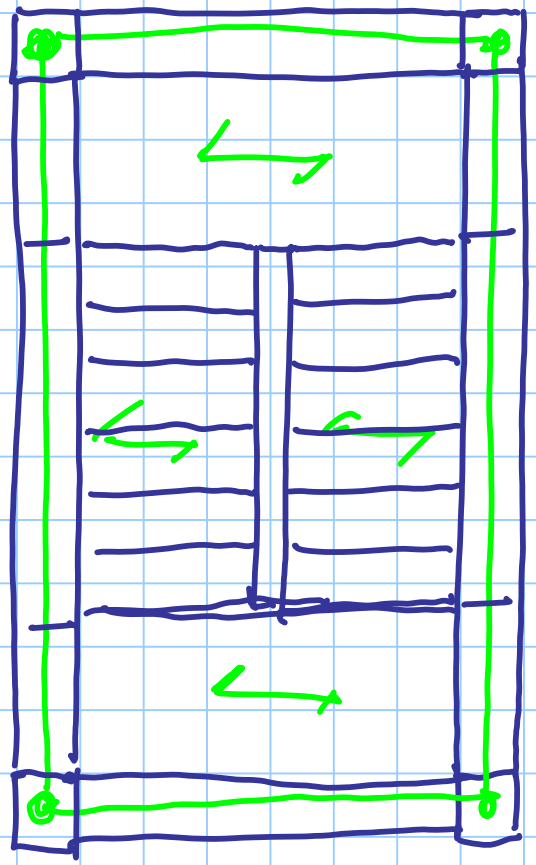
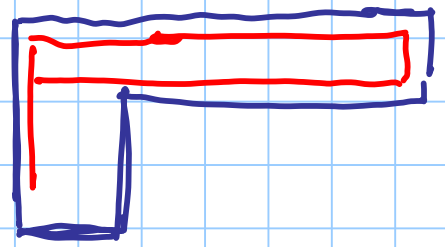
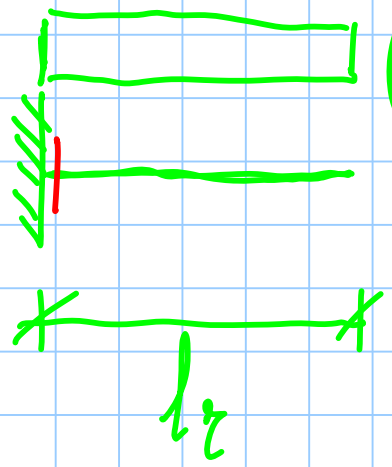
SCALA CON TRAVE A GINOCCHIO

Titolo nota 22/05/2014



GRADINI

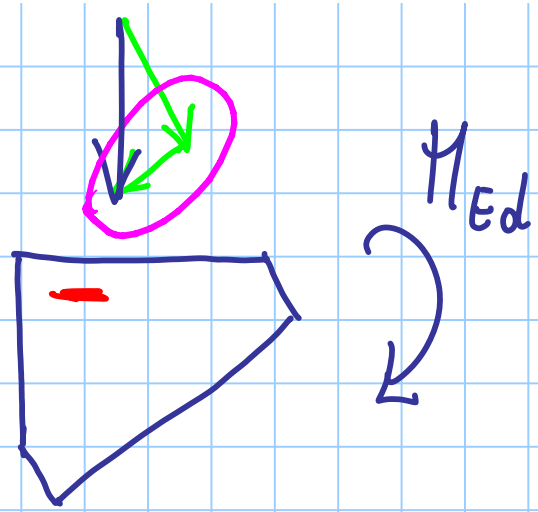


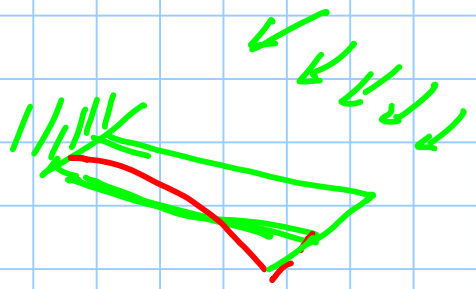


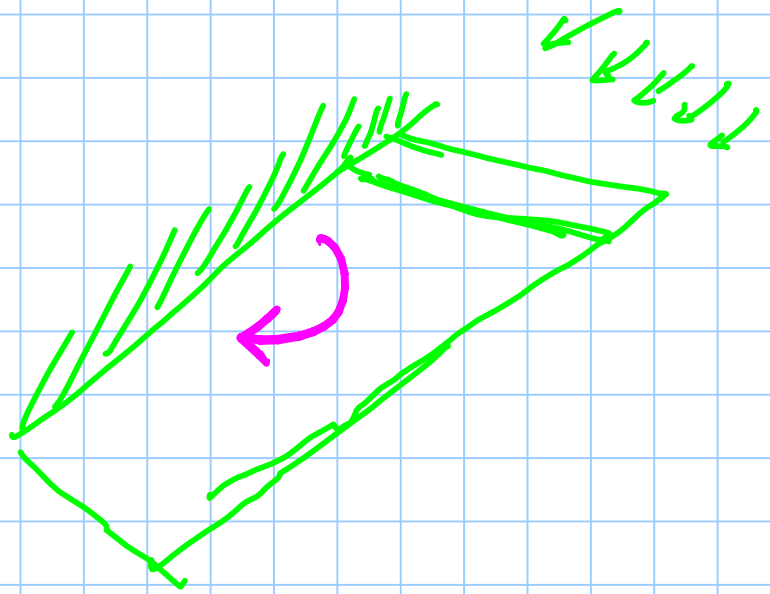
$$(g_{,1} + q_{d1}) \times 0,3 = Q$$

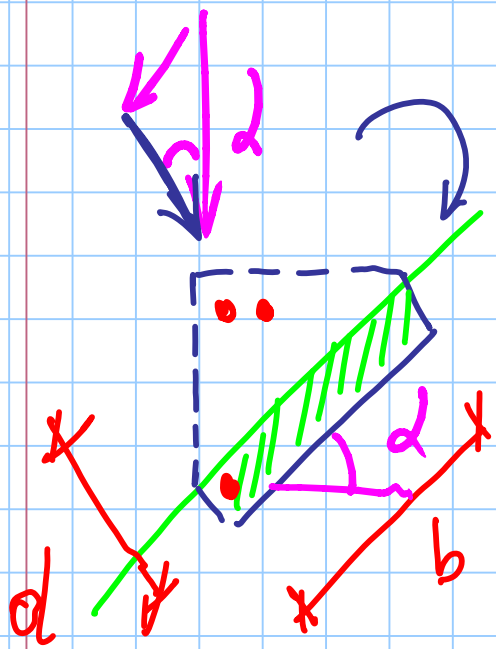
$$M_{Ed} = \frac{Q\, l_2^2}{2}$$

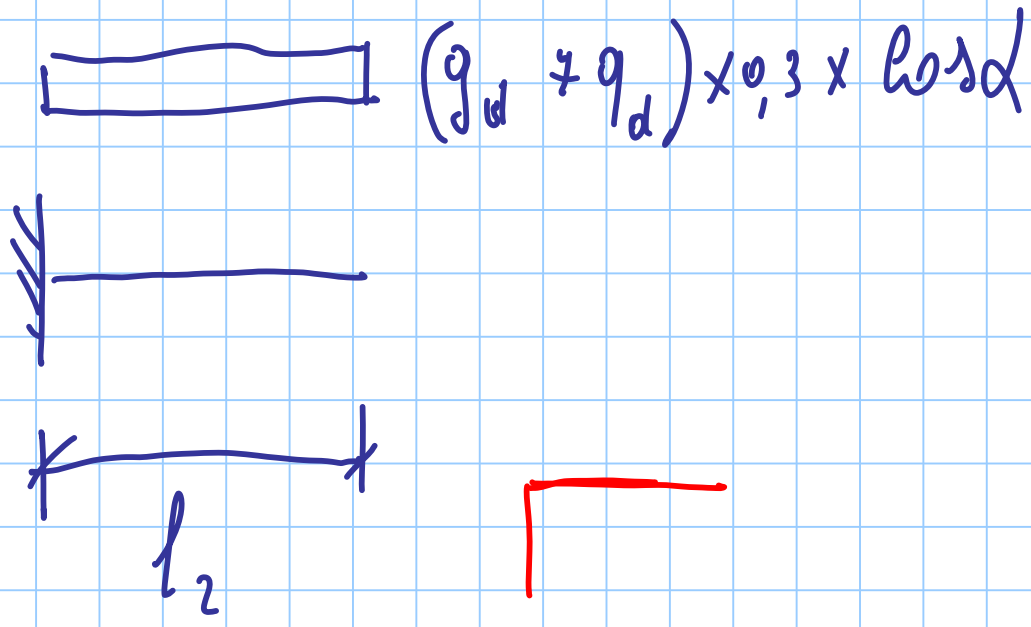
$$V_{Ed} = Q\, l_2$$

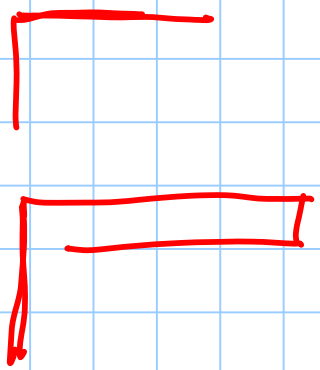

M_{Ed}





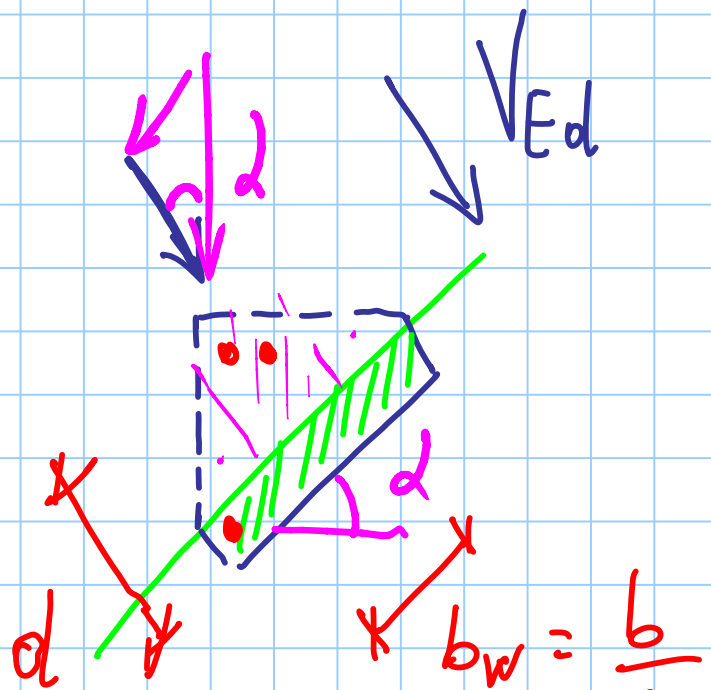




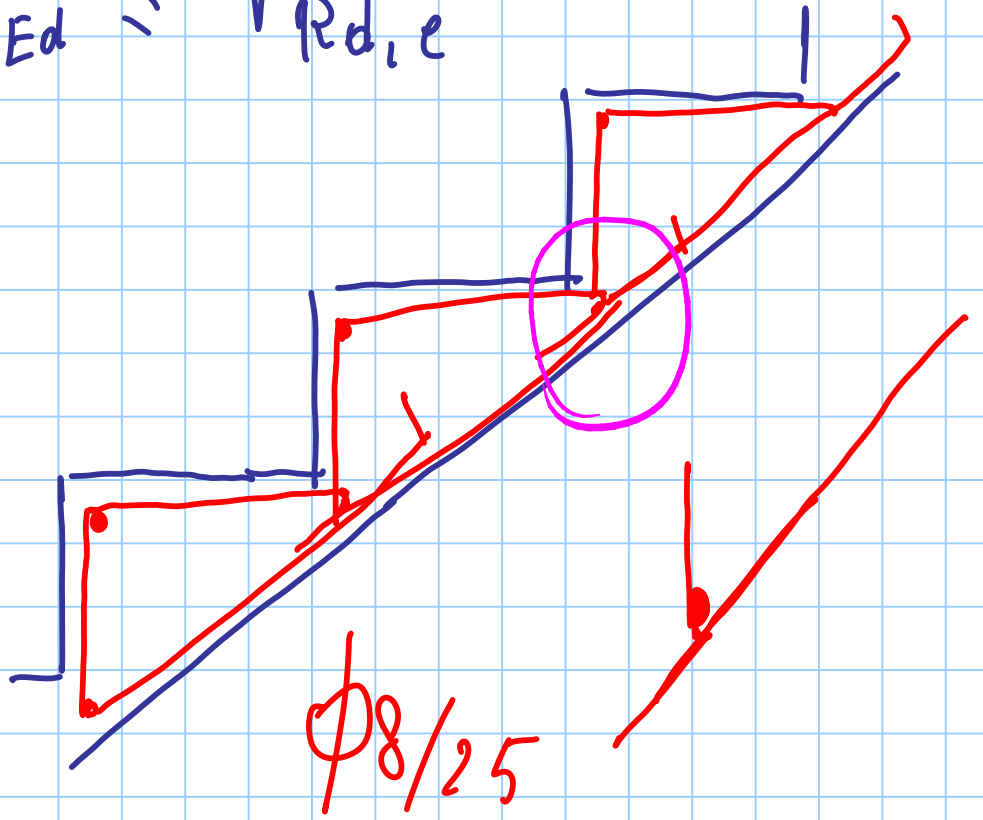


$$M_{Ed} \leq M_{Rd,e} = \frac{b\,d^2}{z'^2}$$

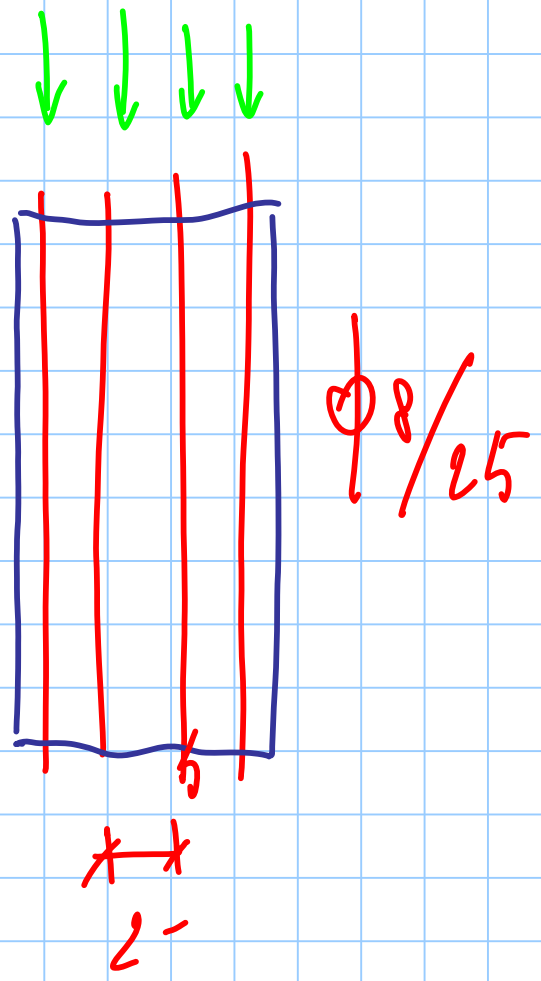
$$A_s = \frac{M_{Ed}}{0{,}9\,d\,f_{yd}}$$



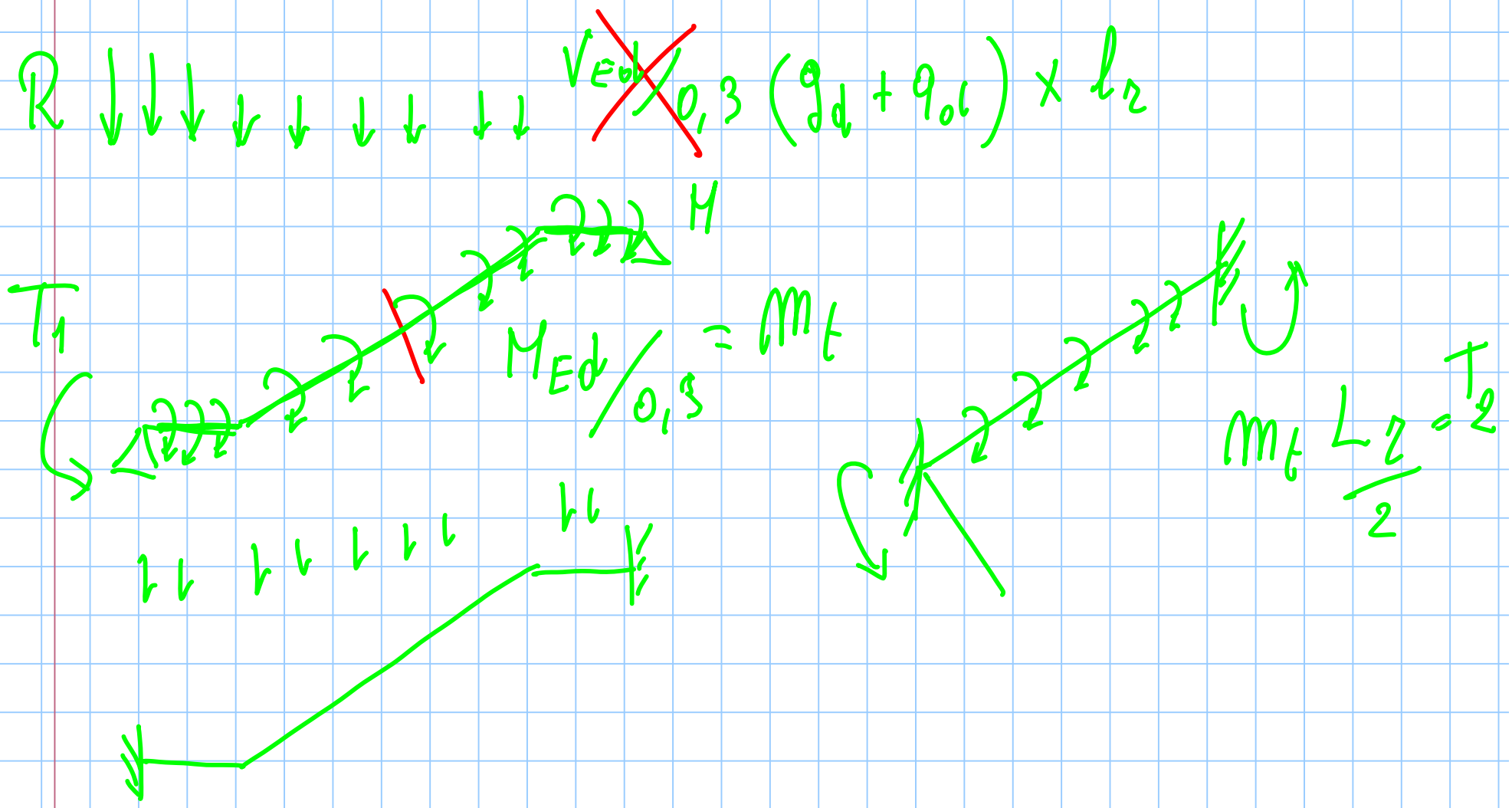
$V_{Ed} \leq V_{Rd,c}$



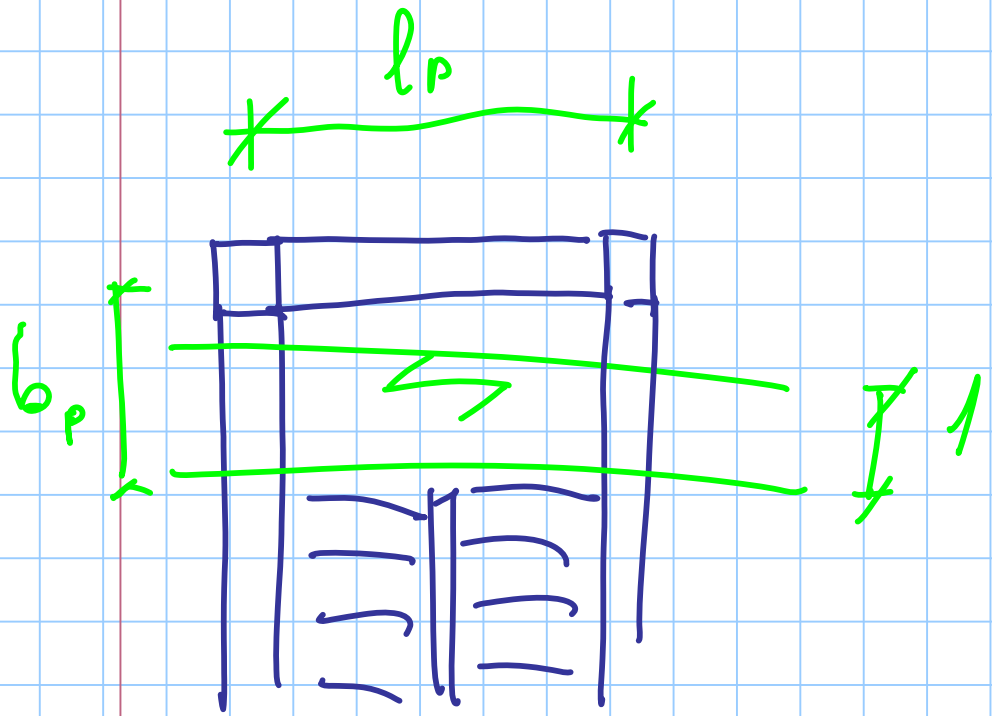
SOLETTA DI COLLEGAMENTO



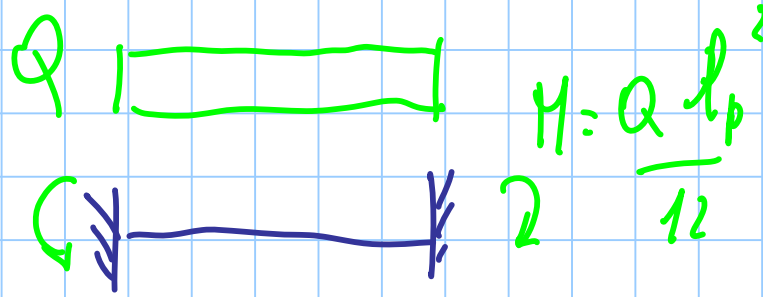
TRAVE A GINOCCHIO



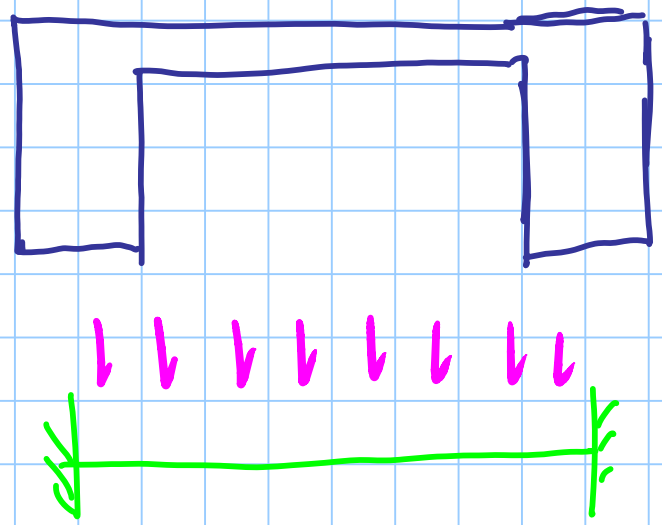
PIANEROTTOLO

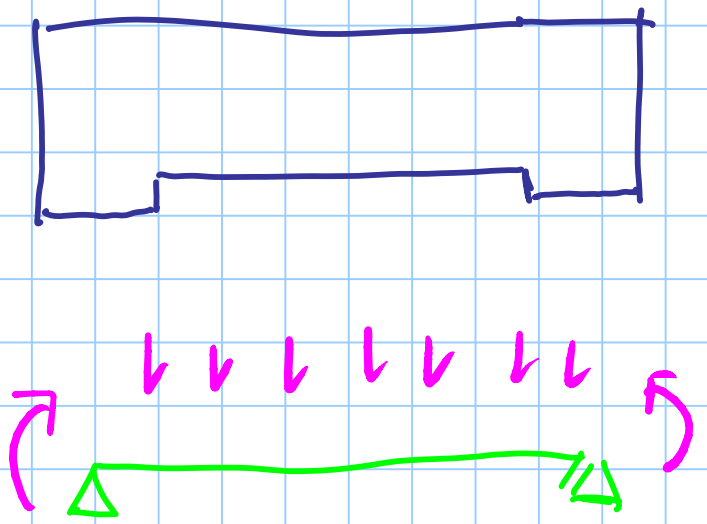


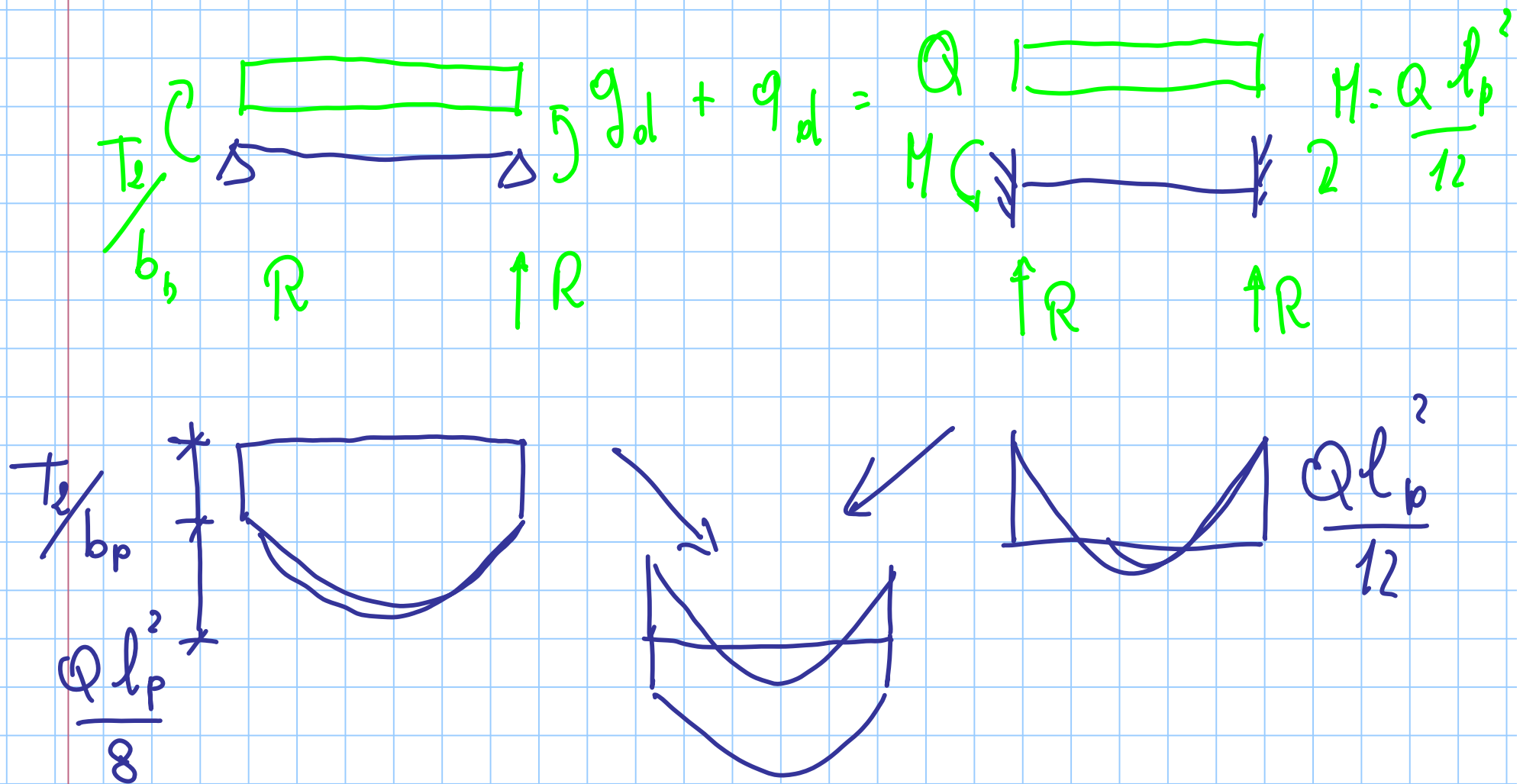
$$R = \frac{(g_d + q_d)\, l_p}{2}$$



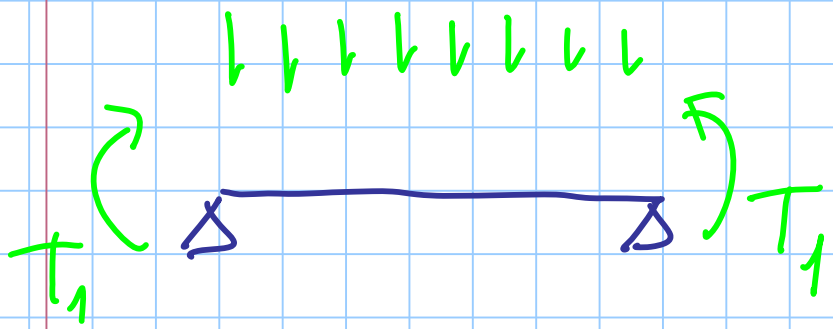
$$M = \frac{Q\, l_p^2}{12}$$

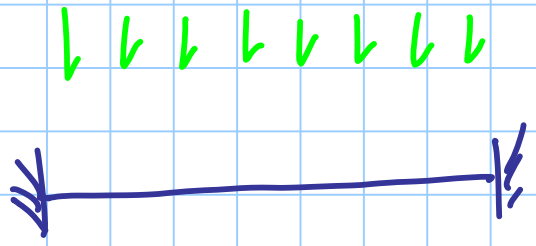


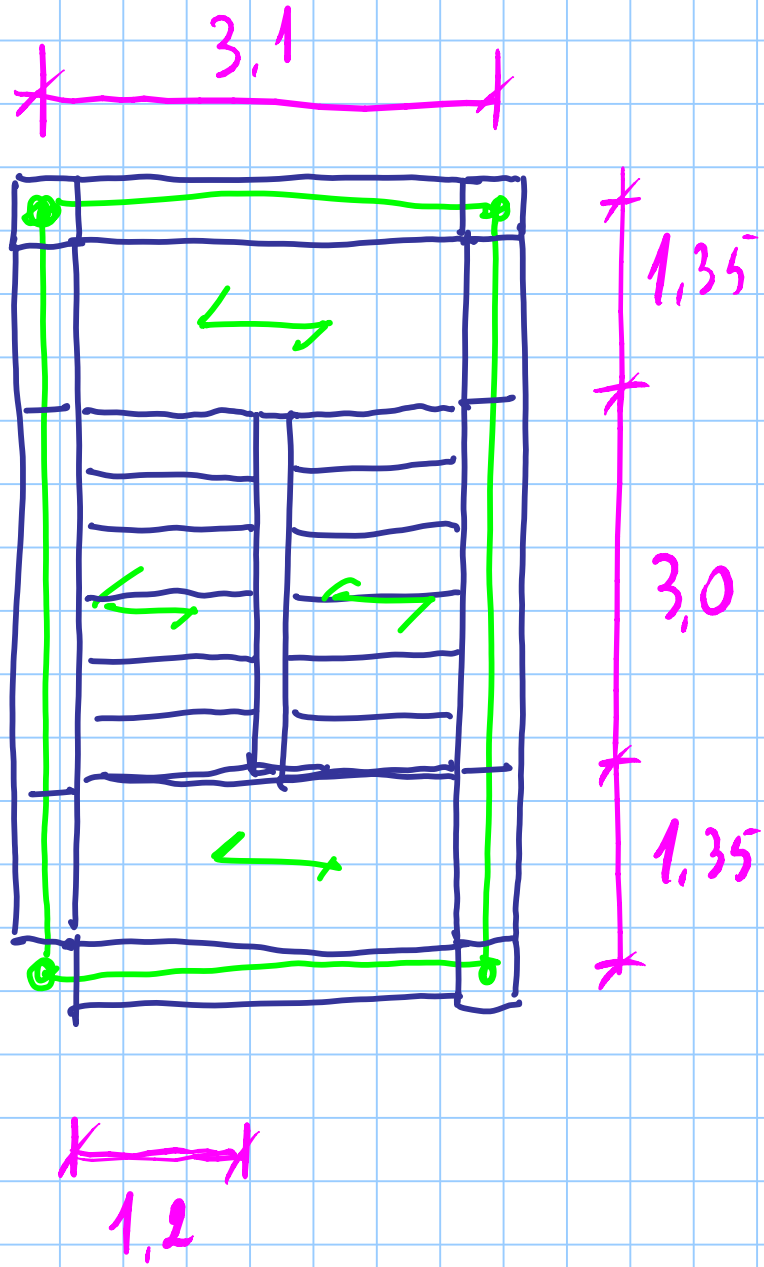



T2/bb
R
R
qd + qd =
Q
M
R
R
M = Q lp² / 12
T2/bp
Q lp² / 8
Q lp² / 12

TRAVE DI TESTATA



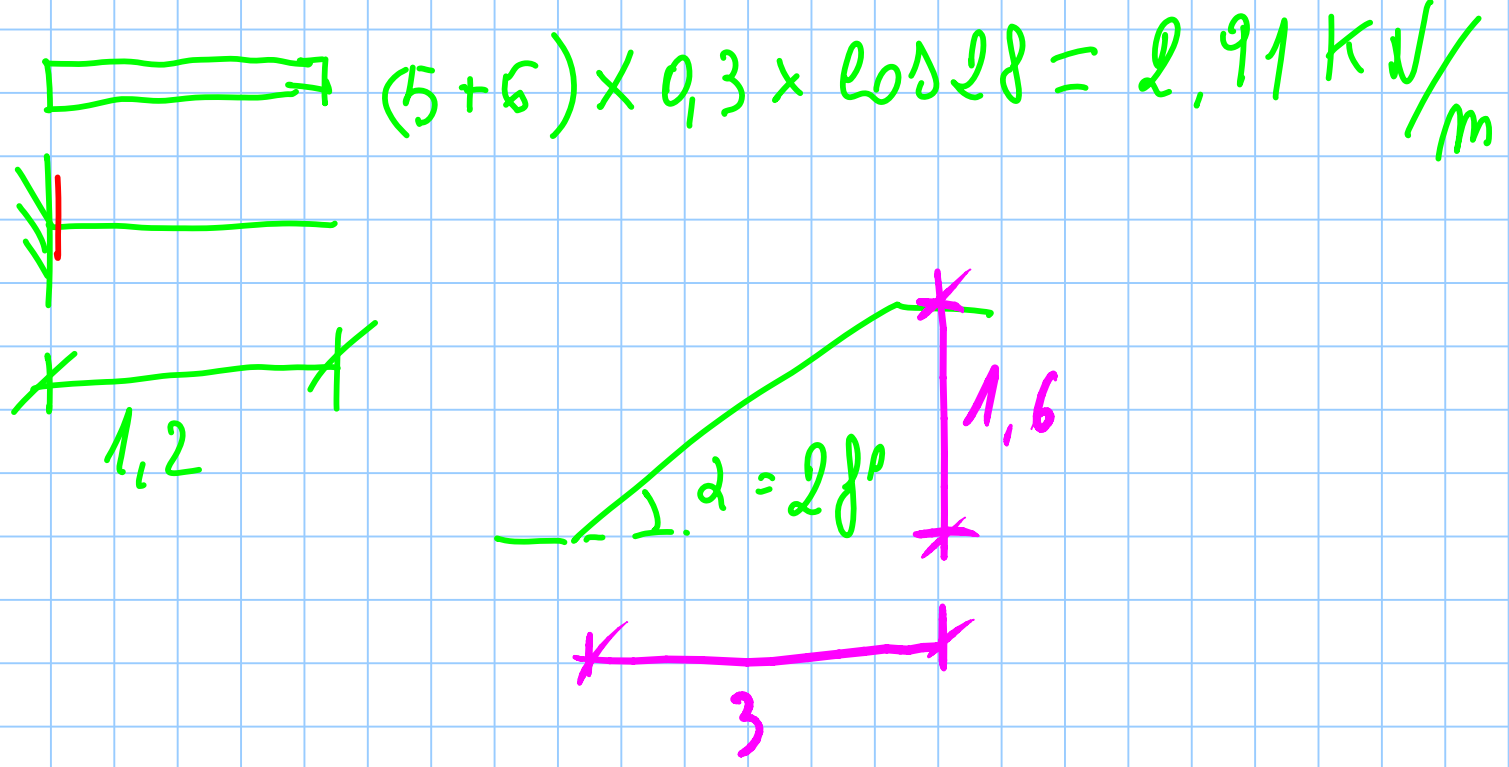




Seda

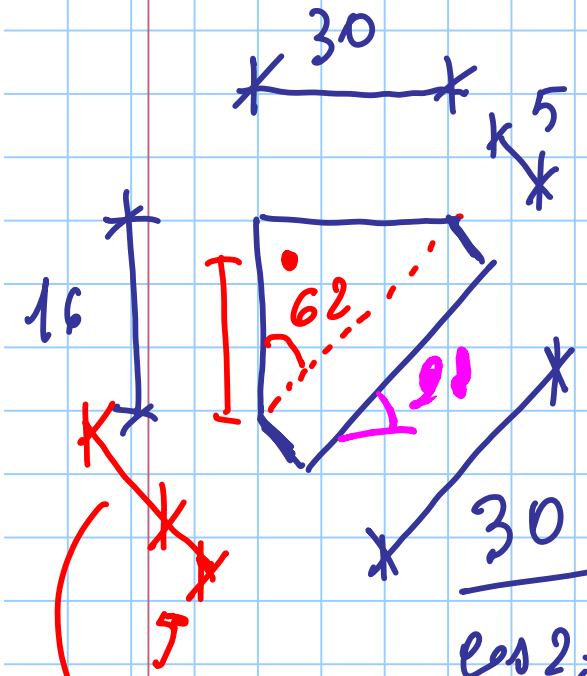
g_d
5 kN/m²

q_d
6 kN/m²



$$V_{Ed} = 2,91 \times 1,2 = 3,5\ kN$$

$$M_{Ed} = 2,91 \times \frac{1,2^2}{2} = 2,1\ kNm$$



$$M_{Rd,c} = \frac{0,34 \times 0,156^2}{0,19^2} = 22,9 \text{ kNm}$$

$$\frac{30}{\cos 28^\circ} = 34$$

$$A_s = \frac{2,1 \times 10}{0,9 \times 0,156 \times 391,3} = 0,38 \text{ cm}^2$$

$$(16-4)\,\text{sin}\,62^\circ = 10,6 \text{ cm}$$

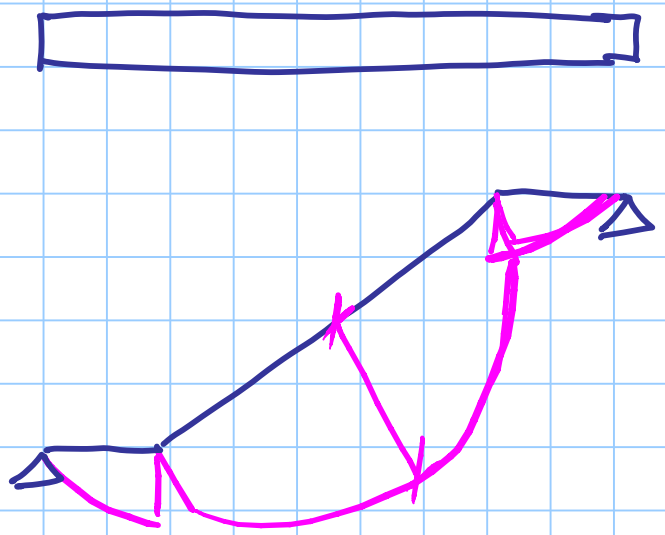
ol: 15,6 cm

no ϕ10

$$V_{Rd,c} = 0{,}035 \sqrt{k^3 \, \rho_{cn} \, b_w \, d}$$

$$k = 1 + \sqrt{\frac{200}{d}} = 2$$

$$V_{Rd,c} = 0{,}035 \sqrt{2^3 \times 25} \times \frac{17 \times 15{,}6}{10} = 13{,}1 \text{ kN}$$



$(5+6) \times 1,2 = 13,2\ kN/m$ guaina

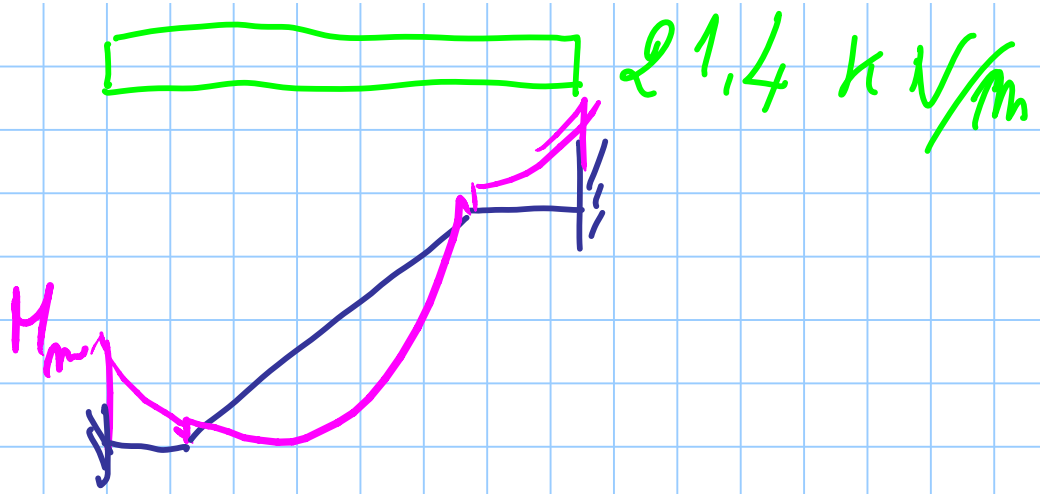
$4,9\ kN/m$ p. p.

$3,3\ kN/m$ temp.

$21,4\ kN/m$

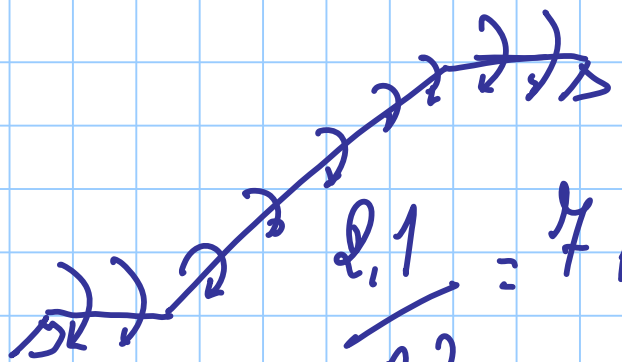
$$M_{max} = \frac{21,4 \times 5,7^2}{8} = 86,7\ kN\,m$$

$$V_{max} = \frac{21,4 \times 5,7}{2} = 61\ kN$$

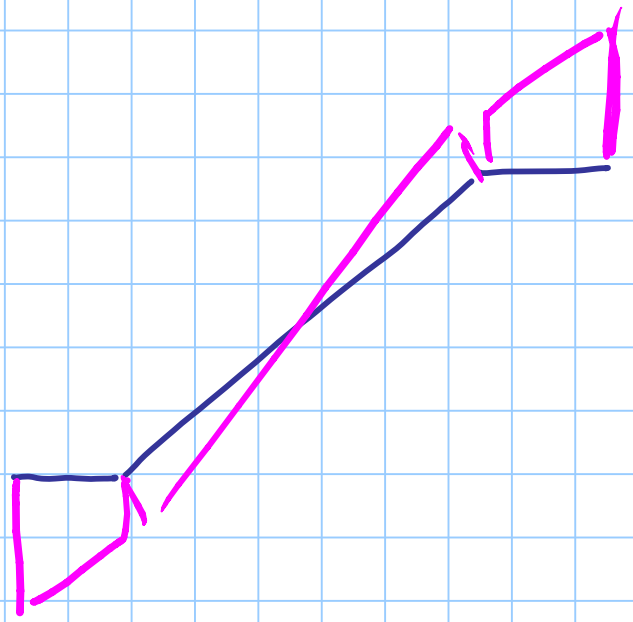


$$M_{max} = \frac{q_{1,4} \times 5,7^2}{12} = 57,9 \text{ KNm}$$

$$V_{max} = 61 \text{ KN}$$



$$\frac{2,1}{0,3} = 7 \text{ KN/m}$$

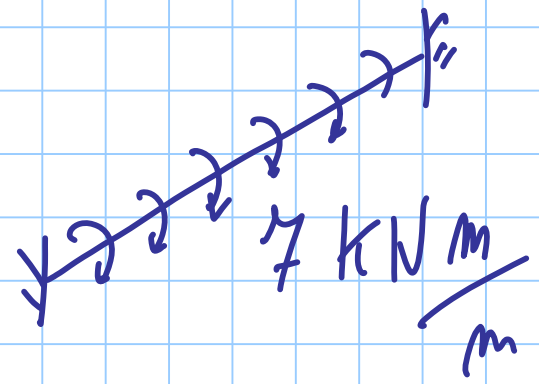


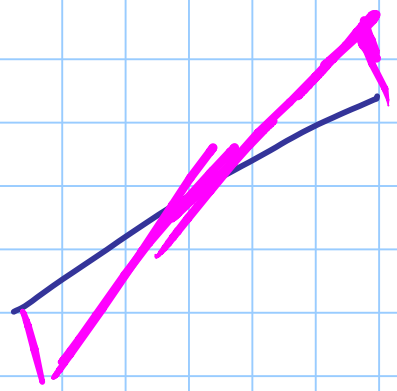
$$\frac{11 \times 3,1^2}{12}$$

$$= 8,8 \text{ KN/m}$$

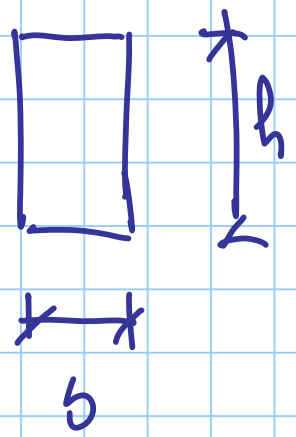
$$T^1_{max} = \left(8,8 \times 1,35 \times 2 + 7 \times 3\right) \frac{1}{2}$$

$$= 22,4 \text{ KN m}$$





$$T^{2}_{max} = \frac{7 \times 3}{2} = 10,5 \text{ kN m}$$



$$d = 2' \sqrt{\frac{M_{max}}{b}} = 0,018 \sqrt{\frac{86,7}{0,3}} = 0,31\ m$$

30 x 40

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

$$\cot g \theta = 2$$

$$A_k = \frac{T_{Ed}}{2 t f'_{cd}} \frac{1 + \cot g^2 \theta}{\cot g \theta} = \frac{22.4}{2 \times 0,1 \times 7,1} \frac{5}{2} \times 10$$

$$= 394 \text{ cm}^2$$

$$t = 2 \times 5 = 10 \text{ cm}$$

$$A_k = b_k \, h_k \Rightarrow h_k = \frac{A_k}{b_k} = \frac{394}{20} = 19{,}7 \text{ cm}$$

$$h = h_k + t = 29{,}7 \text{ cm}$$

30 x 50

$$V_{Rd,max} = 0{,}9\, d\, b_w\, f'_{cd}\, \frac{\operatorname{ctg}\vartheta}{1+\operatorname{ctg}\vartheta} = 0{,}9 \times 45 \times 30 \times 7{,}1 \times \frac{2}{5}\ \frac{1}{10}$$

$$= 345\ kN$$

$$T_{Rd,max} = 2\, A_k\, t\, f'_{cd}\, \frac{\operatorname{ctg}\vartheta}{1+\operatorname{ctg}^2\vartheta} = 2 \times 800 \times 0{,}1 \times 7{,}1 \times \frac{2}{5} \times \frac{1}{10}$$

$$= 45{,}4\ kNm$$

$$t = \frac{A}{u} = \frac{1500}{160} = 9{,}3\ cm$$

$$2c = 10\ cm$$

$$A_k = 20 \times 40 = 800\ cm^2$$

$$V_{Rd,max} = 0{,}9\, d\, b_w\, f'_{cd}\, \frac{\cot\gamma + \cot\theta}{1+\cot\theta\cot\theta} = 0{,}9 \times 45 \times 30 \times 7{,}1 \times \frac{2}{5}\,\frac{1}{10}$$

$$= 345\ kN$$

$$T_{Rd,max} = 2\, A_k\, t\, f'_{cd}\, \frac{\cot\gamma + \cot\theta}{1+\cot\theta\cot\theta} = 2 \times 800 \times 0{,}1 \times 7{,}1 \times \frac{2}{5} \times \frac{1}{10}$$

$$= 45{,}4\ kNm$$

$$\frac{V_{Ed}}{V_{Rd,max}} + \frac{T_{Ed}}{T_{Rd,max}} = \frac{64}{345} + \frac{22{,}4}{45{,}4} = 0{,}67 \quad \text{ok!}$$

$$A_s = \frac{M}{0{,}9\, d\, f_{yd}} = \frac{57{,}9 \times 10}{0{,}9 \times 0{,}45 \times 391{,}3} = 3{,}65 \text{ cm}^2$$

$$\frac{A_{sw}}{s} = \frac{V_{Ed}}{0{,}9\, d\, f_{ywd}} \frac{1}{\operatorname{ctg}\vartheta} = \frac{61 \times 10}{0{,}9 \times 0{,}45 \times 391{,}3} \frac{1}{2} =$$

$$= 1{,}92 \ cm^2/m$$

$$n_{\phi_3} = \frac{1{,}92}{1} = 1{,}92$$

$$\frac{A_{sw}}{s} = \frac{T_{Ed}}{2 A_k f_{yd}} \frac{1}{\operatorname{ctg}\vartheta} = \frac{22,4}{2 \times 800 \times 391,3} \frac{1}{2} \times \frac{10^6 \times 10^3}{10^2 \times 10^2}$$

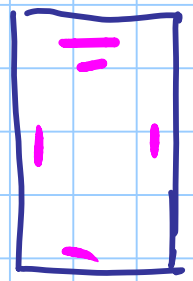
$$= 1,79 \ cm^2/m$$

$$n\phi_8 = \frac{1,79}{0,5} = 3,6$$

$$A_{s,lon} = \frac{T_{Ed}\, u_k}{2 A_k f_{yd}} \operatorname{ctg}\vartheta = \frac{22{,}4 \times 120}{2 \times 800 \times 391{,}3} \times 2 \times \frac{10^6}{10^3}$$

$$= 8{,}6 \text{ cm}^2$$

3,65 + 2,1 = 5,75 4 ϕ 14



2,1

2 ϕ 14

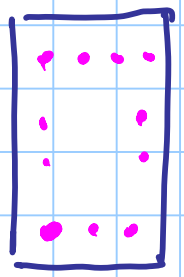
2,1

2 ϕ 14

2,1

~~2 ϕ 14~~

3 ϕ 14



$m_{st}^{v} = 1,92$

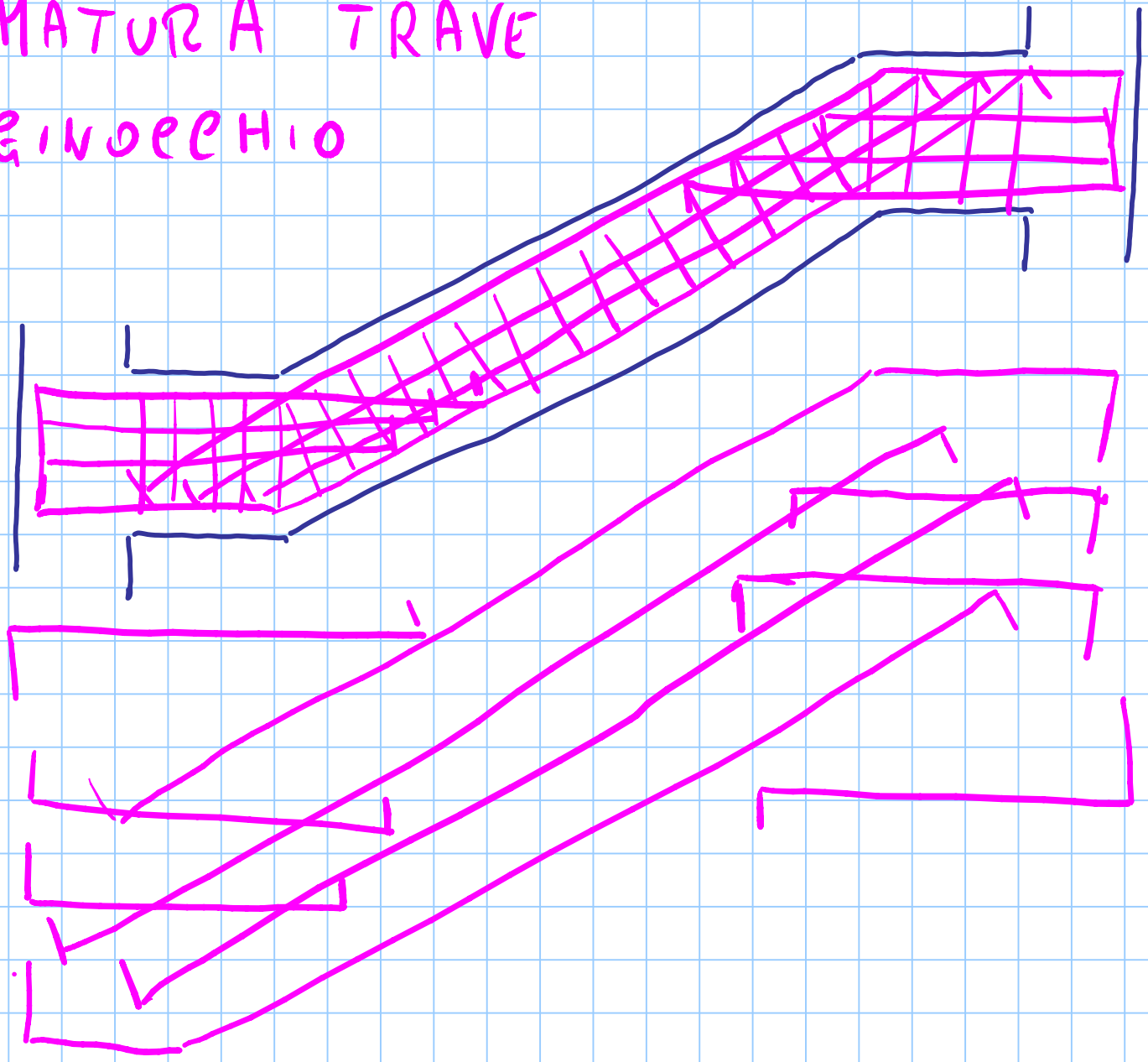
$d = 5,52$

$m_{st}^{r} = 3,6$

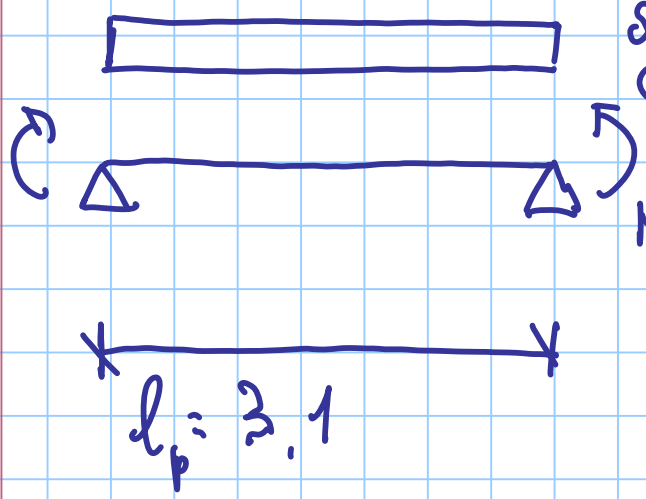
$s = \frac{100}{5,52} = 18,1 \text{ cm}$

$\phi 8/15$

ARMATURA TRAVE A GINOCCHIO



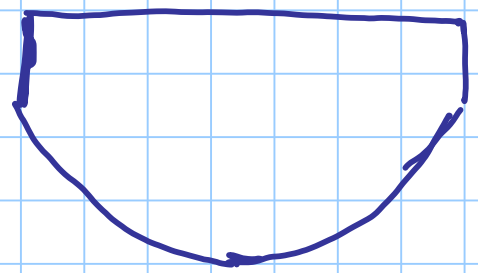
PIANEROTTOLO



$g_{ol} + g_d = 11\ kN/m = q$

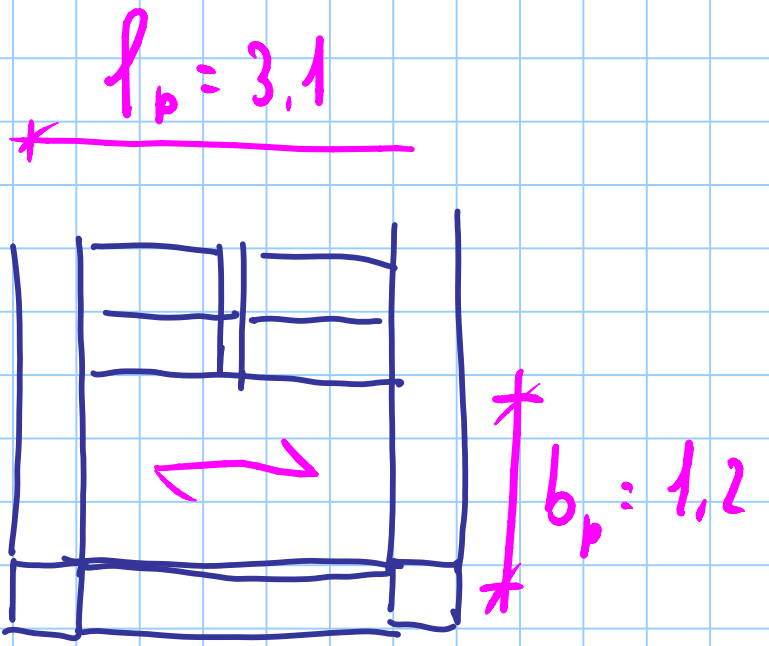
$M = \frac{T_{max}^2}{b_b} = \frac{10,5}{2} = 8,79\ kN\,m$

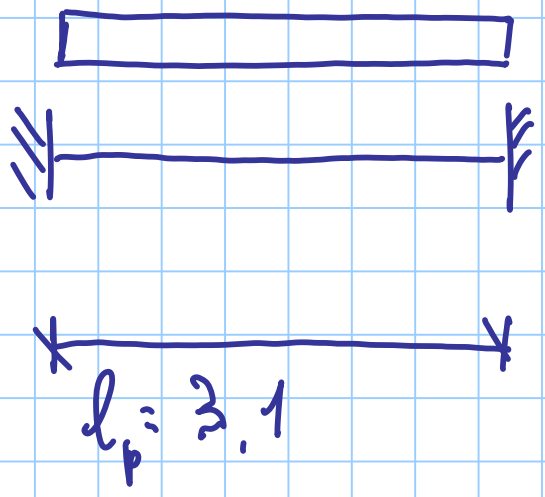
$l_p = 3,1$



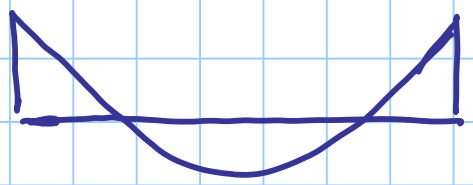
$8,79 = M$

$M + \frac{q l_p^2}{8} = 22,0$

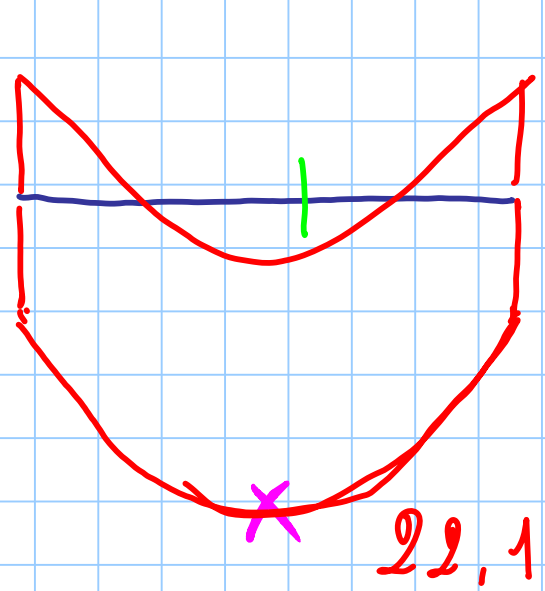


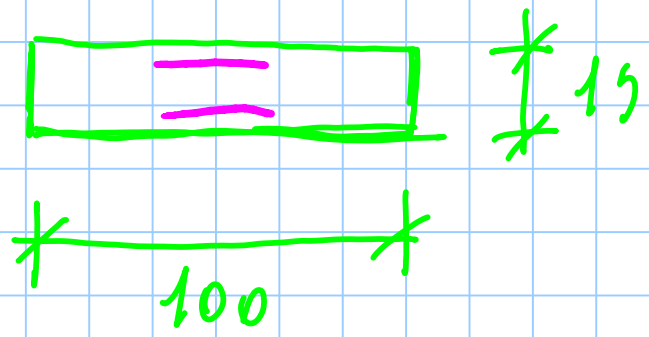


$g_d + q_d = 11\ kN/m = q$



$\frac{q l_p^2}{12} = 8,81\ kNm$

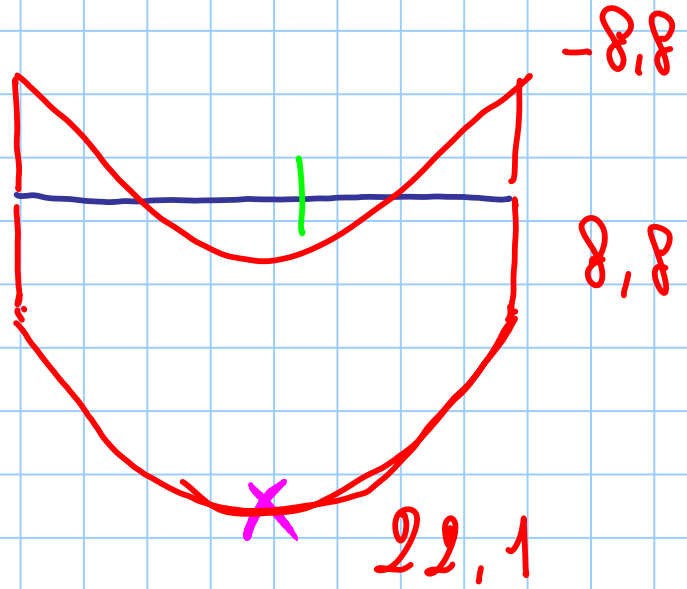


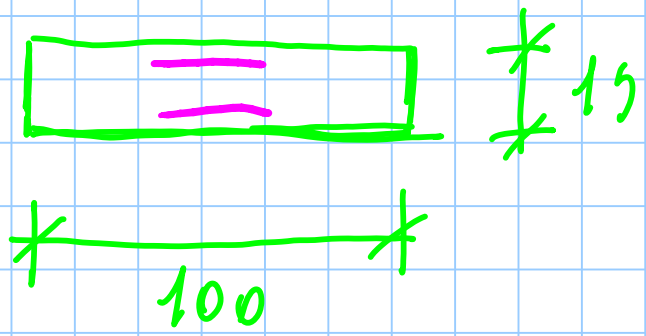


Verifiche sezioni in CLS

$$M_{max}(22,1) \leq M_{Rd} = \frac{b\,d^2}{2'2}$$

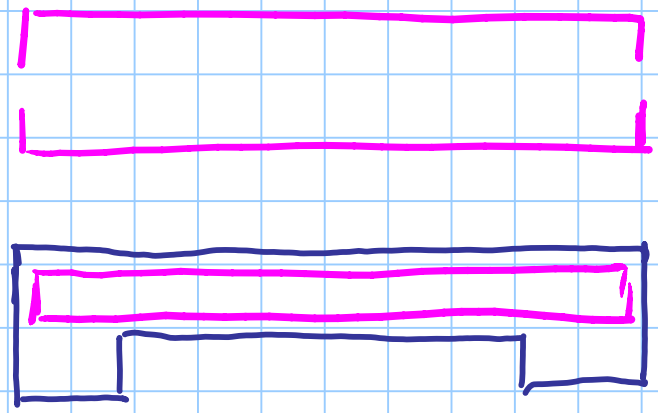
$$V_{max}(17,1) \leq V_{Rd,c}$$



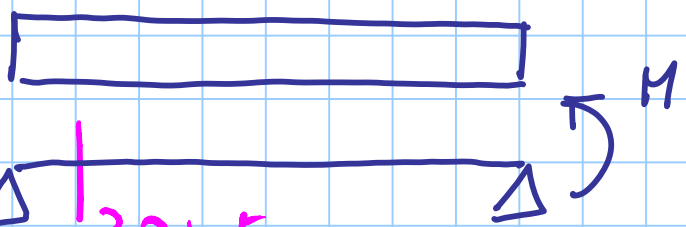


Progetto armature

$$A_s = \frac{M}{0{,}9\, d\, f_{yd}}$$



TRAVE DI TESTATA



M = 22,4

$l_t = 3,1$

6,6

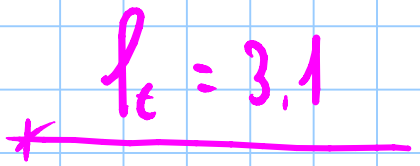
3,7

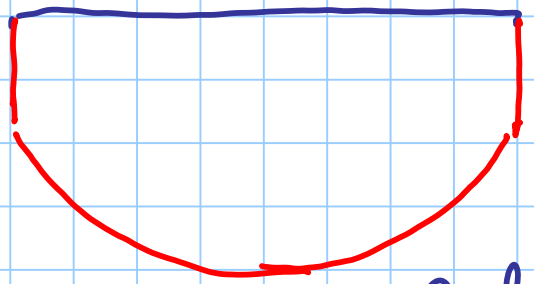
Temperature

P.P. pieno/vuoto

$0,5 \times 11 = 5,5$

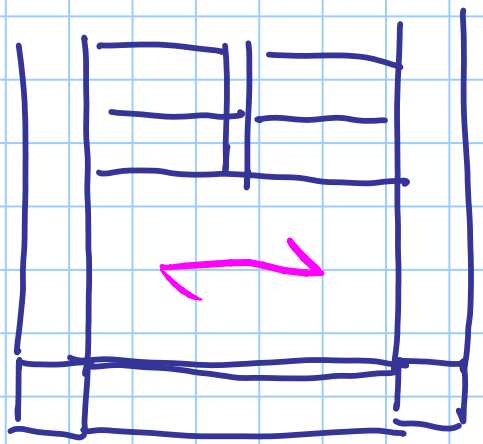
$Q = 15,8$ KN m



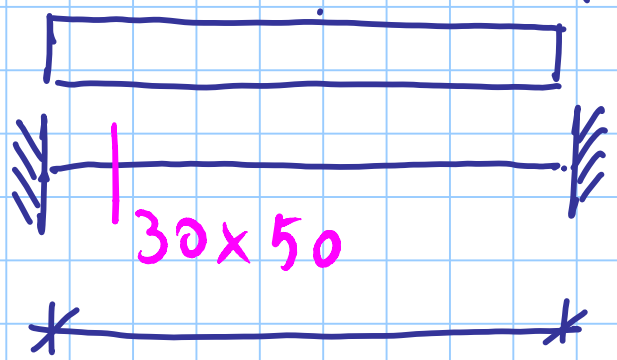


M = 22,4

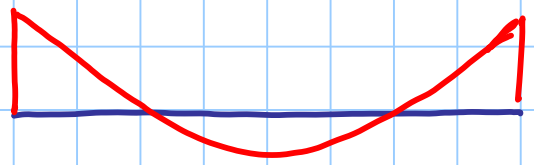
$M + Q \frac{l_t^2}{8} = 41,4$



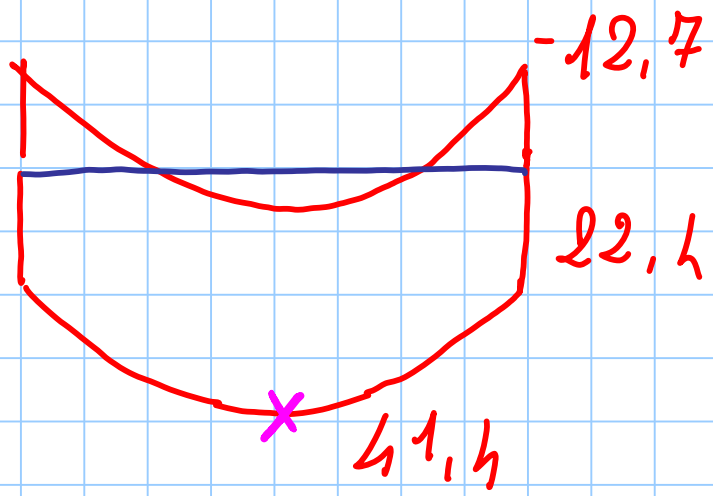
$Q = 15{,}8 \ kN/m$

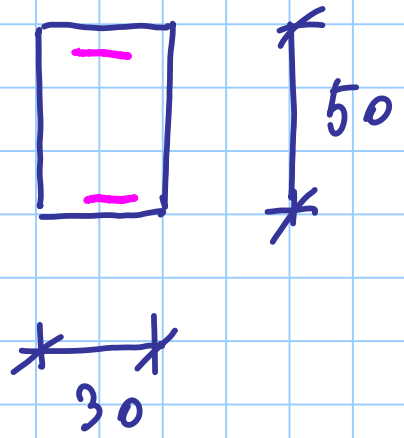


$l_t = 3{,}1$



$$\frac{Q\,l_t^2}{12} = 12{,}7$$

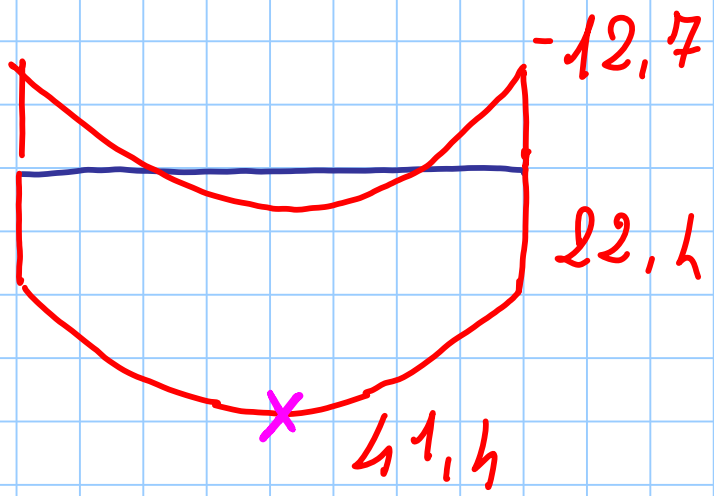


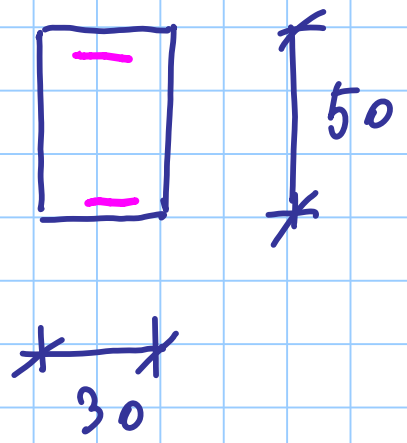


Verifica sezioni in ELS

$$M_{max}\,(41,4) \leq M_{Rd} = \frac{b\,d^2}{\nu\,l}$$

$$V_{max}\,(24,5) \leq V_{Rd,max} = 0,9\,d\,b_w\,f'_{cd}\,\frac{\cot g\,\theta}{1+\cot g^2\theta}$$





Progetto armature

$$A_s = \frac{M}{0{,}9\, d\, f_{yd}}$$

$$\frac{A_{sw}}{s} = \frac{V}{0{,}9\, d\, f_{yd}\, \cot g\, \vartheta}$$