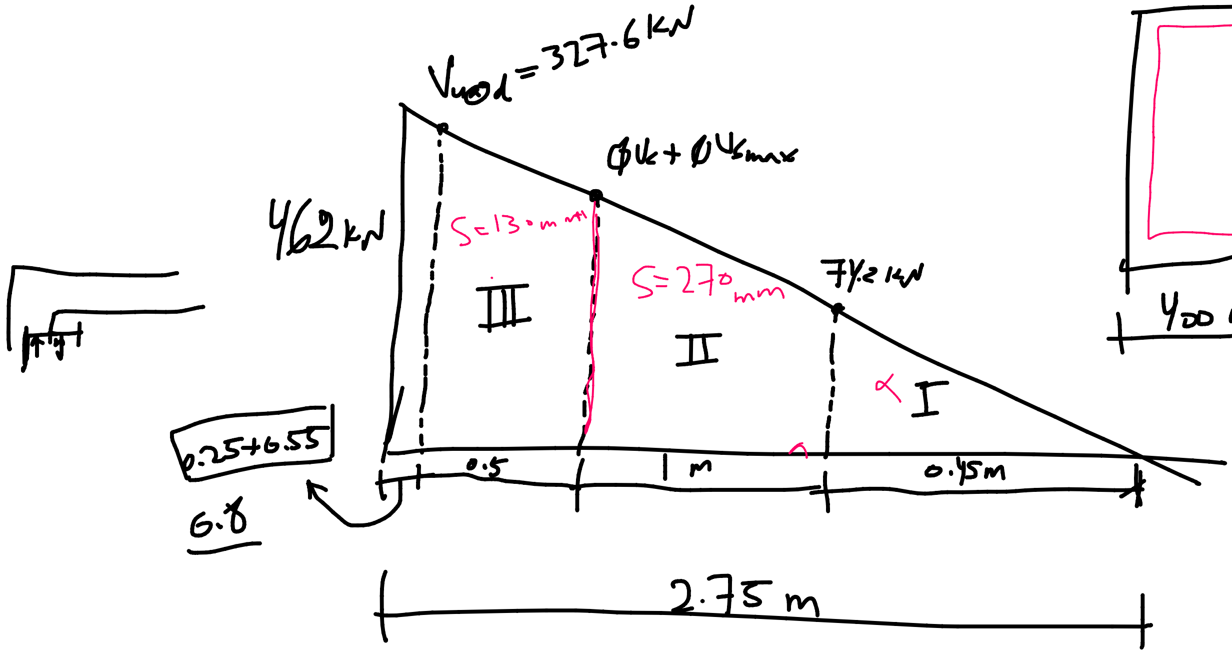
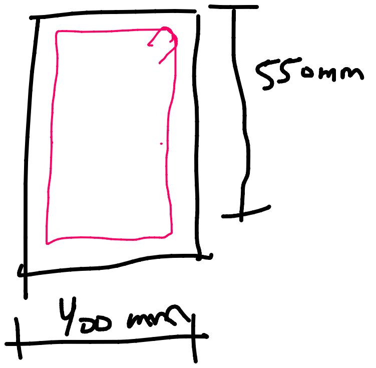
Shear Design

Tuesday, November 24, 2020 12:49 PM

$d_v = 10\text{ mm} \rightarrow A_v = 2\times 71 = 142\text{ mm}^2$





Region I

$$\phi V_c = \phi 0.17\sqrt{f_c'}\, b_w d = 0.75 \times 0.17 \times \sqrt{28} \times 400 \times 550 = 148426.6\text{ N} = 148.4\text{ kN}$$

N, mm, MPa

$$\phi V_c = 148.4\text{ kN} \qquad \frac{\phi V_c}{2} = 74.2\text{ kN} \rightarrow x_1 = 0.45\text{m}$$

Region II: max spacing $\qquad V_{u@d} = 327.6\text{ kN}$

$$V_s = \frac{V_{u@d} - \phi V_c}{\phi} = 239\text{ kN}$$

$$V_s \qquad 2V_c = 0.33\sqrt{f_c'}\, b_w d = 384.2\text{ kN} > V_s$$

$4V_c$

$$S_{max} = \min \begin{cases} \dfrac{A_v f_y}{0.062\sqrt{f_c'}\, b_w} < \dfrac{A_v f_y}{0.35\, b_w} \quad 426\text{ mm} \\ d/2 \quad \boxed{275} \\ 600 \end{cases}$$

$S_{max} = 275$ mm

$$\phi A_v f_y d \quad \frac{0.75 \times 142 \times 420 \times 550}{\ } = 98.4\text{ kN}$$

$$\phi V_{s(max)} = \frac{\phi A_v f_y d}{S_{max}} = \frac{0.75 \times 142 \times 420 \times 550}{275} = 98.4 \text{ kN}$$

$$\phi V_{n,S_{max}} = \phi V_{s(max)} + \phi V_c = 98.4 + 148.4 = \underline{246.8 \text{ kN}}$$

$$X_2 = 1 \text{ m}$$

Region III:

$$S = \frac{A_v f_y d}{V_s} = 137.24 \text{ mm} \sim 130 \text{ mm}$$

$$V_s = \frac{V_{ud} - \phi V_c}{\phi} = 239 \text{ kN} \quad \times 1000$$

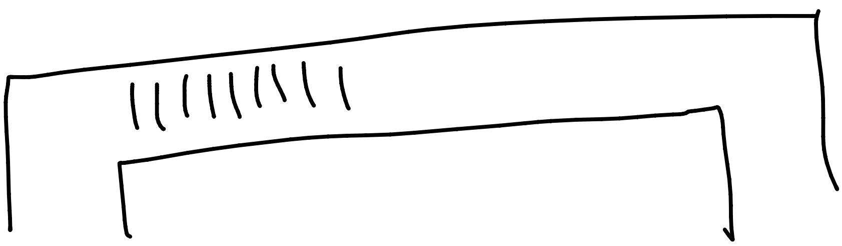
$$\#\text{stirrups} = 2\times\left(\frac{\overset{0.5}{X_2}}{0.13} + \frac{X_2}{0.27} + 1\right) = 18 \text{ stirrups}$$

#total = 32

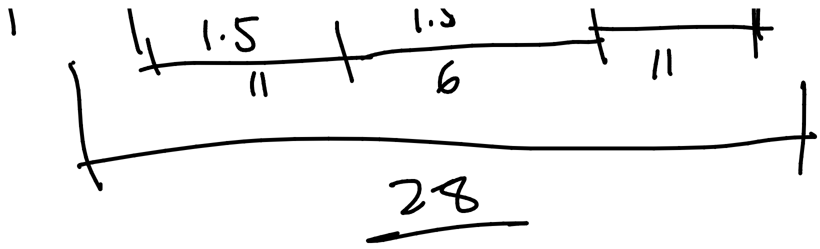
AP1

$\frac{\ }{3}$

0.13



AP2


1.5
1.5
11
6
11
28