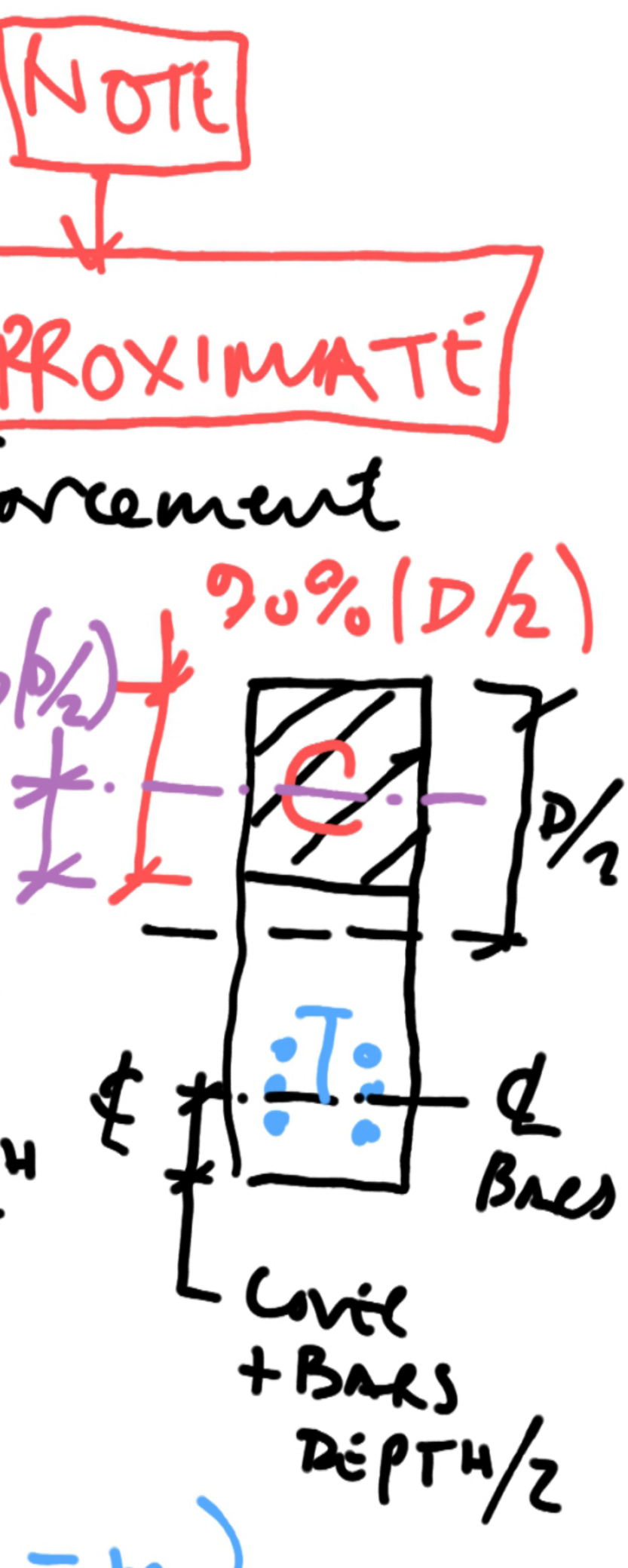
NOTE → APPROXIMATE

(RECAP)

Recap - Bending Reinforcement

C - Compression Zone

T - Tension Zone



LEVER ARM

$L_a = D - 0.45(D/2) - \text{Cover} - \frac{\text{BAR DEPTH}}{2}$

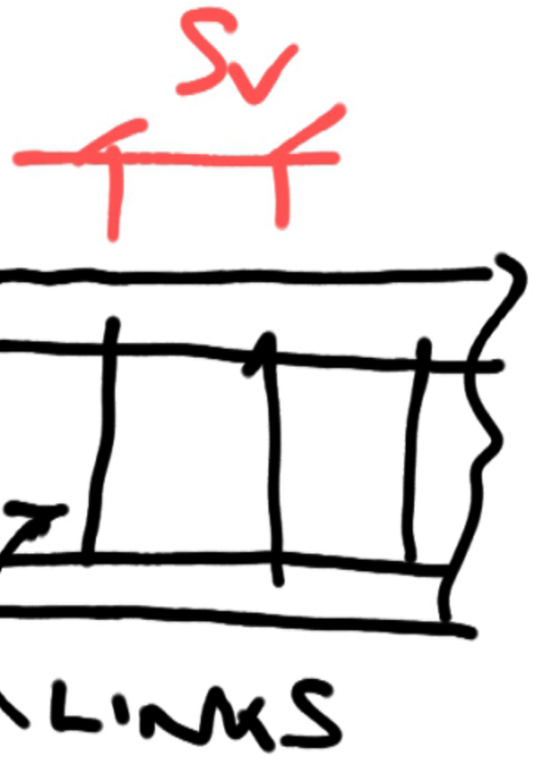
Tension (Bars) kN = M / L_a

(M - kNm L_a - m)

SHEAR Reinforcement

$$A_{sv} = \frac{S_v \cdot w \cdot V_s}{f_y}$$

- A_{sv}: Area of links (TOTAL from no. of legs)
- S_v: Spacing
- w: WIDTH
- V_s: Shear stress
- f_y: YIELD STRENGTH REINFORCEMENT eg N/mm²



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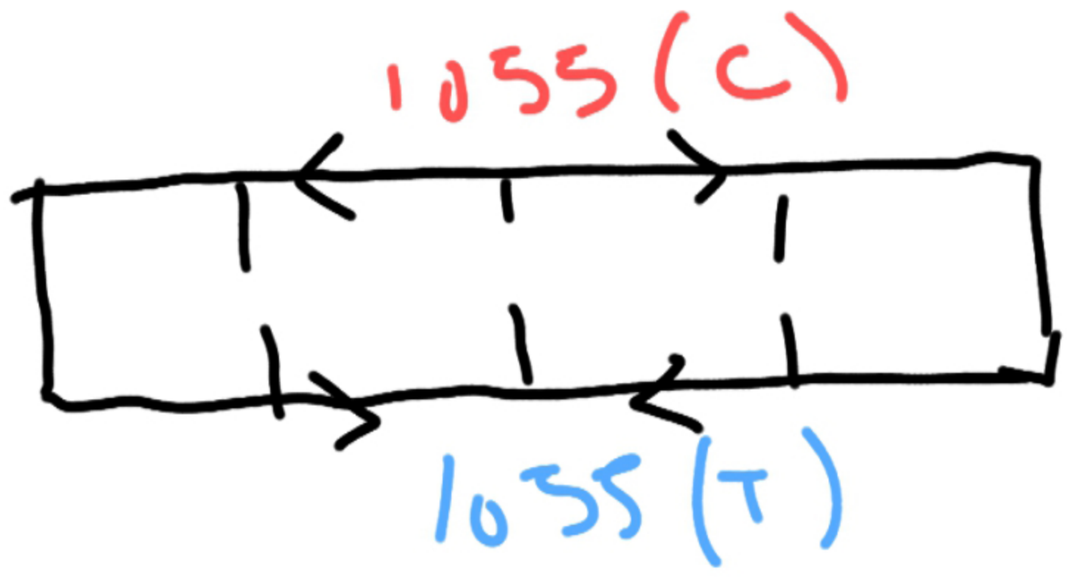
QUESTION 15 - NOTES ON CHORDS (TENSION / COMPRESSION)



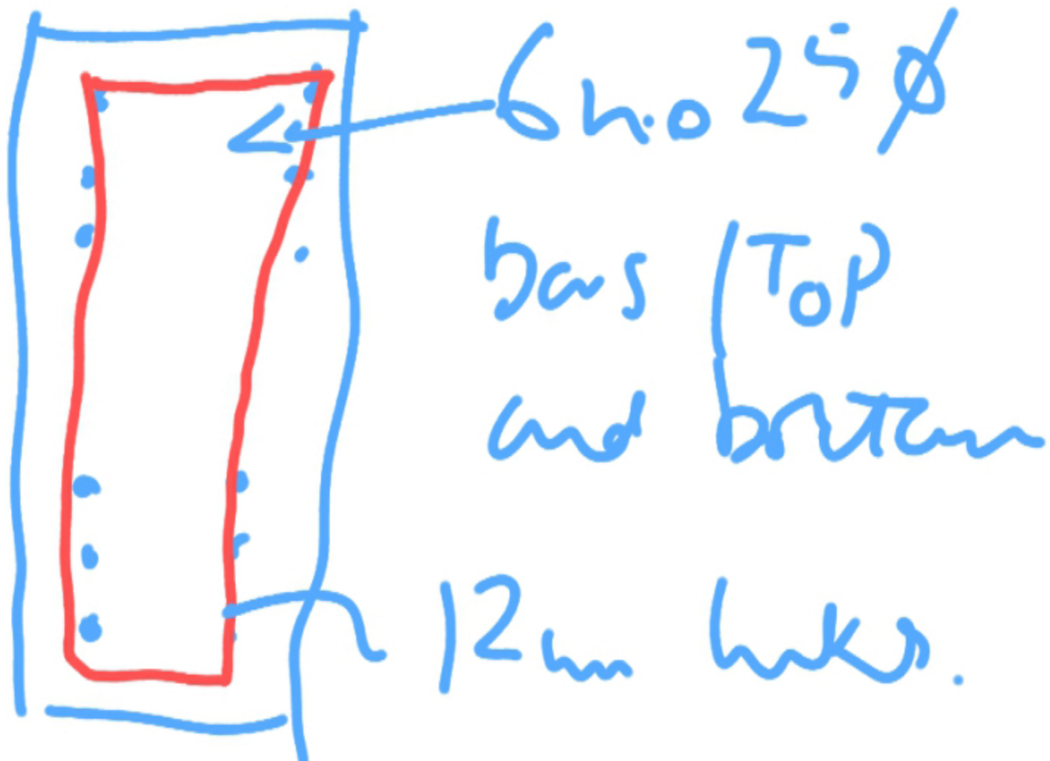
From 15b
1055 kN in chords

This is in addition to bending moment

However where tension/compression at a maximum bending (local) in elements at a minimum

Envisage similar reinforcement throughout

6 x 25 bars tension capacity



$\approx \frac{490 \times 500}{1000} \times 6 \approx 1500\,kN > 1055$