INTERAZIONE V + T

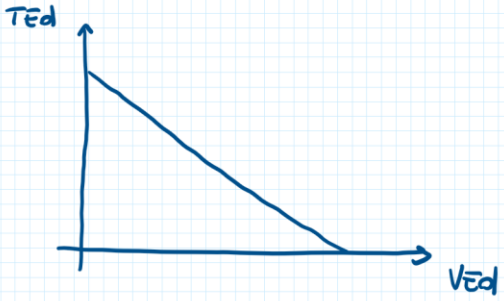
V, T $\Big\}$ τ

PER VERIFICARE ALLO SW:

1) PER LA SEZ. IN CLS

$$\frac{V_{Ed}}{V_{Rdmax}} + \frac{T_{Ed}}{T_{Rdmax}} < 1$$

↳ STESSO $\cot\theta$



2) PER LE ARMATURE

$A_{s,st\,V}$, $A_{s,st\,T}$ $\Big\}$ $A_{par\,V}$, $A_{staff\,T}$ $\Big\}$

ESEMPIO

30 x 60 c = 5 cm

$M_{Ed} = 130$ kNm

$V_{Ed} = 110$ kN

$T_{Ed} = 30$ kNm

1) VERIFICO LA SEZ. IN CLS

$$M_{Ed} = \frac{b\,d^2}{z^2} = \frac{0.30 \times 0.55^2}{0.0197^2} = 233.2 \text{ kNm} > 130$$

$$V_{Rd_{max}} = 0.9\,d\,b\,f'_{cd}\,\alpha_c\,\frac{\cot\vartheta}{1+\cot^2\vartheta} =$$

$$= 0.9 \times 55 \times 30 \times 0.5 \times 14.17 \times \frac{1.0}{10} \times \frac{\cot\vartheta}{1+\cot^2\vartheta} = 1052 \frac{\cot\vartheta}{1+\cot^2\vartheta}$$

se $\cot\vartheta = 1 \Rightarrow V_{Rd\,max} = 526$ kN

se $\cot\vartheta = 2.5 \Rightarrow V_{Rd\,max} = 362.7$ kN

$$T_{Rd\,max} = 2 A_k\, t\, f'_{cd} \frac{\cot\vartheta}{1+\cot^2\vartheta} =$$

$t = MAX \begin{cases} 2 \times 5 = 10 \\ \frac{A}{u} = \frac{30 \times 60 = 1800}{(30+60)\times 2 = 180} = 10 \end{cases}$

$b_k = 30 - \frac{10}{2} - \frac{10}{2} = 20$ cm

$h_k = 60 - \frac{10}{2} - \frac{10}{2} = 50$ cm

$A_k = 50 \times 20 = 1000$ cm^2

$u_k = (50+20)\times 2 = 140$ cm

$$T_{Rd\,max} = 2 \times 1000 \times 10 \times 0.5 \times \frac{14.17}{10^3} \times \frac{\cot\vartheta}{1+\cot^2\vartheta} = 141.7 \frac{\cot\vartheta}{1+\cot^2\vartheta} \text{ kNm}$$

se $\cot\vartheta = 1 \Rightarrow 70.5$ kNm

se $\cot\vartheta = 2.5 \Rightarrow 48.9$ kNm

VERIFICO A V + T:

$$\frac{V_{Ed}}{V_{Rd\,max}} + \frac{T_{Ed}}{T_{Rd\,max}} = \frac{110}{362.7} + \frac{30}{48.9} = 0.926 < 1.0 \quad \text{OK!}$$

2) PROGETTO LE ARMATURE

$M_{Ed} \Rightarrow A_s$ $\quad V_{Ed} \Rightarrow \frac{A_{s,st}}{s}$ $\quad T_{Ed} \Rightarrow \frac{A_{s,st}}{s}$

A_{par} $\quad A_{s\,long}$

PER M_{Ed} :

$$A_s = \frac{M_{Ed}}{0.9\ d\ f_{yd}} = \frac{130 \times 10^3}{0.9 \times 55 \times 391.3} = 6.7\ cm^2$$

STAFFE

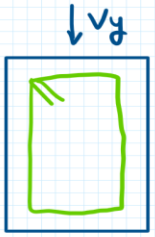
$$(A_{s,st})_V = \frac{V_{Ed}\ s=1m}{0.9\ d\ f_{yd}\ \cot\theta} = \frac{110 \times 1 \times 10^3}{0.9 \times 55 \times 391.3 \times \cot\theta} = \frac{5.6}{\cot\theta}\ \frac{cm^2}{1m}$$

$$(A_{s,st})_T = \frac{T_{Ed} \times s=1m}{2\ A_k \times f_{yd} \times \cot\theta} = \frac{30 \times 1 \times 10^5}{2 \times 1000 \times 391.3 \times \cot\theta} = \frac{3.8}{\cot\theta}\ \frac{cm^2}{1m}$$

$$A_{s,st} = \frac{1}{\textcircled{2}}\frac{5.6}{\cot\theta} + \frac{3.8}{\cot\theta} = \frac{6.6}{\cot\theta}\ \frac{cm^2}{1m}$$

n bracci a V

$A_{1\phi 8} = 0.5\ cm^2$



FISSO ϕ 8/10 $\Rightarrow$ $0.5\ cm^2 \times 10 \frac{\text{STAFFE}}{1\ m} = 5 \frac{cm^2}{1\ m}$

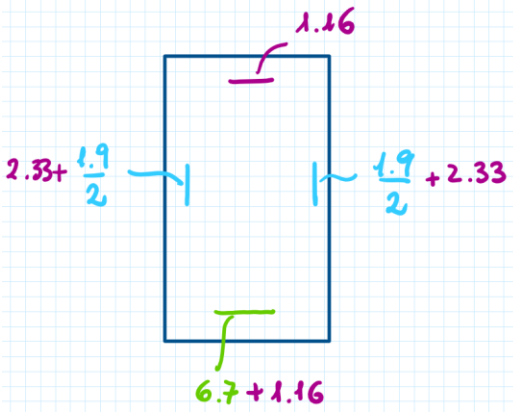
RICAVO $\cot\theta$ $\Rightarrow$ $\frac{6.6}{\cot\theta} = 5 \Rightarrow \cot\theta = \frac{6.6}{5} = 1.32$

ARMATURA DI PARETE E LONGITUDINALE

$\cot\theta = 1.32$

$$A_{s\,par} = \frac{V}{2} \frac{\cot\theta}{f_{yd}} = \frac{110 \times 1.32 \times 10}{2 \times 391.3} = 1.9\ cm^2$$

$$A_{s\,lon} = \frac{T_{Ed}\ u_k \cot\theta}{2 A_k f_{yd}} = \frac{30 \times 140 \times 1.32 \times 10^3}{2 \times 1000 \times 391.3} = 7.0\ cm^2$$



$A_s = 6.7\ cm^2$

$A_{par} = 1.9\ cm^2$

$A_{s\,lon} = 7.0\ cm^2$

$A_{s\,lon\,b} = \frac{7.0}{180} \times 30 = 1.16\ cm^2$

$A_{s\,lon\,h} = \frac{7.0}{180} \times 60 = 2.33\ cm^2$