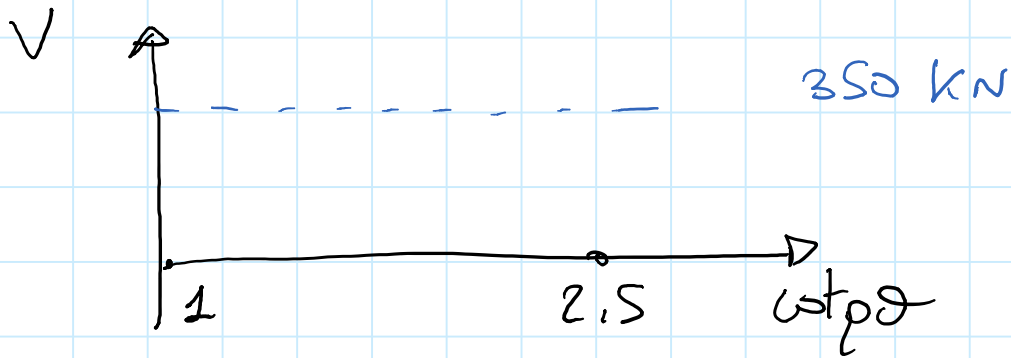
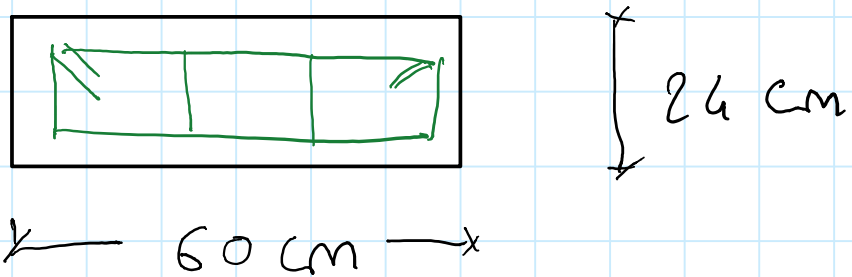


ESEMPIO VERIFICA A TAGLIO



$$c = 4 \text{ cm}$$

$$\phi 8/7.5 \text{ (4 BRACCI)}$$

$$V_{ed} = 350 \text{ kN}$$

$$C30/37$$

$$d = 24 - 4 = 20 \text{ cm}$$

$$V_{rd,s} = n_b \frac{A_{st}}{s} z f_{yd} \cdot \cot \vartheta$$

$$V_{rd,max} = \sqrt{f_{cd} b} z \cdot \frac{\cot \vartheta}{1 + \cot^2 \vartheta}$$

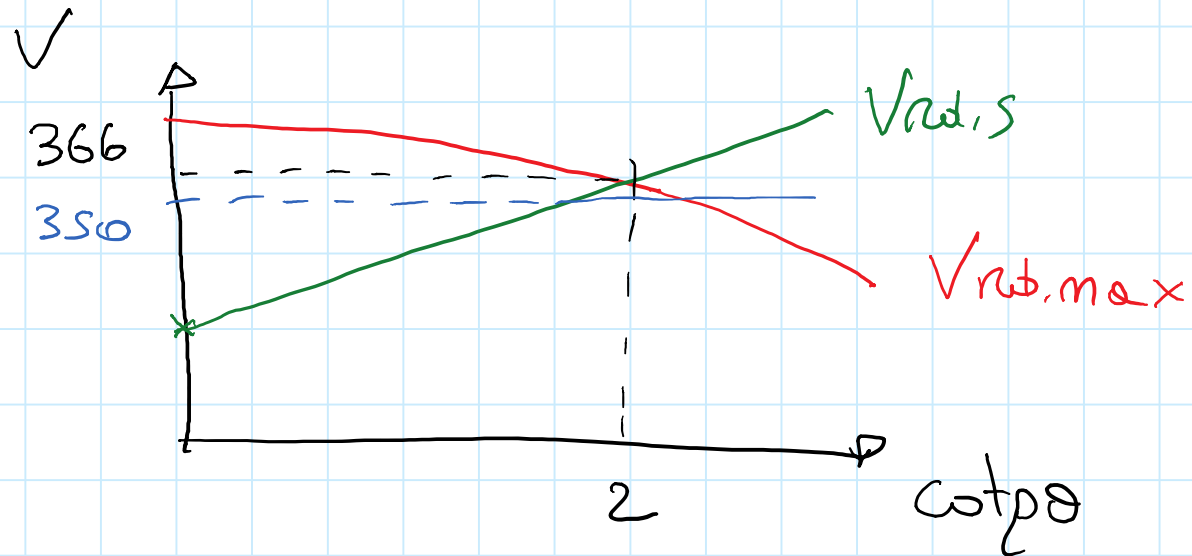
$$V_{rd,s} = V_{rd,max} \Rightarrow$$

$$\cot \vartheta = \sqrt{\frac{\sqrt{f_{cd} b}}{n_b \frac{A_{st}}{s} f_{yd}} - 1}$$

$$\frac{n_b A_{st}}{s} = \frac{4 \times 0.5 \text{ cm}^2}{7.5 \text{ cm}} = 0.26 \text{ cm}$$

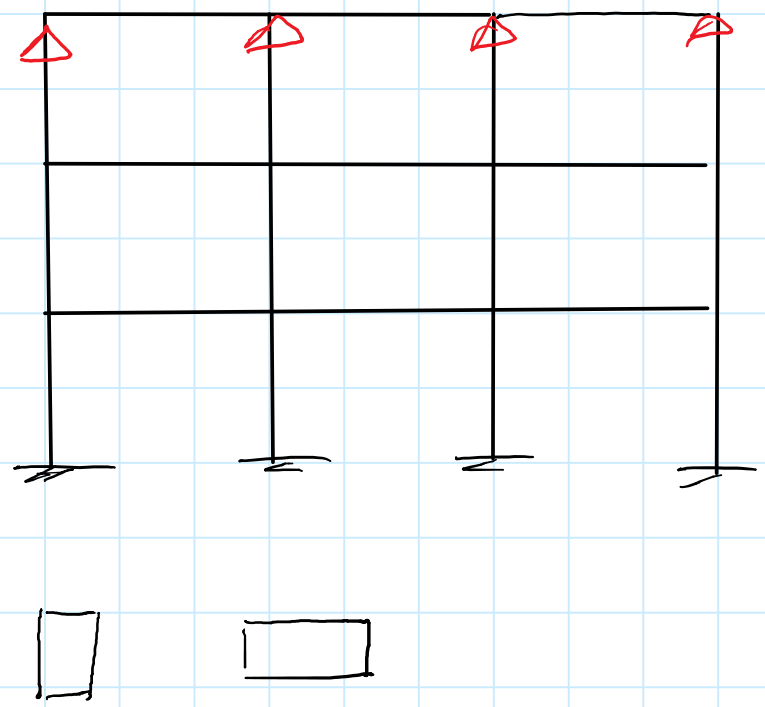
$$z = 0.9d = 0.9 \times 20 = 18 \text{ cm}$$

$$\cot \vartheta = \sqrt{\frac{0,5 \times 17 \text{ MPa} \times 60 \text{ cm}}{0,26 \text{ cm} \times 391,3 \text{ MPa}}} - 1 = 2,00$$

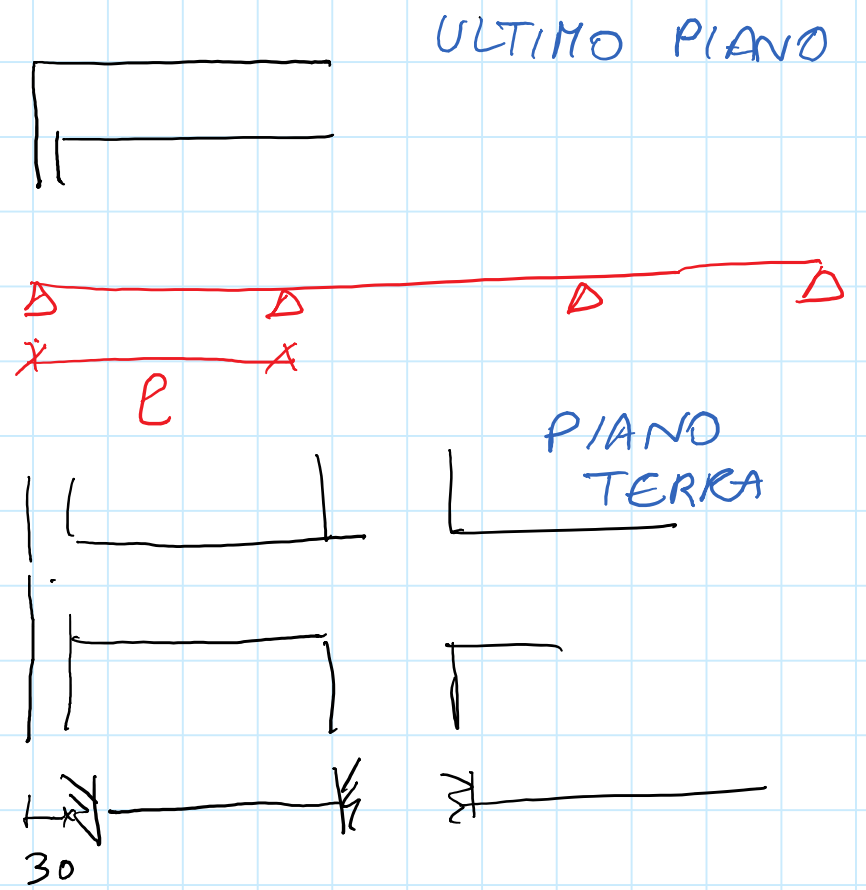


$$\begin{aligned}
 V_{rd,s} &= \frac{n_s A_{st}}{s} z f_{yd} \cot \vartheta = 0,26 \text{ cm} \times 18 \text{ cm} \times \\
 &\quad \times 391,3 \frac{\text{N}}{\text{mm}^2} \times 2 \cdot \frac{1}{20} = \\
 &= 366,3 \text{ kN} > 350 \text{ kN} \\
 &\quad \Rightarrow \text{VERIFICATA}
 \end{aligned}$$

MODELLO DI CALCOLO TRAVI



LUCE DA
ASSE AD
ASSE
PIASTRO

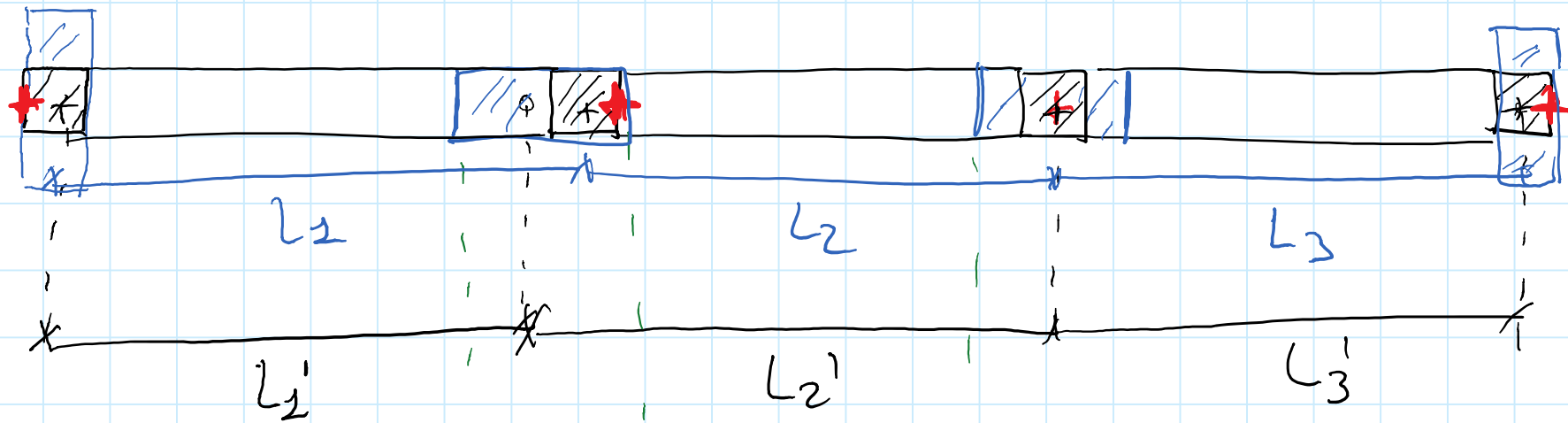


CRITERIO DI FASCIA

- TRAVE CONTINUA (Piani sup.)
- TRAVE INCASTRATA A FILO PIASTRO (Piani inf.)
- SCHERA LIBRE



CONSIDERAZIONI SULLE LUCI



CARICHI SULLE TRAVI



CALCO SU 2m DI
TRAVE CAMBIATO DI SEGNO

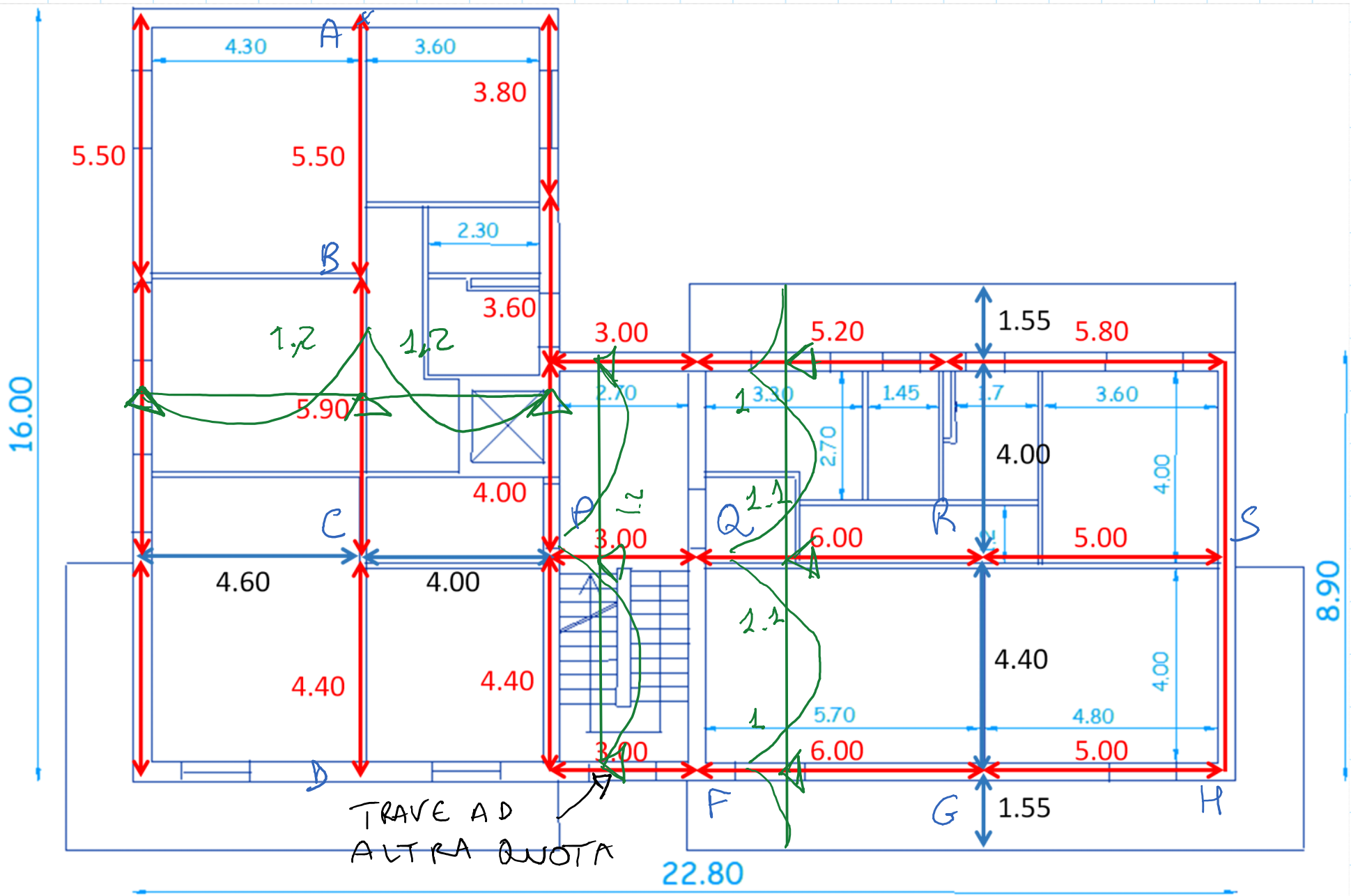
PROBLEMA : SUL SOLAIO HO $q_d + p_d$

→ NON POSSO SEPARARE
EFFETTI.

⇒ STIMO CARICHI MEDIANTE COEFF. DI
CONTINUITA'

PREDIMENSIONAMENTO

1. INDIVIDUO TRAVI EMERGENTI PIU'
SOLLECITATE (q_{max} e P_{max})
2. INDIVIDUO TRAVI A SPESSORE E
RELATIVI CARICHI



CARICHI CAMPATA BC

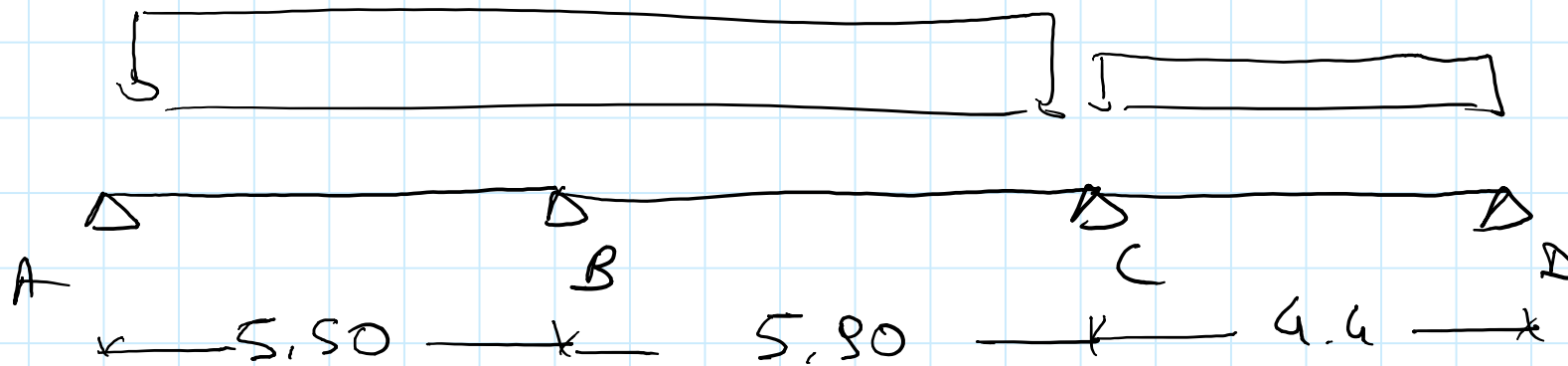
	$g_{d,max}$	$g_{d,min}$	q_d	LUCE	$G_{d,max}$	$G_{d,min}$	Q_d
SOLAIO	8.69	7.85	3	$\frac{4.5}{2} \times 1.2 + \frac{4}{2} \times 1.2$	44.84^*	40.51	15.5
BALCONE	6.89		6.71	0			
SCALA	9.00		6.00	0			
<hr/>							
	G_d					0	
TAMPONATURA	6.75					4.72	
PESO PZ.	4.72						
<hr/>							
TOTALE					49.56	45.23	15.5

$$G_{d,max} + Q_d = 65.06$$

$$G_{d,min} = 45.23$$

$$G_{d,max}^* = g_{d,max} \cdot Luce = 6.89 \times 5.16$$

STIMA MOMENTO MASSIMO



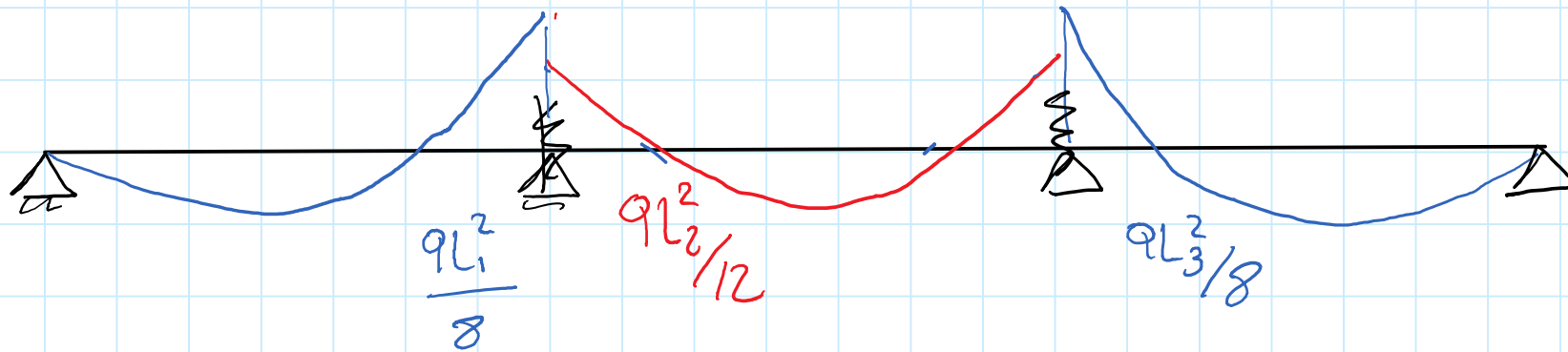
EFFETTO DEI CARICHI SULLE CARPATE



SE GLI EFFETTI SI BILANCIANO $\varphi_B \approx 0 \Rightarrow$

CONSIDERO INIZIALMENTE APPOGGI CENTRALI
BLOCCATI ALLA ROTAZIONE

STIMA MOMENTO MASSIMO



$$M_1 = \frac{(G_{dmax} + Q_d) \times 5,5^2}{8} = \frac{65,06 \times 5,5^2}{8} = 246 \text{ kNm}$$

$$M_2 = \frac{65,06 \times 5,9^2}{12} = 188 \text{ kNm}$$

SOLUZIONE CONGRUENTE MA NON EQUILIBRATA
IN MODO APPROSSIMATO CONSIDERO

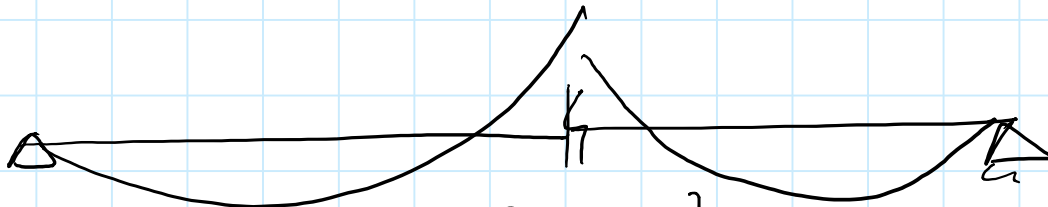
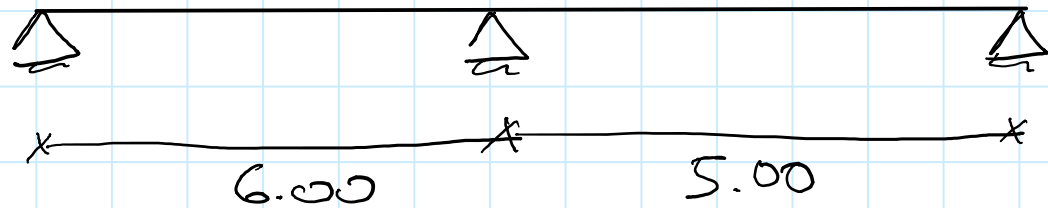
$$M_B = \frac{M_1 + M_2}{2} = \frac{246 + 188}{2} = 217 \text{ kNm}$$

CAMER TRAVE FH

	Q_{dmax}	Q_{dmin}	Q_d	Luce
SOLAIO	8.69	7.85	3	$\frac{4.4}{2} \times 1 = 2.2$
BALCONE	6.89		6.71	1.55
SCALE	3.00		6.00	//
<hr/>				
TAMP.	G_d			
	6.75			
PESO PROPRIO	4.72			

	G_{dmax}	G_{dmin}	Q_{d1}	
SOLAIO *	$8.69 \times 2.2 = 19.11$	17.27	6.6	$G_{dmax} + Q_{d1}$ $= 58,20 \text{ kN/m}$
BALCONE	20,60	10,33	10,4	
TAMP.	6.75	6.75		
PESO PROPRIO	4.72	4.72		
	<hr/>			
	41,20	39,40	17	

STIMA MOMENTO E DIMENSIONAMENTO



$$\frac{9L^2}{8} = \frac{9 \times 6^2}{8} = 58,2 \times \frac{6^2}{8} = 262 \text{ kNm}$$
$$\frac{9L^2}{8} = \frac{9 \times 5^2}{8} = 58,2 \times \frac{5^2}{8} = 182 \text{ kNm}$$

$$M = \frac{262 + 182}{2} = 222 \text{ kNm}$$

$$M = \frac{bd^2}{\alpha^2} \Rightarrow$$

$$d = \alpha \sqrt{\frac{M}{b}} =$$
$$= 0.017 \sqrt{\frac{222}{0.3}}$$
$$= 0.46 \text{ m}$$

$$COPRA FERRO = 5 \text{ cm}$$

\Rightarrow FISSO

$$h = 50 \text{ cm}$$

CARICHI CAMPATA PQ

	Q_{dmax}	Q_{dmin}	Q_d	Luce
SOLAIO	8.69	7.85	3	$\frac{4}{2} \times 1.2 = 2.4$
BALCONI		6.89	6.71	//
SCALE		9.00	6.00	$\frac{4.40}{2} \times 1.2 = 2.64$
TAMP.		6.75		//
PESO PROPRIO		2.96		

	\times G_{dmax}	G_{dmin}	Q_{d1}
SOLAIO	20.85	28.84	7.2
SCALE	23.76	23.76	15.84
Peso p	2.96	2.96	
	47.57	45.56	23.04

CARICHI CAMPATA QR - RS

	L ort	gd min	gd max	qd	Gd min	Gdmax	Qd
Solaio	4.62	7.85	8.69	3.00	36.27	40.15	13.86
Scala		9.00	9.00	6.00	0.00	0.00	0.00
Balcone	0	6.89	6.89	6.71	0.00	0.00	0.00
Tamp	0	6.75	6.75		0.00	0.00	0.00
Peso Sp	0	2.96	2.96		0.00	0.00	0.00
Peso Em	1	4.72	4.72		4.72	4.72	0.00
					40.99	44.87	13.86

$$G_{dmax} + Q_d = 58.73 \text{ kNm}$$

$$G_{dmin} = 40.99 \text{ kNm}$$

STIMA MOMENTO TRAVE A SPESSORE

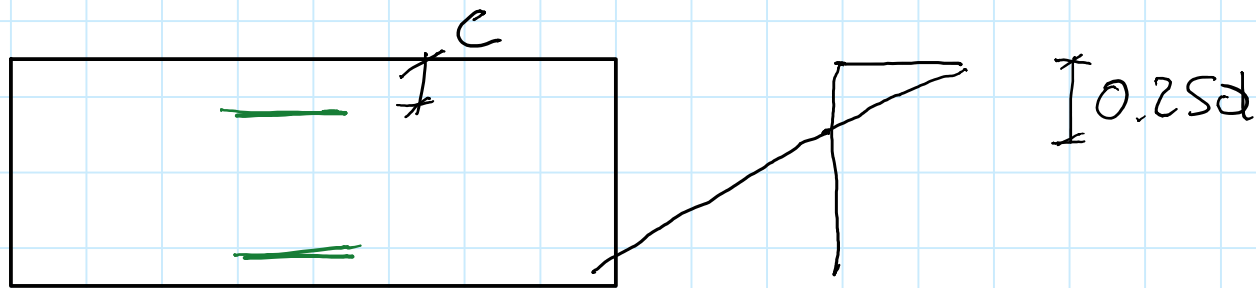


$$M_1 = \frac{q_1 \times 3^2}{8} = \frac{(45.57 + 23.04)}{8} \times 3^2 = 80.3 \text{ kNm} \quad \frac{q_2 \times 6^2}{12}$$

$$M_2 = \frac{(44.87 + 13.86) \times 6^2}{12} = 176.2 \text{ kNm}$$

$$M \approx \frac{M_1 + M_2}{2} = 128.25 \text{ kNm} \quad \left(\begin{array}{l} \text{IN CASO DI TRAVE} \\ \text{A SPESSORE} \\ \pi \rightarrow M_1 \end{array} \right)$$

PREDIMENSIONAMENTO TRAVE A SPESSORE



Se $\gamma = \frac{c}{d} = 0.25 \rightarrow$ ARMATURA COMPRESSA \equiv
ASSE NEUTRO \Rightarrow

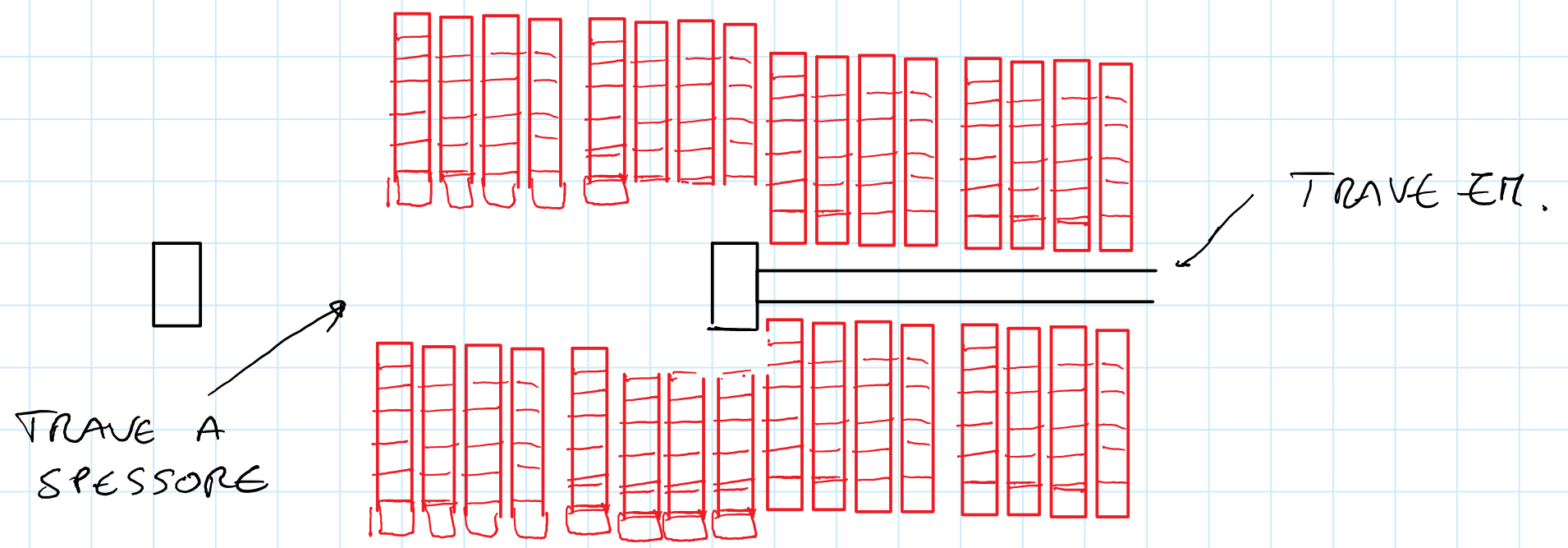
$$M = bd^2/\gamma^2$$

Se $\gamma \approx 0.20 \Rightarrow M = bd^2/\gamma'^2$

$\gamma = \frac{c}{d} = \frac{4}{19} = 0.21 \Rightarrow$ BASE NECESSARIA
IN APPOGGIO

$$d = \frac{M \cdot \gamma'^2}{b^2} = \frac{128 \text{ kNm} \cdot 0.017^2}{0.18^2} = 1.02 \text{ m}$$

TRAVE A SPESSORE A SEZIONE VARIABILE



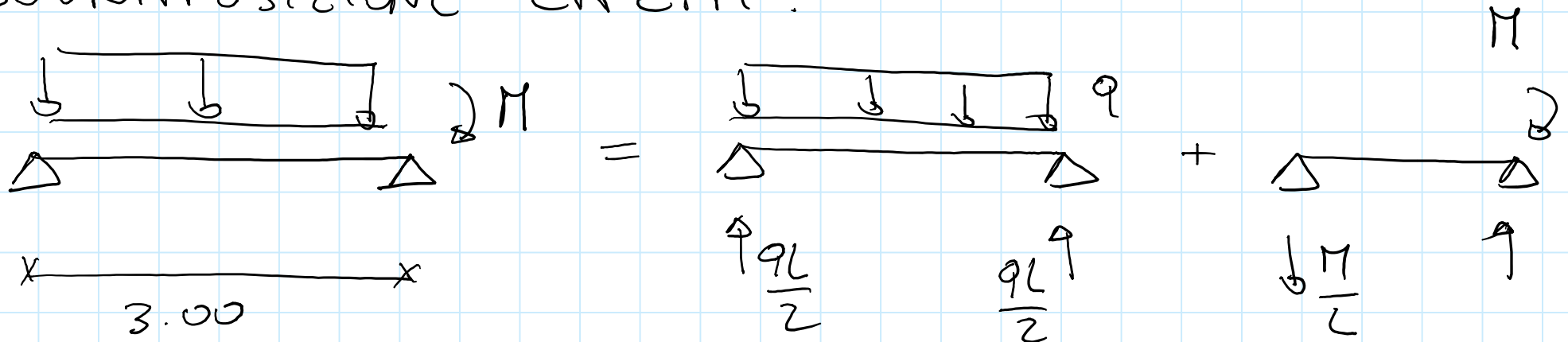
REALIZZO TRAVE A SPESSORE ELIMINANDO

1 PIGNATTE \Rightarrow

POSSO AVERE $b_{CAMP} \neq b_{APPOGGIO}$

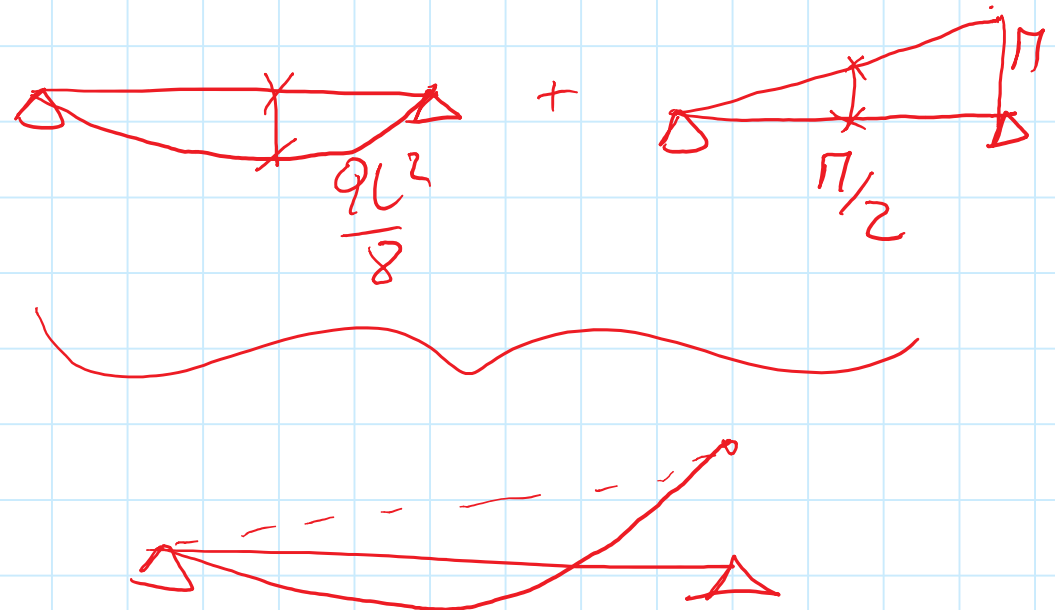
STIMA MOMENTO IN CAPPATA

SOVRAPPOSIZIONE EFFETTI :



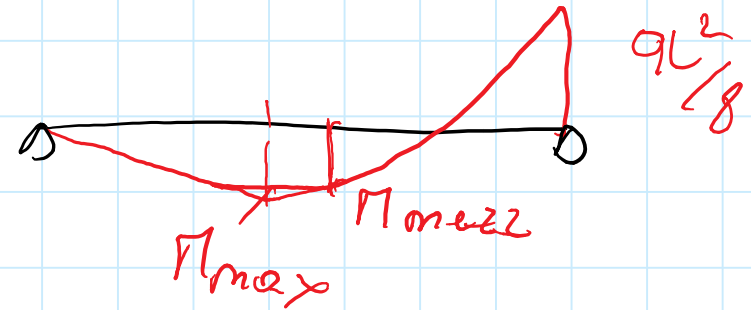
$$M_{mezz} = \frac{qL^2}{8} - \frac{M}{2}$$

(NON COINCIDE CON M_{max})



$$\text{Se } M = \frac{qL^2}{8} \Rightarrow M_{\text{mezz}} = \frac{qL^2}{8} - \frac{qL^2}{16} = \frac{qL^2}{16}$$

$$M_{\text{max}} = \frac{qL^2}{14}$$

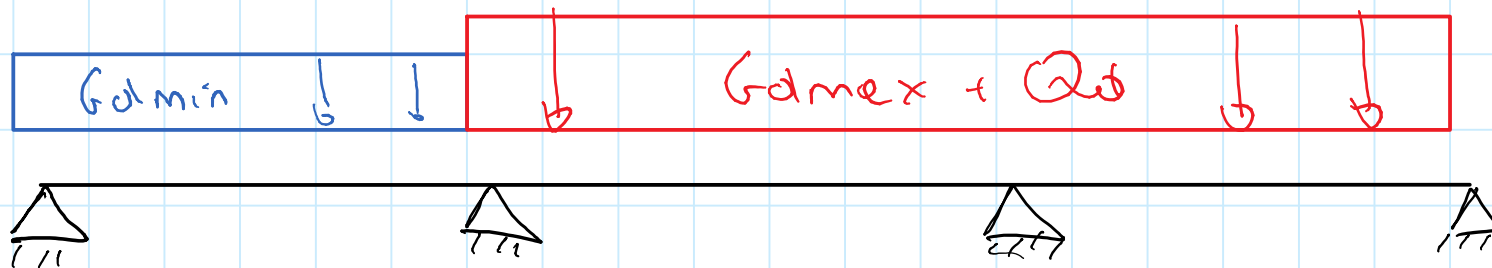
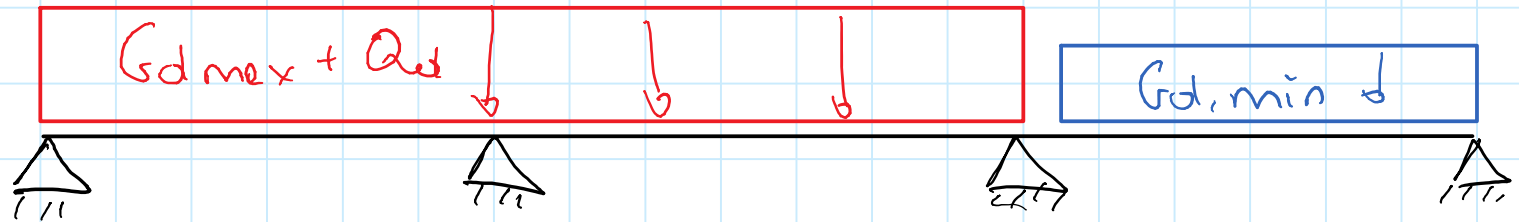
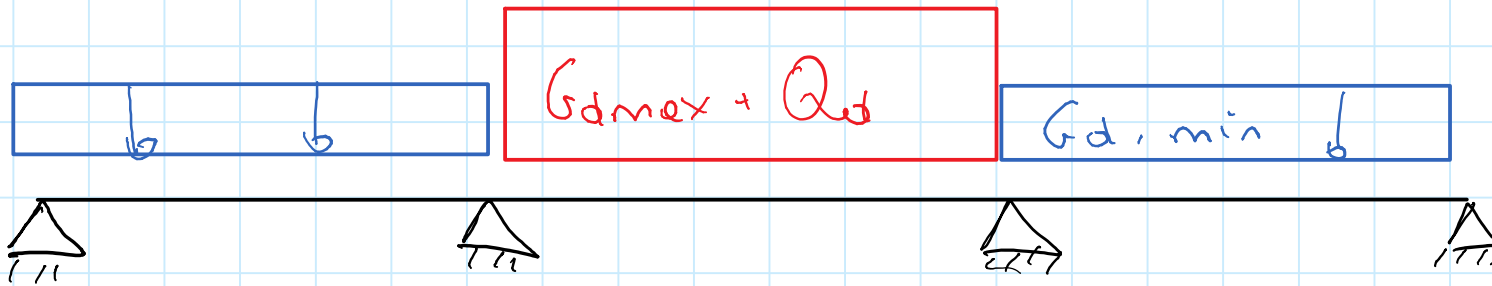
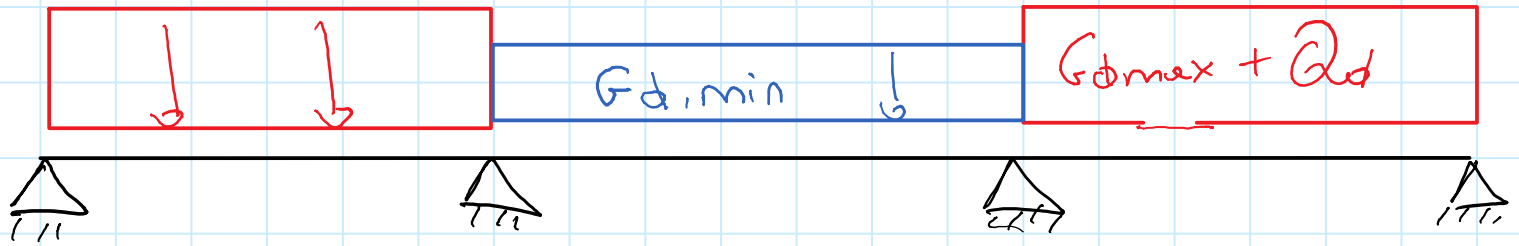


NEL NOSTRO CASO

$$M_{\text{max}} = \frac{(G_{\text{max}} + Q_d) \times 3^2}{14} = 40 \text{ KNm}$$

\Rightarrow b NECESSARIA MOLTO PICCOLA

COMBINAZIONI DI CARICO SULLA TRAVE



+
SCHEMI
LIMITE