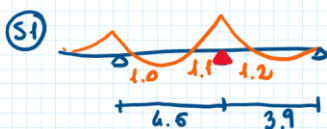


Hand-drawn floor plan of a building with dimensions and annotations. The plan shows a rectangular building with a central corridor and two main rooms. Dimensions are given in meters. Annotations include room numbers (15, 22), area calculations ($96.2/12$, $96.2/8$), and a list of dimensions at the bottom: 1.50, 4.60, 3.90, 3.00, 3.50, 3.70, 3.80, 1.50. The plan also shows a staircase and a small room labeled '8'.

$$M_{16} = \frac{1}{2} \left[M_{22 \cdot 15} + M_{15 \cdot 8} \right] = \frac{1}{2} \left[\left(\frac{QL^2}{8} \right)_{22 \cdot 15} + \left(\frac{QL^2}{12} \right)_{15 \cdot 8} \right]$$

$$L_{22.15} = 4.30 \text{ m}$$


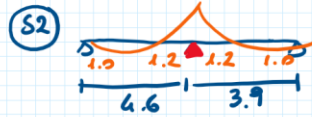
$$Q = \begin{cases} \text{SOLAI0} : \left(\frac{4.6}{2} \times 1.1 + \frac{3.9}{2} \times 1.2 \right) \left(\underset{3.42}{\underset{\parallel}{Gd}} + \underset{3}{\underset{\parallel}{Qd}} \right)_{\text{SOL}} = 55.6 \frac{\text{kN}}{\text{m}} \\ \text{PESO PROPRIO} : 1 \times \underset{3.74}{\underset{\parallel}{Gd}}_{\text{T.E}} = 3.74 \frac{\text{kN}}{\text{m}} \end{cases}$$

$$Q = 55.6 + 3.74 = 59.34 \text{ kN}$$

$$M_{22.15} = \frac{QL^2}{8} = \frac{59.34 \times 4.30^2}{8} = 137.15 \text{ kNm}$$

CAMPATA 15.18

$$L_{15.8} = 4.0 \text{ m}$$



$$Q = \begin{cases} \text{SOLAIO: } \left(\frac{4.6}{2} \times 1.2 + \frac{3.9}{2} \times 1.2 \right) (3.42 + 3) = 58.24 \frac{\text{kN}}{\text{m}} \\ \text{PESO PROPRIO: } 1 \times 3.74 = 3.74 \frac{\text{kN}}{\text{m}} \end{cases}$$

$$Q = 58.24 + 3.74 = 61.98 \frac{\text{kN}}{\text{m}}$$

$$M_{15.8} = \frac{Q L^2}{12} = \frac{61.98 \times 4.0^2}{12} = 82.64 \text{ kNm}$$

$$M_{15} = \frac{1}{2} [137.15 + 82.64] = 109.9 \text{ kNm}$$

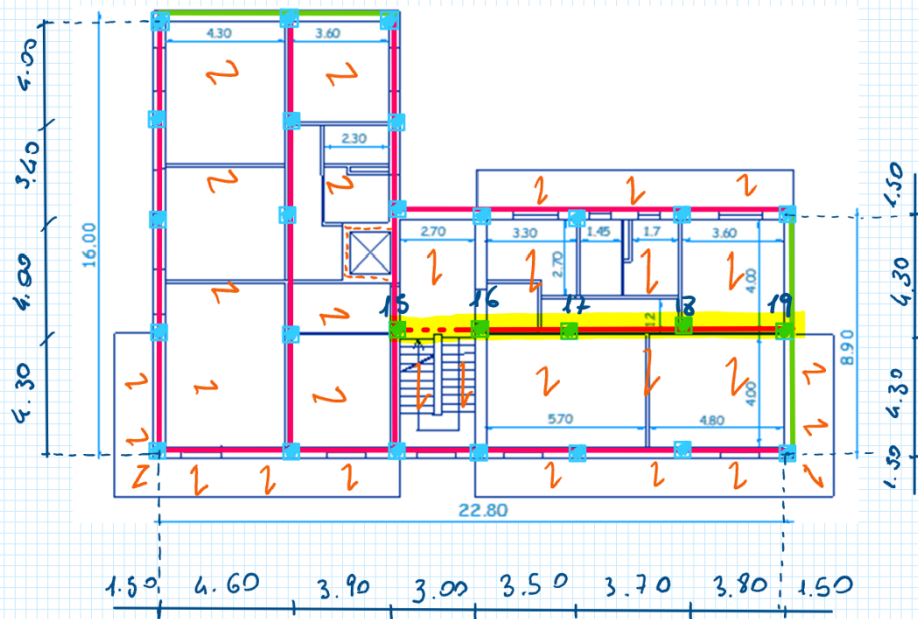
DIMENSIONO LA SEZ. TRASVERSALE DELLA TRAVE EMERGENTE:

$$M_{Ed} = \frac{b d^2}{2}$$

$$\text{Fisso } b = 30 \text{ cm} = 0.3 \text{ m} \Rightarrow d = \sqrt[2]{\frac{M_{Ed}}{b}} = 0.019 \sqrt{\frac{110}{0.3}} = 0.36 \text{ m}$$

$$h = 36 + 5 = 41 \text{ cm}$$

PROGETTO UNA TRAVATA DI STUDIO



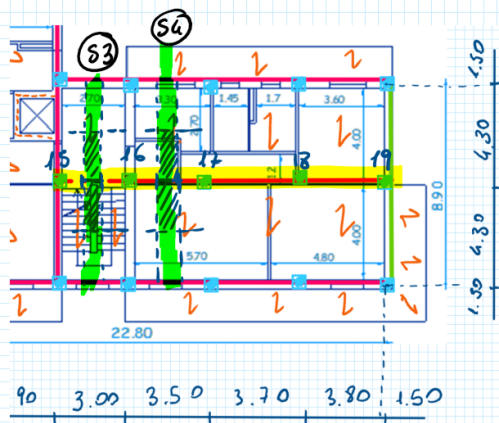
1) SEZ. TRASVERSALI $\left\{ \begin{array}{l} \text{TR. EMERGENTE} = 30 \times 50 \text{ DA PREDIHENSIONAMENTO} \checkmark \\ \text{TR. SPESSORE} \checkmark \end{array} \right.$

2) CARICHI SULLE CAMPATE \checkmark

3) RISOLVERE SCHEMI E COMBINAZIONI

4) INVILUPPO DEI DIAGR. DI M E V

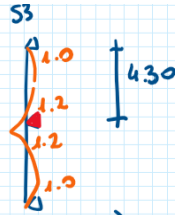
1) DEFINISCO TRAVE A SPESSORE



$$M_{16} = \frac{1}{2} \left[\left(\frac{qL^2}{2} \right)_{15.16} + \left(\frac{qL^2}{12} \right)_{16.17} \right]$$

CAMPATA 15.16

$$L_{15.16} = 3.0 \text{ m}$$



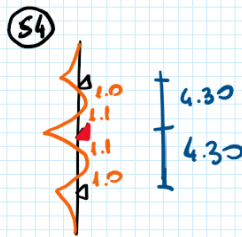
$$Q = \begin{cases} \text{SOLAI} : \left(\frac{4.30}{2} \times 1.2 \right) (8.42 + 3) = 29.46 \\ \text{SCALA} : \left(\frac{4.30}{2} \times 1.2 \right) (8.98 + 6) = 38.65 \\ \text{PESO PROPRIO} : 1 \times 2.22 = 2.22 \end{cases}$$

$$Q = 70.33 \frac{\text{kN}}{\text{m}}$$

$$M_{15.16} = \frac{QL^2}{8} = \frac{70.33 \times 3.0^2}{8} = 79.12 \text{ kNm}$$

CAMPATA 16.17

$$L_{16.17} = 3.50 \text{ m}$$



$$Q = \begin{cases} \text{SOLAI} : \left(\frac{4.30}{2} \times 1.1 + \frac{4.30}{2} \times 1.1 \right) \times (8.42 + 3) \\ \text{PESO PROPRIO} : 1 \times 3.74 \end{cases}$$

$$Q = 57.76 \frac{\text{kN}}{\text{m}}$$

$$M_{16.17} = \frac{QL^2}{12} = \frac{57.76 \times 3.50^2}{12} = 58.96 \text{ kNm}$$

$$M_{16} = \frac{1}{2} (79.12 + 58.96) = 69.0 \text{ kNm}$$

PROGETTO LA TRAVE A SPESSORE:

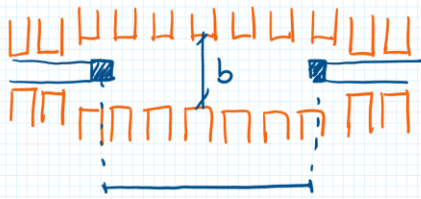
$$M_{Ed} = b \frac{d^2}{z^2} = M_{Ed}$$

$$\Rightarrow b = M_{Ed} \frac{z^2}{d^2} = 69 \times \frac{0.019^2}{0.19^2} = 0.7$$

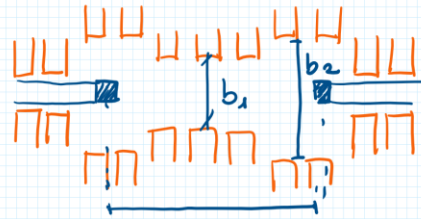
$$d = h_{sol} - c = 23 - 4 = 19 \text{ cm}$$

$$70 \times 23$$

SE LA BASE b FOSSE TROPPO GRANDE $\Rightarrow b$ VARIABILE

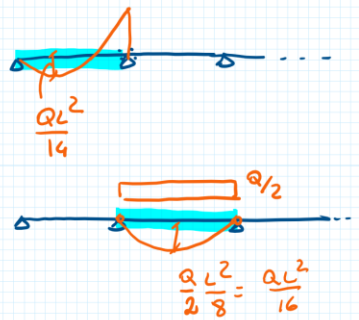


$b = \text{costante}$

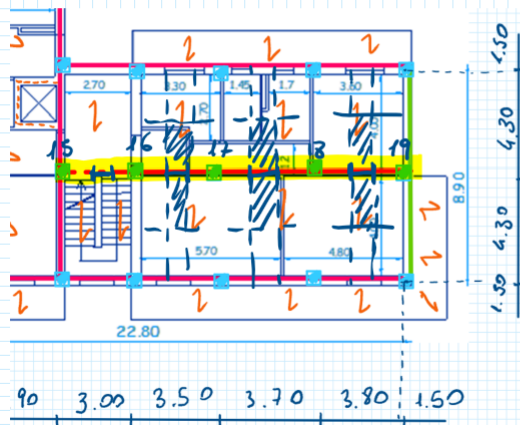


$b_2 > b_1$
 $\nwarrow \searrow$
 DAL M STIMATO SUGLI APP DAL M STIMATO IN CAMPATA

PER STIMARE M IN CAMPATA:



2) CARICHI SULLE CAMPATE



CAMPATA 15-16

$$Q = \begin{cases} \text{SOLAIO : } \left(\frac{4.30}{2} \times 1.2 \right) \\ \text{SCALA : } \left(\frac{4.30}{2} \times 1.2 \right) \\ \text{PESO PROPRIO : } 1 \times \end{cases}$$

15-16	Carichi unitari				Carichi per m di trave			
Carichi	Gdmax	Gdmin	Qd	Area/1m	L/1m	Gdmax	Gdmin	Qd
Solaio	8.42	7.56	3	2.58	---	21.72	19.50	7.74
Balcone	5.66		6.36		---	0.00		0.00
Scala	8.98		6	2.58	---	23.17		15.48
Trave emerg	3.74			---		0.00		
Trave spess	2.22			---	1	2.22		
Tamponatura	5.37			---		0.00		
Tot						47.11	44.89	23.22

CAMPATA 16-17 - 17-18 - 18-19

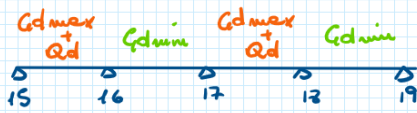
$$Q = \begin{cases} \text{SOLAIO : } \left(\frac{4.30}{2} \times 1.1 + \frac{4.30}{2} \times 1.1 \right) \\ \text{PESO PROPRIO : } 1 \end{cases}$$

16-17	Carichi unitari				Carichi per m di trave			
Carichi	Gdmax	Gdmin	Qd	Area/1m	L/1m	Gdmax	Gdmin	Qd
Solaio	8.42	7.56	3	4.73	---	39.83	35.76	14.19
Balcone	5.66		6.36		---	0.00		0.00
Scala	8.98		6		---	0.00		0.00
Trave emerg	3.74			---	1	3.74		
Trave spess	2.22			---		0.00		
Tamponatura	5.37			---		0.00		
Tot						43.57	39.50	14.19

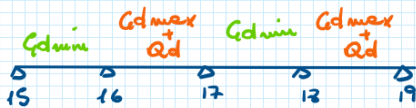
3) SCHEMI E COMBINAZIONI

A) TRAVE CONTINUA

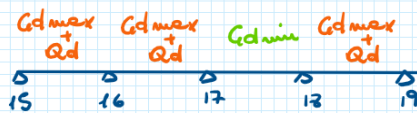
CAMP. DISPARI



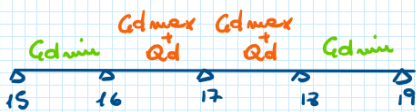
CAMP. PARI



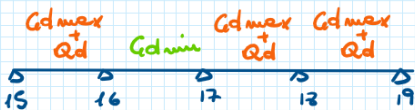
APP. 16



APP. 17



APP. 18



TRAVE CON

$$\left. \begin{array}{l} b = 30 \\ h = 60 \end{array} \right\} \text{TR. EMERG.}$$

$$\left. \begin{array}{l} b = 70 \\ h = 23 \end{array} \right\} \text{TR. SPESSORE}$$

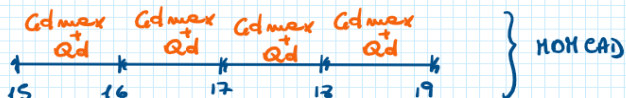
$$L_{ALA} = 0$$

$$S_{ALA} = 0$$

$$L : 1:50$$

$$M : 1 \text{ cm} = 20 \text{ kNm}$$

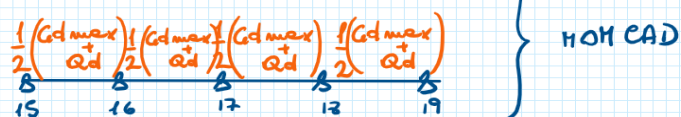
B) SCHEMA CON INCASTRI



$$\frac{(G_{dmax} + Q_d) L^2}{12} = M_{sx} = M_{dx} \text{ di OGNI TRAVE}$$

Campata	L [m]	Gdmax+Qd [kN/m]	QL ² /12
15-16	3	70.33	52.7
16-17	3.5	57.76	59.0
17-18	3.7	57.76	65.9
18-19	3.9	57.76	73.2

C) SCHEMA CON CERNIERE



SCALA LUNGHEZZE 1:50

SCALA MOMENTI 1 cm = 25 kNm

