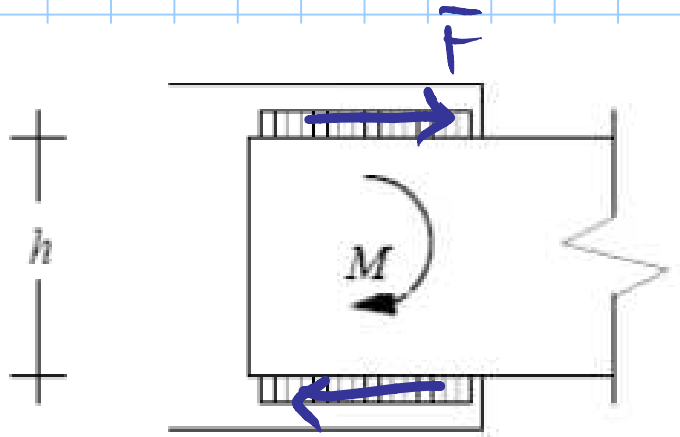
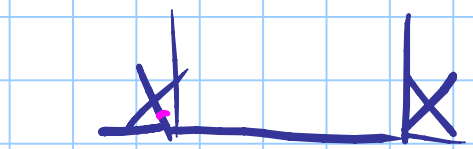


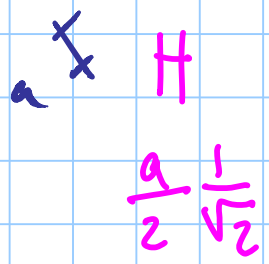
$$F = a\, l\, f_{vwd}$$

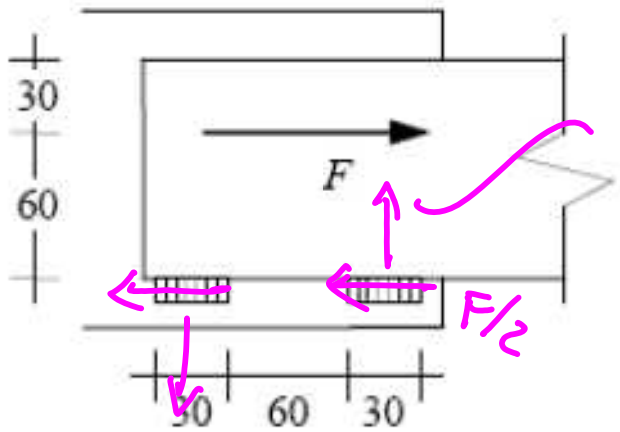
$$M \simeq F\, h$$

$$f_{vwd} = \frac{430}{0.85 \cdot \sqrt{3} \cdot 1.25} = 233.7\ MPa$$



$$h + \frac{a}{\sqrt{2}} \simeq h$$





d_1

d_2

$F \frac{d_1}{d_2}$

$$R = \sqrt{\left(\frac{F}{2}\right)^2 + \left(\frac{F d_1}{d_2}\right)^2}$$

$$= F \sqrt{\left(\frac{1}{2}\right)^2 + \left(\frac{d_1}{d_2}\right)^2}$$

$R = a\,l\,f_{vwd}$

$$F = \frac{a\,l\,f_{vwd}}{\sqrt{\left(\frac{1}{2}\right)^2 + \left(\frac{d_1}{d_2}\right)^2}}$$

33.7

$\rightarrow 0.83$

$$\frac{F_{v,Ed}}{F_{v,Rd}} + \frac{F_{t,Ed}}{1.4\,F_{t,Rd}} \leq 1$$

$$F_{t,Ed} \leq \left(1 - \frac{F_{v,Ed}}{F_{v,Rd}}\right) 1.4\, F_{t,Rd}$$

$$\left(1 - \frac{30.0}{46.1}\right) 1.4 \times 69.1 = 33.8$$

$$F_{b,Rd} = k \alpha d t \frac{f_u}{\gamma_{M2}} \qquad = 93.9 \text{ kN}$$

f_u: 430 — d: 16 — t: 12 — γ_{M2}: 1.25

$\times 6 = 563$

$$k = \text{MIN}\left(2.5 \; ; \; \frac{2.8 e_2}{d_0} - 1.7 \; ; \; \frac{1.4 p_2}{d_0} - 1.7\right) = 2.418$$

e_2: 25 — d_0: 17

$$\alpha = \text{MIN}\left(\frac{e_1}{3 d_0} \; ; \; \frac{p_1}{3 d_0} - 0.25\right) = 0.588$$

e_1: 30

ATTRITO

$$F_{s,Rd} = M \; n_b \cdot n_s \; \frac{F_{pc}}{\gamma_{M3}}$$

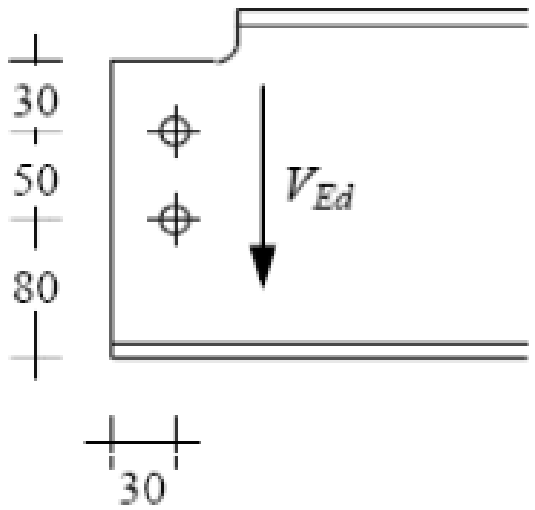
F_{pc} → 45

M → 0.3

n_b → 6

n_s → 2

γ_{M3} → 1.25 per SLU

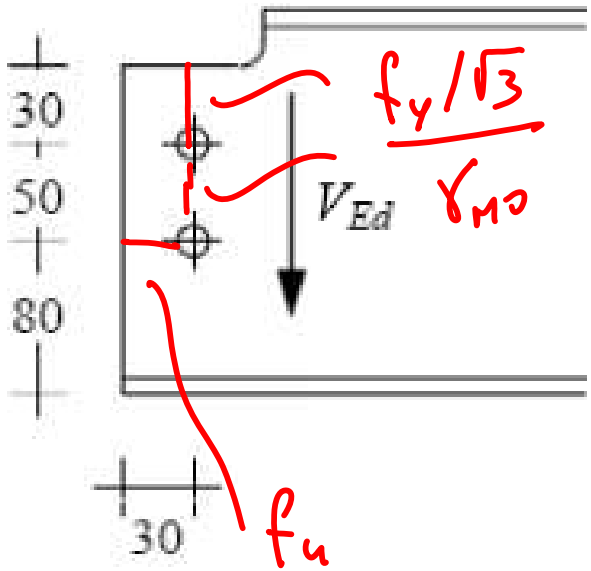


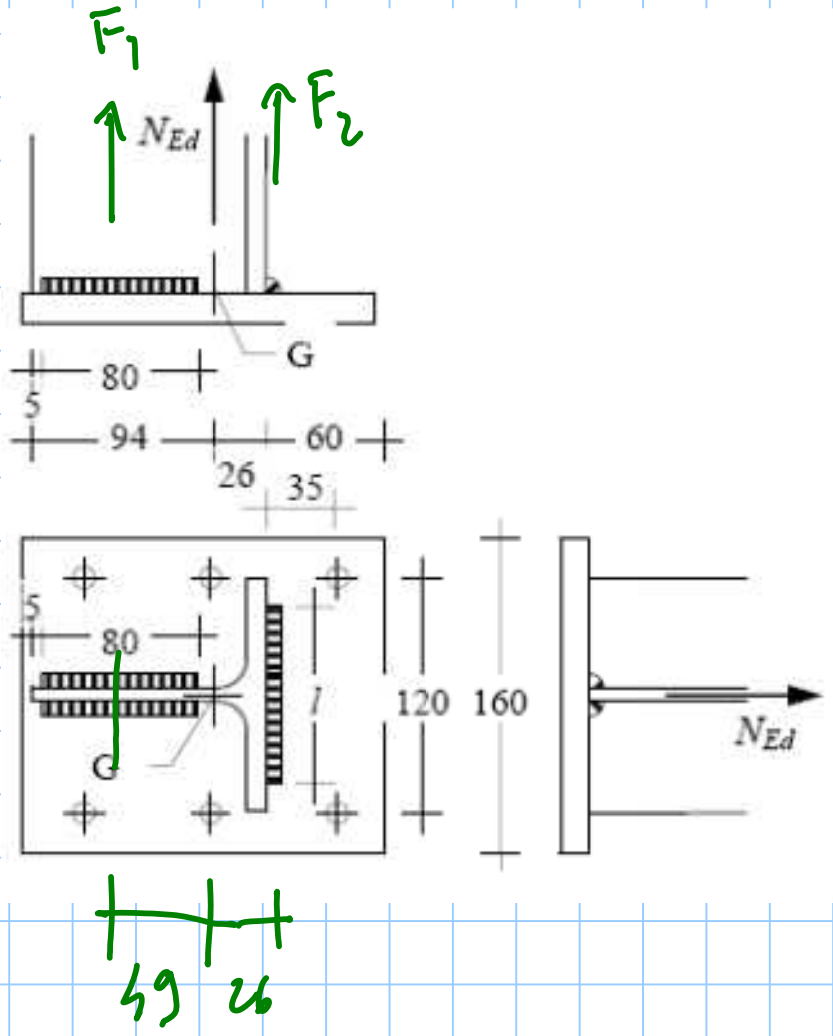
$$F_{v,Ed} \leq F_{v,Rd} = n_b \, n_s \, 0.6 \, A \, \frac{f_{ub}}{\gamma_{M2}}$$

$$f_{ub} \geq \frac{F_{v,Ed} \, \gamma_{M2}}{n_b \, n_s \, 0.6 \, A} = 254 \text{ MPa}$$

n_b: 2 — n_s: 2 — A: 154 — γ_{M2}: 1.6

con un bullone acciaio viene 508 MPa → 6.8


30
50
80
30
V_{Ed}
$f_y/\sqrt{3}$
γ_{M0}
f_u
γ_{M2}

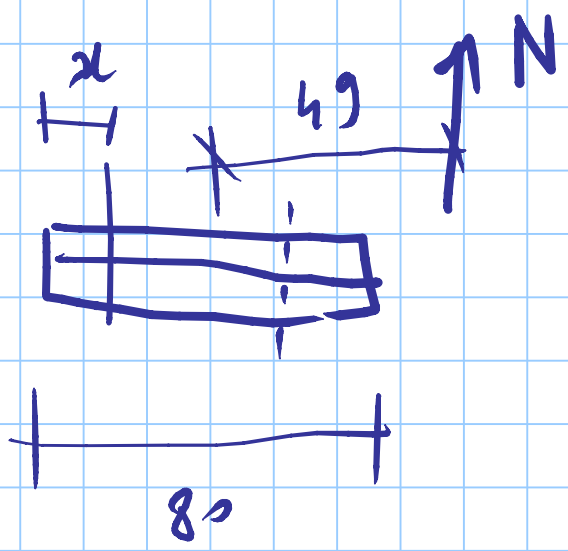


$$F_1 \times 49 = F_2 \times 26$$

$$F_2 = F_1 \times \frac{49}{26}$$

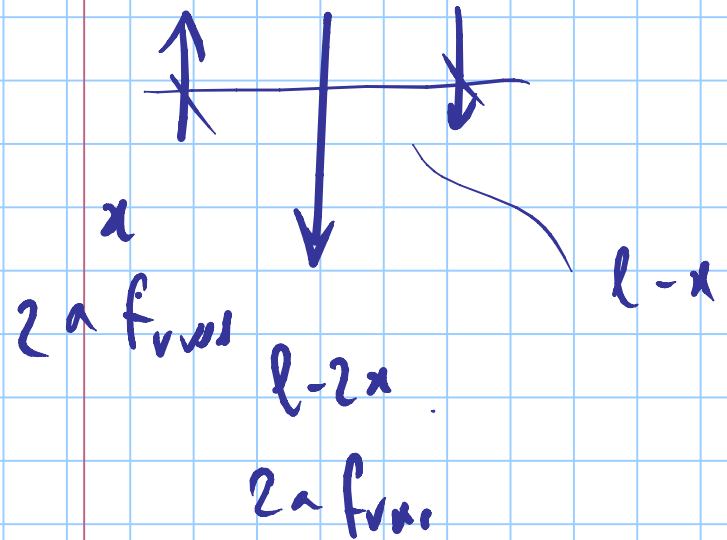
$$F_2 = 11\,l\,f_{yd} = 2 \times 80 \times 5 f_{yd} \times \frac{49}{26}$$

$$l = \frac{2 \times 80 \times 5}{11} \times \frac{49}{26} = 110 \text{ mm}$$



$$M = 2a f_{vad}\, x\,(l - x)$$

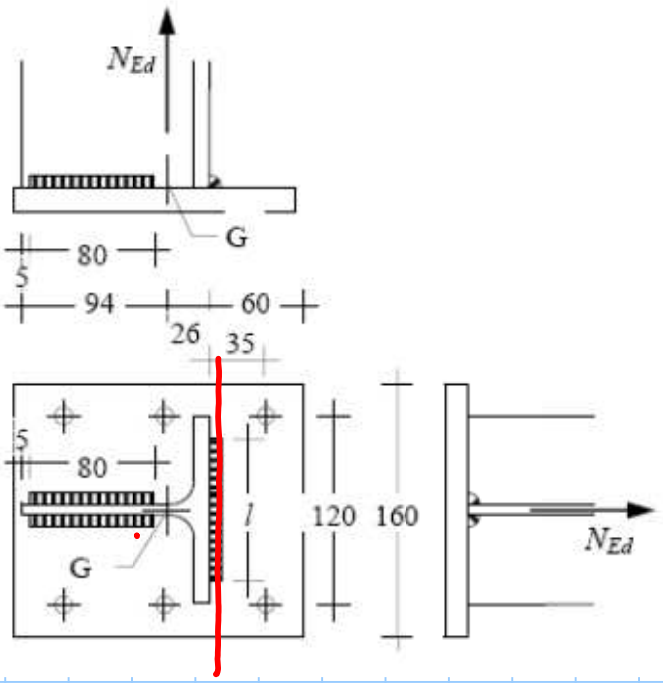
$$N = (l - 2x)\, 2a f_{vad}$$



$$\frac{M}{N} = e$$

$$\frac{x(l-x)}{l-2x} = E$$

$$x = \frac{2E + l + \sqrt{4E^2 + l^2}}{2} \qquad \text{(controller)}$$



$$F_m \leq \frac{b\,t^2}{4}\,\frac{f_y}{\gamma_{M0}}$$

$$t \geq \sqrt{\frac{4\,F_m\,\gamma_{M0}}{b\,f_y}}$$

F ↑ 2 × 50 kN

m