

GESTIONE CASE LAVORATORI (legge 14.2.1963 n° 60)		INTERVENTO n° 82		STAZIONE APPALTANTE: I. A. G. P.	
RIONE COMMENDA - BRINDISI - EDILIZIA SOVVENZIONATA AREA PALAZZINA c			data	agg	
RELAZIONE DI CALCOLO			archivio:		
Dott.ing. L. POTI	EDILIZIA	visto:	note		
Dott.ing. N. VIVARELLI SCARASCIA	IMPIANTI				
Dott.ing. G. CASANOVA	STRUTTURE				
Dott.ing. A. MALDARI	PROGRAMMAZIONE				
DIREZIONE LAVORI	I. A. G. P.		controllo	visto:	

Palazzina c - Colonnato.

Analisi di carico dei pilastri

Pilastro 1

4° ordine: Solaino:  $\frac{3.50}{2} (1.65 + \frac{4.00}{2}) \times 650 = 4.265 \text{ kg}$   
 Cornice:  $080 \times 033 \times 2500 (\frac{1.65 + 4.00}{2}) = 3.409 \text{ kg}$   
 bordo cornice:  $053 \times 020 \times 2500 (\frac{3.80}{2} + \frac{1.65 + 4.00}{2}) = 1.470 \text{ kg}$   
 muro attico:  $330 \times 1.20 (\frac{3.80}{2} + \frac{4.00}{2} + 0.80) = 1.861 \text{ kg}$   
 tegole + tavelle:  $300 (\frac{3.80}{2} + \frac{4.00}{2} + 0.80) = 1.410 \text{ kg}$   
 p.p.trave:  $030 \times 063 \times 2500 (\frac{4.00 + 1.65}{2}) = 1.724 \text{ kg}$   
 p.p.p.:  $030 \times 030 \times 2500 \times 3.00 = 675 \text{ kg}$   
Sommario 13.8 t.

3° - 2° - 1° ordine:

Solaino:  $\frac{3.50}{2} [1.60 + \frac{4.00}{2}] \times 650 = 4.095 \text{ kg}$   
 Corridoio tra le travi:  $040 \times 020 \times 2500 \times \frac{3.50}{2} = 350 \text{ kg}$   
 P.p.trave:  $030 \times 060 \times 2500 [\frac{1.60 + 4.00}{2}] = 1350 \text{ u}$   
 Malespiano:  $015 \times 020 \times 2500 [\frac{1.60 + 4.00}{2}] = 270 \text{ u}$   
 Muratura:  $330 \times 2.80 [\frac{1.60 + 4.00}{2}] = 3326 \text{ u}$   
 $330 \times 3.10 \times 3.50/2 = 1560 \text{ u}$   
 p.p.pilastro:  $030 \times 040 \times 2500 \times 3.00 = 900 \text{ u}$   
Totale 11.851 kg

4° ordine: 13.8 t.

3° Ordine: 25.65 t.

2° Ordine: 37.50 t.

1° Ordine: 49.35 t.

## Pilastro 2

4<sup>o</sup> ordine :

$$\text{Solai} \left[ \frac{1.65 + 4.00}{2} \right] \left[ \frac{3.80 + 3.65}{2} \right] \times 650 = 8.83 \text{ t.}$$

$$\text{Cornice} [1.90 + 1.80] \times 0.20 \times 0.55 \times 2500 = 0.98 \text{ t.}$$

$$\text{Trave} 0.30 \times 0.63 \times 2500 \left[ \frac{1.65 + 4.00}{2} + \frac{3.65}{2} \right] = 3.58 \text{ t.}$$

$$\text{Mur. attico} 330 \times 1.20 \left[ \frac{3.80 + 3.65}{2} \right] = 1.47 \text{ t.}$$

$$\text{Tavola + tegole} \left[ \frac{3.80 + 3.65}{2} \right] \times 300 = 1.12 \text{ t.}$$

$$\text{P/pil.} 0.30 \times 0.30 \times 2500 \times 3.00 = 0.68 \text{ t.}$$

$$\text{Totale} \quad \underline{\quad \quad \quad} \quad 15.66 \text{ t.}$$

3<sup>o</sup> - 2<sup>o</sup> - 1<sup>o</sup> ordine.

$$\text{Solai} \frac{3.30}{2} \times \left[ \frac{1.60 + 4.00}{2} \right] \times 650 = 4.09 \text{ t.}$$

$$\frac{3.60}{2} \times \frac{4.00}{2} \times 650 = 2.34 \text{ t.}$$

$$\text{Balcon.} \frac{3.65}{2} \times 1.70 \times 700 = 2.17 \text{ t.}$$

$$\text{Cordolo} 0.40 \times 0.20 \times 2500 \times 3.50/2 = 0.35 \text{ t.}$$

$$\text{Murales} \left( \frac{1.45 + 3.35}{2} \right) \times 2.80 \times 330 = 2.21 \text{ t.}$$

$$\frac{3.50}{2} \times 3.10 \times 330 = 1.73 \text{ t.}$$

$$\text{P/p travi} \left( \frac{1.60 + 4.00}{2} + \frac{3.65}{2} \right) \times 375 = 2.03 \text{ t.}$$

$$\text{P/p pil.} 0.30 \times 0.40 \times 2500 \times 3.00 = 0.90 \text{ t.}$$

$$\text{Totale.} \quad \underline{\quad \quad \quad} \quad 15.88 \text{ t.}$$

4<sup>o</sup> ordine : 15.66 t.

3<sup>o</sup> ordine : 31.54 t.

2<sup>o</sup> ordine : 47.42 t.

1<sup>o</sup> ordine : 63.30 t.

Pilastro 3-4

4<sup>o</sup> ordine : coperture.

$$\text{Solai} \frac{3.70}{2} \times 3.60 \times 650 = 4.33 \text{ t.}$$

$$\text{Shalzo: } 1.70 \times 3.60 \times 650 = 3.98 \text{ t.}$$

$$\text{Coruice: } 0.53 \times 0.20 \times 2500 \times 3.60 = 0.96 \text{ t.}$$

$$\text{Teade: } 0.30 \times 0.50 \times 2500 \times 3.60 = 1.35 \text{ t.}$$

$$\text{Muro attico: } 3.30 \times 1.20 \times 3.60 = 1.43 \text{ t.}$$

$$\text{Tabelle + tegole: } 300 \times 3.60 = 1.08 \text{ t.}$$

$$\text{pppnl} : 0.30 \times 0.30 \times 2500 = 0.68 \text{ t.}$$

$$\text{totale} \quad \underline{\quad\quad\quad} \quad 13.81 \text{ t.}$$

3<sup>o</sup> - 2<sup>o</sup> - 1<sup>o</sup> ordine

$$\text{Solai: } 3.70/2 \times 3.60 \times 650 = 4.33 \text{ t.}$$

$$\text{Shalzo: } 1.70 \times 3.60 \times 700 = 4.28 \text{ t.}$$

$$\text{Teade: } e.s \quad = 1.35 \text{ t.}$$

$$\text{Muralura: } 3.80 \times 3.30 \times 3.60 = 3.33 \text{ t.}$$

$$\text{pppnl } 0.30 \times 0.40 \times 2500 = 0.30 \text{ t.}$$

$$\text{totale} \quad \underline{\quad\quad\quad} \quad 14.19 \text{ t.}$$

4<sup>o</sup> ordine : 13.81 t.

3<sup>o</sup> ordine : 28.00 t.

2<sup>o</sup> ordine : 42.13 t.

1<sup>o</sup> ordine : 56.38 t.

Pilastro 5

4<sup>o</sup> ordine : coperture

Solara  $\left(\frac{4.60+4.00}{2}\right) \times 3.50 \times 650 = 4.89 \text{ t.}$

shales 080  $\left(\frac{4.60+4.00}{2}\right) \times 650 = 3.24 \text{ t.}$

Cornice 020 x 050 x 2500  $\times \left(\frac{4.60+4.00}{2}\right) = 1.14 \text{ t.}$

tas+tey. 300  $\left(\frac{4.60+4.00}{2}\right) = 1.29 \text{ t.}$

Mur. attico 330 x 1.20  $\left[\frac{4.60+4.00}{2}\right] = 1.70 \text{ t.}$

trave 030 x 050 x 2500  $\left[\frac{4.60+4.00}{2}\right] = 1.24 \text{ t.}$

pppnl 3.00 x 030 x 030 x 2500 = 0.68

- totale. 13.18 t.

3<sup>o</sup> - 2<sup>o</sup> - 1<sup>o</sup> ordine.

Solario : es = 4.89 t.

Mare. 015 x 020 x 2500  $\left[\frac{4.60+4.00}{2}\right] = 0.33 \text{ t.}$

Mur. 330 x 2.80 x 4.30 = 3.97 t.

trave : es = 1.24 t.

pppnl 030 x 040 x 2500 x 3.00 = 0.90 t

- totale. 11.33 t.

4<sup>o</sup> ordine : 13.18 t.

3<sup>o</sup> ordine : 24.51 t.

2<sup>o</sup> ordine : 35.84 t.

1<sup>o</sup> ordine : 47.17 t.

## Pilar 206

$4^{\circ} - 3^{\circ} - 2^{\circ} - 1^{\circ}$  ordime

Soleno  $4.30 \times \frac{3.80}{2} \times 650 = 5.31 \text{ t.}$

$\frac{3.80}{2} \times 4.30 \times 650 = 5.45 \text{ t.}$

Motivale  $4.30 \times 375 = 1.61 \text{ t.}$

$\frac{3.80}{2} \times 375 = 0.88 \text{ t.}$

Mypil  $0.30 \times 0.40 \times 2500 \times 3.00 = 0.9 \text{ t}$

- totale.  $14.15 \text{ t.}$

$4^{\circ}$  ordime : 14.15 t.

$3^{\circ}$  ordime : 28.30 t.

$2^{\circ}$  ordime : 42.45 t.

$1^{\circ}$  ordime : 56.60 t.

## P. lanteo L

4<sup>o</sup> - 3<sup>o</sup> - 2<sup>o</sup> - 1<sup>o</sup> ordines:

$$\text{solariis } \left[ \frac{370 + 390}{2} \right] \times 11.30 \times 650 = 10.62 \text{ t.}$$

$$\text{pyritate } 375 \times 3.80 = 1.425 \text{ t.}$$

$$\text{pyrrhol. } 0.30 \times 0.40 \times 2500 \times 3.00 = 0.90 \text{ t.}$$

$$\text{totale. } \underline{\quad\quad\quad} 12.95 \text{ t.}$$

4<sup>o</sup> ordine 13.85 t

3<sup>o</sup> ordine : 25.90 t.

2<sup>o</sup> ordine : 38.85 t.

1<sup>o</sup> ordine : 51.80 t.



P. lettera 3

4<sup>o</sup> ordine: Solaino  $\frac{3.50}{2} [1.35 + \frac{4.60}{2}] \times 650 = 4.15 \text{ t.}$

$080 \times 033 \times 2500 [\frac{1.35 + 4.60}{2}] = 2.41 \text{ t}$

banda cornice

$053 \times 020 \times 2500 [\frac{3.80}{2} + 1.35 + 0.80 + 1.5 + \frac{4.60}{2}] = 1.72 \text{ t.}$

murata attico  $330 \times 1.20 [\frac{3.80}{2} + \frac{4.60}{2} + 0.80] = 1.98 \text{ t.}$

tefale + tav.  $300 [\frac{3.80}{2} + \frac{4.60}{2} + 0.80] = 1.50 \text{ t.}$

1<sup>a</sup> p. trave  $030 \times 063 \times 2500 [\frac{4.60}{2} + 1.35] = 1.73 \text{ t.}$

pppne  $030 \times 030 \times 2500 \times 3.00 = 0.68 \text{ t.}$

3<sup>o</sup> - 2<sup>o</sup> - 1<sup>o</sup> ordine:

- totale.

14.17 t.

Solaino  $\frac{3.50}{2} [1.00 + \frac{4.60}{2}] \times 650 = 3.75 \text{ t}$

coradolo tra le murate  $040 \times 020 \times 2500 \times \frac{3.50}{2} = 0.35 \text{ t.}$

1<sup>a</sup> p. trave  $030 \times 050 \times 2500 [\frac{1.17 + 4.60}{2}] = 1.30 \text{ t.}$

mur.  $330 \times 2.80 [\frac{1.00 + 4.60}{2}] = 3.05 \text{ t.}$

$330 \times 3.10 \times \frac{3.50}{2} = 1.56 \text{ t}$

pppne  $030 \times 040 \times 2500 \times 3.00 = 0.900 \text{ t.}$

10.91

4<sup>o</sup> ordine: 14.17 t.

3<sup>o</sup> ordine: 25.08 t

2<sup>o</sup> ordine: 35.95 t.

1<sup>o</sup> ordine: 46.30 t.

Pilars 10

4<sup>e</sup> ordina:

Solaris:  $\left[ \frac{1.35 + 4.60}{2} \right] \left[ \frac{3.80 + 3.80}{2} \right] \times 650 = 9.01 \text{ t.}$

Comice  $3.80 \times 0.20 \times 0.53 \times 2500 = 1.01 \text{ t.}$

trave  $0.30 \times 0.63 \times 2500 \left[ \frac{1.35 + 4.60}{2} + \frac{3.80}{2} \right] = 3.62 \text{ t.}$

leul. alieo  $3.80 \times 0.30 \times 1.20 = 1.50 \text{ t.}$

tabelle + fog.  $3.80 \times 300 = 1.14 \text{ t.}$

ppil  $0.30 \times 0.30 \times 2500 \times 3.00 = 0.68 \text{ t.}$

- totale 15.96 t.

3<sup>e</sup> - 2<sup>e</sup> - 1<sup>e</sup> ordina

Solaris  $\frac{3.50}{2} \left[ \frac{1.00 + 4.60}{2} \right] \times 650 = 3.75 \text{ t.}$

$\frac{3.80}{2} \times \frac{4.60}{2} \times 650 = 2.84 \text{ t.}$

trave:  $\frac{3.80}{2} \times 1.20 \times 700 = 1.58 \text{ t.}$

cordolo  $0.20 \times 0.40 \times 2500 \times \frac{3.50}{2} = 0.35 \text{ t.}$

leul.  $\left[ \frac{1.00 + \frac{3.50 + 3.50}{2}}{2} \right] \times 3.00 \times 330 = 4.45 \text{ t.}$

pptravi:  $\left[ \frac{1.20 + \frac{4.60 + 3.80}{2}}{2} \right] \times 0.30 \times 0.50 \times 2500 = 2.03 \text{ t.}$

pppil  $0.30 \times 0.40 \times 2500 \times 3.00 = 0.90 \text{ t.}$

15.91 t.

4<sup>e</sup> ordina: 15.96 t.

3<sup>e</sup> ordina: 31.87 t.

2<sup>e</sup> ordina: 47.78 t.

1<sup>e</sup> ordina: 63.69 t.

# Pilar 11

Cooperatura :

$$\begin{aligned} \text{Zoleno} & 3.80 \times \frac{1.60}{2} \times 650 = 5.68 \text{ t.} \\ \text{shalzo} & 1.20 \times 3.80 \times 650 = 2.96 \text{ t.} \\ \text{loznie} & 0.20 \times 0.53 \times 2500 \times 3.80 = 1.01 \text{ t.} \\ \text{trave} & 0.30 \times 0.50 \times 2500 \times 3.80 = 1.43 \text{ t.} \\ \text{mulo attico} & 330 \times 1.20 \times 3.80 = 1.48 \text{ t.} \\ \text{tavo teg.} & 300 \times 3.80 = 1.14 \text{ t.} \\ \text{pppnl} & 0.30 \times 0.30 \times 2500 \times 3.00 = 0.68 \\ & \hline & 13.78 \text{ t.} \end{aligned}$$

$3^{\circ} - 2^{\circ} - 1^{\circ}$  ordine :

$$\begin{aligned} \text{Zoleno e.s.} & 5.68 \text{ t.} \\ \text{shalzo} & 1.20 \times 3.80 \times 700 = 3.13 \text{ t.} \\ \text{trave e.s.} & = 1.43 \text{ t.} \\ \text{mur.} & 2.80 \times 3.80 \times 330 = 3.51 \text{ t.} \\ \text{pppnl} & 0.30 \times 0.40 \times 2500 \times 3.00 = 0.90 \text{ t.} \\ & \hline & 14.71 \text{ t.} \end{aligned}$$

$4^{\circ}$  ordine : 13.78 t.

$3^{\circ}$  ordine : 28.49 t.

$2^{\circ}$  ordine : 43.20 t.

$1^{\circ}$  ordine : 57.91 t.

P. l'entree 12

cop. seals :

$$\begin{aligned} \text{solario} & \left[ \frac{4.60}{2} + 4.25 \right] \times \frac{3.60}{2} \times 600 = 3.84 \text{ t.} \\ \text{pp. trave} & 0.30 \times 0.50 \times 2500 \left[ \frac{4.60}{2} + 1.40 \right] = 1.38 \text{ t.} \\ \text{cornice} & 0.20 \times 0.53 \times 2500 \left[ \frac{4.60}{2} + 1.25 + \frac{3.60}{2} \right] = 1.42 \text{ t.} \\ \text{pp. pml} & 0.30 \times 0.30 \times 2500 \times 3.20 = 0.50 \text{ t.} \\ & \text{- totale } \underline{7.14 \text{ t.}} \end{aligned}$$

4<sup>o</sup> ordine :

$$\begin{aligned} \text{solario} & \left[ \frac{4.60}{2} + 1.20 \right] \times \frac{3.80}{2} \times 650 = 4.45 \text{ t.} \\ \text{cornice} & 0.20 \times 0.53 \times 2500 \times \left[ \frac{3.80 + 2.90}{2} \right] = 0.83 \text{ t.} \\ \text{tav. + teg.} & 300 \left[ \frac{3.80 + 2.90}{2} \right] = 1.01 \text{ t.} \\ \text{mur. attico} & 1.20 \times \frac{3.80}{2} \times 330 = 0.75 \text{ t.} \\ \text{mur. trave} & 2.50 \times 330 \times \left[ \frac{2.60}{2} + 0.90 + \frac{4.30}{2} \right] = 3.53 \text{ t.} \\ \text{pp. trave} & 375 \left[ \frac{3.80}{2} + \frac{2.90}{2} + 0.90 + \frac{4.30}{2} \right] = 2.40 \text{ t.} \\ \text{sol. seals} & 1000 \left[ \frac{4.60}{2} + 0.65 \right] \times \frac{2.60}{2} = 3.84 \text{ t.} \\ \text{trave a f.} & 0.20 \times 0.50 \times \left[ \frac{4.30}{2} + 0.95 \right] \times 2500 = 0.78 \text{ t.} \\ \text{pp. pml} & 0.30 \times 0.30 \times 2500 \times 3.00 = 0.68 \text{ t.} \\ & \underline{18.33 \text{ t.}} \end{aligned}$$

3<sup>o</sup> - 2<sup>o</sup> - 1<sup>o</sup> ordine :

$$\begin{aligned} \text{solario} & \frac{4.60}{2} \times \frac{3.80}{2} \times 650 = 2.84 \text{ t.} \\ \text{mur.} & 330 \times \frac{3.80}{2} \times 2.80 = 1.76 \text{ t.} \\ & 330 \times 2.80 \times \left[ \frac{4.30 + 0.65 + 2.60}{2} \right] = 3.78 \text{ t.} \\ \text{pp. trave} & 375 \left[ \frac{3.80}{2} + 0.95 + \frac{4.30}{2} \right] = 1.88 \text{ t.} \\ \text{sol. seals} & : \text{e.s.} = 3.84 \text{ t.} \\ \text{trave a fin} & 0.20 \times 0.50 \left[ \frac{4.30}{2} + 0.95 \right] \times 2500 = 0.78 \text{ t.} \\ \text{pp. pml} & 0.30 \times 0.30 \times 2500 \times 3.00 = 0.50 \text{ t.} \\ & \underline{15.78 \text{ t.}} \end{aligned}$$

5<sup>o</sup> ordine : 7.14 t.

4<sup>o</sup> ordine : 25.53 t.

3<sup>o</sup> ordine : 41.31 t.

2<sup>o</sup> ordine : 57.03 t.

1<sup>o</sup> ordine : 72.87 t.

## Calcolo fondazioni -

Travate 1-2-3-4-4' ecc.:

$$P_1 = 49.35 \text{ t} \quad P_2 = 63.30 \text{ t} \quad P_3 = 56.38 \text{ t}$$

$$P_4 = 47.17 \text{ t}$$

$$\Sigma P = 216.20 \text{ t}$$

Caso dist. o reazione terreno per i caschi dei pilastri:

$$p = \frac{\Sigma P}{l/2} = \frac{216.20}{13.00} = 16.6 \text{ t/m}$$

Caso distribuito dovuto alle mur.  $p_t$  e al peso proprio della fond.:  $5.00 \text{ t/m}$  (v. in prec.)

$$p_{tot} = 21.6 \text{ t/m}$$

$$\sigma_{max} = 1.35 \text{ kg/cm} \quad b = 1.60$$

Trave 1-2

$$M = \frac{3.80^2}{12} \times 16.6 = 21.1 \text{ tm}$$

red.  $40 \times 150$

$$r_e = 33 \text{ kg/cm}$$

$$r_f = 1400 \text{ kg/cm}$$

$$A_f = 11 \text{ eq. } 6\phi 16$$

$$T = 1.85 \times 16.6 = 30.8 \text{ t}$$

$$\sigma_{max} = \frac{30.800}{25 \times 40 \times 145} = 5.3 \text{ kg/cm} < 6 \text{ kg/cm}$$

Trave 2-3; 3-4; 4-4'

$$M = \frac{3.60^2}{12} \times 16.6 = 18.1 \text{ tm}$$

red.  $40 \times 150$

$$r_e = 31 \text{ kg/cm}$$

$$r_f = 1400 \text{ kg/cm}$$

$$A_f = 9.3 \text{ eq}$$

$$\sigma_{max} < 6 \text{ kg/cm}$$

Suelo :  $\rho = 13500 \text{ kg/m}^3$

$$u = \frac{0.60^2}{2} \times 13500 = 2430 \text{ kg/m}^2 \text{ / seg}^2$$

$b = 1 \text{ m}$        $H = 40 \text{ cm}$

$r_e = 30 \text{ kg/seg}$

$r_f = 1400 \text{ kg/seg}$

$A_f = 4.75 \text{ seg/m}^2$

Trade 5-6-7-8-8'

$P_5 = 47.17 \text{ t}$

$P_6 = 56.60 \text{ t}$

$P_7 = 51.80 \text{ t}$

$P_8 = 63.66 \text{ t}$

$\Sigma P = 225 \text{ t}$

$p = \frac{225}{13.00} = 17.3 \text{ t/m}^2$

pero propio fund.

$2.7 \text{ t/m}^2$

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$P_{tot} = 20 \text{ t/m}^2$

$r_t = 1.25 \text{ kg/seg}$

$b = 1.60 \text{ cm}$

Trade 5-6

$$u = \frac{3.80^2}{12} \times 17.3 = 32 \text{ t/m}^2$$

ser.  $40 \times 150$

$r_e = 34 \text{ kg/seg}$

$r_f = 1400 \text{ kg/seg}$

$A_f = 11.5 \text{ seg}$

$\Sigma u_x < 6 \text{ kg/seg}$

Trade 6-7; 7-8

$$u = \frac{3.80^2}{12} \times 17.3 = 21 \text{ t/m}^2$$

ser.  $40 \times 150$

$r_e = 33 \text{ kg/seg}$

$r_f = 1400 \text{ kg/seg}$

$A_f = 11 \text{ seg}$

$\Sigma u_x < 6 \text{ kg/seg}$

Trade 8-8'

luc. 310

$$M = \frac{3.10^2}{12} \times 17.3 = 14.7 \text{ t.m}$$

ser. 140 x 150

$$r_e < 30 \text{ g/h}$$

$$r_f = 1400 \text{ g/h}$$

$$A_f = 7.5 \text{ eq.}$$

Quota: armatura come in precedenti.

Travate 8-10-11-12-12' ecc.

$$P_8 = 46.30 \text{ t.}$$

$$P_{10} = 63.63 \text{ t.}$$

$$P_{11} = 57.91 \text{ t.}$$

$$P_{12} = 72.87 \text{ t.}$$

$$\Sigma P = 241.37 \text{ t.}$$

$$k = 18.7 \text{ t/m.}$$

Carico dovuto al pp. fond. 2.7 t/m

$$p_t = 21.4 \text{ t/m.}$$

$$r_f = 1.33 \text{ g/h}$$

$$B = 160 \text{ cm}$$

Trade 8-10

$$M = \frac{3.50^2}{12} \times 18.7 = 23.5 \text{ t.m}$$

ser. 140 x 150

$$r_e = 35 \text{ g/h}$$

$$r_f = 1400 \text{ g/h}$$

$$A_f = 12.5 \text{ eq.}$$

$$r_{max} < 6 \text{ g/h}$$

Trade 10-11; 11-12

$$M = \frac{3.70^2}{12} \times 18.7 = 20.5 \text{ t.m}$$

ser. 140 x 150

$$r_e = 33 \text{ g/h}$$

$$r_f = 1400 \text{ g/h}$$

$$A_f = 10.8 \text{ eq.}$$

$$r_{max} < 6 \text{ g/h}$$

Trade 12-12'

$$l = 310$$

$$ll = \frac{3.10^2}{12} \times 18.7 = 15.4 \text{ t.u.}$$

ser. 40 x 150

$$r_e < 30 \text{ g/h}$$

$$r_f = 1400 \text{ g/h}$$

$$A_f = 7.2 \text{ eq}$$

$$Z_{us} \times < 6 \text{ g/h}$$

Goals: assuming same in procedure

Trade 1-5-3

$$p = 10 \text{ t. fuel.}$$

Trade 1-5

$$l = 400$$

$$ll = \frac{4.00^2}{12} \times 10 = 13.3 \text{ t.u.}$$

ser. 30 x 150

$$r_e = 30 \text{ g/h}$$

$$r_f = 1400 \text{ g/h}$$

$$A_f = 6.8 \text{ eq}$$

$$Z_{us} \times < 6 \text{ g/h}$$

Trade 5-3

$$ll = \frac{4.00^2}{12} \times 10 = 16.2 \text{ t.u.}$$

ser. 30 x 150

$$r_e = 30 \text{ g/h}$$

$$r_f = 1400 \text{ g/h}$$

$$A_f = 8.5 \text{ eq}$$

$$Z_{us} \times < 6 \text{ g/h}$$

Goals

$$ll = \frac{0.20^2}{2} \times 10 = 2000 \text{ g/h/mil}$$

$$b = 1 \text{ t.u.}$$

$$H = 40 \text{ eq}$$

$$r_e < 30 \text{ g/h}$$

$$r_f = 1400 \text{ g/h}$$

$$A_f = 4.55 \text{ eq/mil}$$

Trade 8-12

$$p = 17 \text{ t. / m.}$$

$$u = \frac{4 \cdot 60^2}{12} \times 17 = 30 \text{ t. m}$$

$$\text{bed. } 40 \times 150$$

$$r_e = 41 \text{ kg/m}$$

$$r_f = 1400 \text{ kg/s}$$

$$A_f = 16 \text{ eq}$$

$$T = 17 \times 230 = 34.51 \text{ t.}$$

$$Z_{\text{max}} = \frac{34510}{0.5 \times 40 \times 145} = 6.6 \text{ kg/m}$$

$$S = \frac{6.6 \times 230 \times 40}{2} = 30.36 \text{ t.}$$

$$\text{st. } \phi p / 20$$

$$S_{\text{statte}} = 11 \times 1400 = 15.400 \text{ t.}$$

$$A_{fp} = \frac{15.18}{\sqrt{2} \times 1400} = 7.5 \text{ eq.}$$

Quest

$$u = \frac{2.60}{12} \times 10 = 2650 \text{ kg/m}$$

$$b = 1 \text{ m}$$

$$h = 50$$

$$r_e = 33 \text{ kg/m}$$

$$r_f = 1400 \text{ kg/m}$$

$$A_f = 9 \text{ eq. / ogni m. di largh.}$$

$$Z_{\text{max}} < 6 \text{ kg/m}$$

Calcolo delle travi al 1° - 2° - 3° ordine.

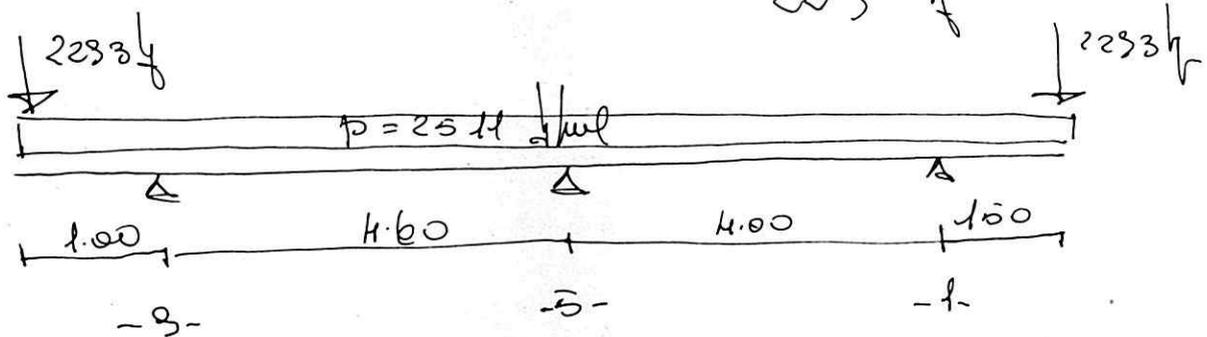
Trave 1-5-6

Solaro  $\frac{3.50}{2} \times 650 = 1137 \text{ kg/m}$   
 ipotese  $= 375 \text{ kg/m}$   
 mur.  $330 \times 2.80 = 924 \text{ u}$   
 mare.  $0.15 \times 0.20 \times 2500 = 75 \text{ u}$   
 tot.  $2511 \text{ kg/m}$

Carico concentrato sulle murate:

cordole  $\frac{3.50}{2} \times 0.20 \times 0.10 \times 2500 = 350 \text{ kg}$

mur.  $3.10 \times \frac{3.80}{2} \times 330 = 1943 \text{ kg}$   
 $2293 \text{ kg}$



Car. el. e geom.  $W_{5-3} = \frac{1}{4.60} = 0.218$

$W_{5-1} = \frac{1}{4.00} = 0.25$

$K_{5-3} = \frac{0.218}{0.468} = 0.465$

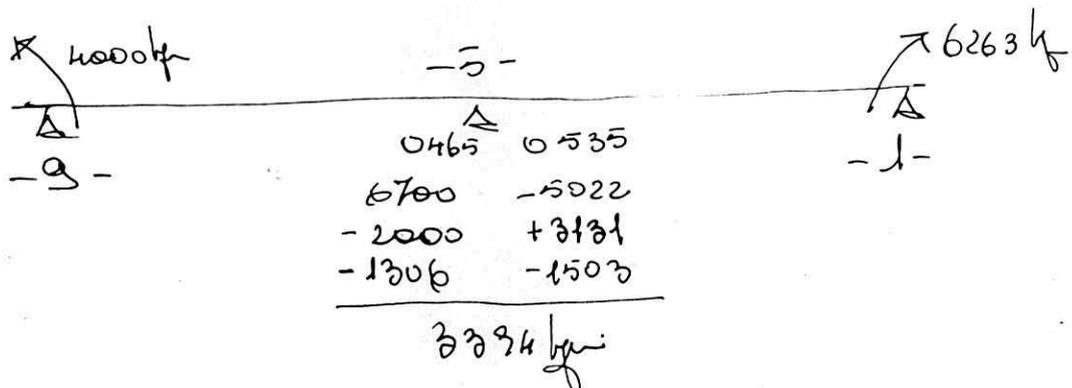
$\mu_3 = 2293 + \frac{2511}{2} = 4000 \text{ kg}$

$K_{5-1} = 0.535$

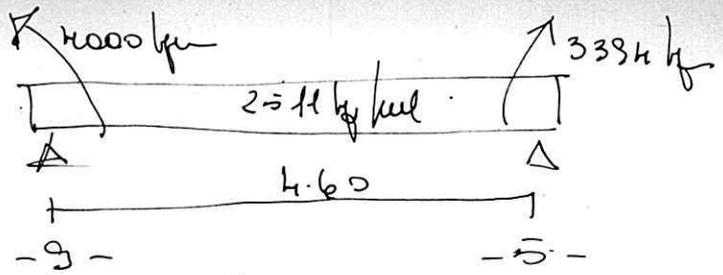
$\mu_1 = 2293 \times 1.50 + \frac{1.50^2}{2} \times 2511 = 3439 + 2824 = 6263 \text{ kg}$

$\mu_{5-3} = \frac{1}{8} \times 4.60^2 \times 2511 = 6700 \text{ kg}$

$\mu_{5-1} = \frac{1}{8} \times 4.00^2 \times 2511 = 5022 \text{ kg}$



Trade 3-5



$$T_3'' = 2511 \times 4.60 + \frac{4000 - 3384}{4.60} = 5807 \text{ lb}$$

$$T_3' = 5775 - 132 = 5643 \text{ lb} \quad \text{Eux} = \frac{5807}{0.09 \times 30 \times 12} < 6 \text{ lb/in}$$

$$M_{3-5} = \frac{5807^2}{5022} - 4000 = 2950 \text{ lb-ft}$$

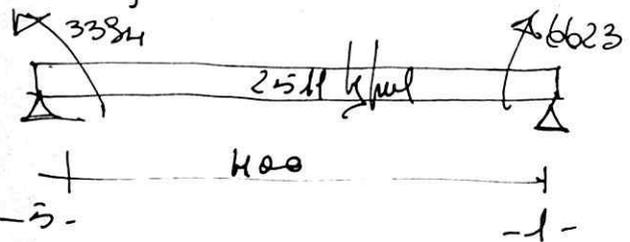
$M_3 = 4000 \text{ lb-ft}$     ser. 30x50     $r_c = 53 \text{ in}$      $r_f = 1400 \text{ lb-ft}$

$$A_f = 6.45 \text{ sq.}$$

$M_{3-5} = 2950 \text{ lb-ft}$     ser. 30x50     $r_c = 45 \text{ in}$      $r_f = 1400 \text{ lb-ft}$

$$A_f = 4.75 \text{ sq.}$$

Trade 5-1



$$T_5'' = 2511 \times \frac{4.00}{2} - \frac{6623 - 3384}{4.00}$$

$$= 5022 - 800 = 4222 \text{ lb}$$

$$T_5' = 5822 \text{ lb} \quad \text{Eux} = \frac{5822}{0.09 \times 30 \times 12} < 6 \text{ lb/in}$$

$M_5 = 3384 \text{ lb-ft}$

ser. 30x50

$$r_c = 48 \text{ in}$$

$$r_f = 1400 \text{ lb-ft}$$

$$A_f = 5.4 \text{ sq.}$$

$M_{5-1} = 2950 \text{ lb-ft}$

$$r_c = 45 \text{ in}$$

$$A_f = 4.75 \text{ sq.}$$

$$r_f = 1400 \text{ lb-ft}$$

$M_1 = 6623 \text{ lb-ft}$

$$r_c = 68 \text{ in}$$

$$r_f = 1200 \text{ lb-ft}$$

$$A_f = 13 \text{ sq.}$$

Trade 2-6-10

Parchi sulle lussure : come l. 5-8.

tratto 10-6 :  $\frac{3.50}{6.2} \times 650 = 1137 \text{ kg/ha}$   
 pp trade =  $375 \text{ €}$

coeff. di ripart. : come trade free. rimane 1512 kg/ha

$$\mu_{6-2} = \frac{4.00^2}{8} \times 1512 = 3024 \text{ kg}$$

$$\mu_{6-10} = \frac{4.60^2}{8} \times 1512 = 4000 \text{ kg}$$

x 4000 kg		x 6263 kg
-10-	0465	-6-
	3024	-2-
	-2000	
	-73	
	0535	
	-4000	
	3131	
	-83	
	952 kg	

Trade 10-6

-  $\mu_{10} = 4000 \text{ kg}$  res. 30 x 50  $r_e = 53$   $r_f = 1400 \text{ kg/ha}$   
 $A_f = 6.45 \text{ €}$

-  $\mu_{10-6} = \frac{4.60}{14} \times 1512 = 2300 \text{ kg}$  res. 30 x 50  
 $r_e = 33 \text{ kg/ha}$   $r_f = 1400 \text{ kg/ha}$   
 $A_f = 3.7 \text{ €}$   
 $\text{Energia} < 6 \text{ kg/ha}$

Trade 6-2

$\mu_6 = 6263 \text{ kg}$  res. 30 x 50  
 $r_e = 68 \text{ kg/ha}$   $r_f = 1200 \text{ kg/ha}$   
 $A_f = 13 \text{ €}$

$\mu_{6-2} = \frac{1}{14} \times 4.00^2 \times 1512 = 1730 \text{ kg}$   
 $r_e = 33 \text{ kg/ha}$   $r_f = 1400 \text{ kg/ha}$   
 $\text{Energia} < 6 \text{ kg/ha}$   $A_f = 2.7 \text{ €}$

Trade 2-3-H-H' ecc

shaleso  $1.70 \times 700 = 1190 \text{ kg}$   
 pps trave  $= 375 \text{ u}$   
 leus.  $2.80 \times 330 = 924 \text{ u}$   
 solario  $\frac{3.70}{2} \times 650 = 1202 \text{ u}$   
 - totale  $3691 \text{ kg}$

carico colle. messagio H-H'  
 leus.  $600 \times \left[ \frac{3.70}{2} + 1.70 \right] = 2130 \text{ kg}$   
 cord.  $0.40 \times 0.20 \times 2500 \left[ \frac{3.70}{2} + 1.70 \right] = 1710 \text{ kg}$   
2840 kg

$l = 360$

$w_{3-2} = 0.75$   
 $w_{3-H} = 1.00$   
 $w_{H-H'} = 0.5$

$k_{3-2} = \frac{0.75}{1.75} = 0.43$

$k_{3-H} = 1 - k_{3-2} = 0.57$

$k_{H-3} = \frac{1}{1.5} = 0.67$

$k_{H-H'} = \frac{0.5}{1.5} = 0.33$

$\mu_{3-2} = \frac{1}{8} 3.60^2 \times 3691 = 5973 \text{ kg}$

$\mu_{3-H} = \mu_{H-3} = \frac{1}{12} 3.60^2 \times 3691 = 3986 \text{ kg}$

$\mu_{H-H'} = \frac{1}{12} 3.60^2 \times 3691 + \frac{2840}{8} \times 360 = 4110 \text{ kg}$

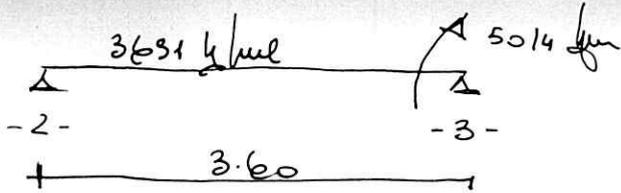
	-12
-10	22
-99	-133
	232
-856	-1137
5973	-3986

	4
-6	2
43	21
-67	228
464	-4110
-568	
3986	

$\Delta$   
 -3-  
 $0.43 \Delta$   
 -3-  
 $5044 \text{ kg}$

$0.67 \Delta$   
 -4-  
 $3859 \text{ kg}$

Trade 2-3



$$T_2 = 3691 \times \frac{3.60}{2} - \frac{5014}{3.60} = 5251 \text{ kg}$$

$$T_3^1 = 6643.8 + 1332 = 8035 \text{ kg} \quad \sum_{\text{avg}} x = \frac{8035}{0.5 \times 30 \times 180} = 6.2 \text{ kg/eq}$$

$$M_{2-3} = \frac{5251^2}{2 \times 3691} = 3700 \text{ kg}$$

$$S = \frac{6.2 \times 30 \times 180}{2} = 16.8 \text{ t.}$$

8 t of 8/20

$$S_{\text{at}} = 3 \times 1400 \times 2 \times 0.5 = 11.7 \text{ t.}$$

$$A_{\text{fp}} = \frac{8 \times 1400}{\sqrt{2} \times 1400} = 4.2 \text{ eq}$$

$$M_{2-3} = 3700 \text{ kg}$$

ser. 20 x 50  $r_c = 51 \text{ kg/eq}$   $r_f = 1400 \text{ kg/eq}$

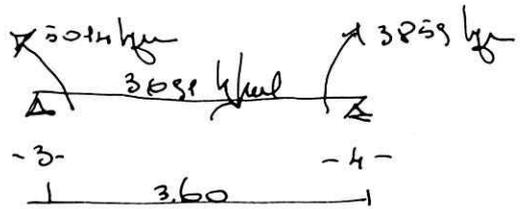
$$A_f = 6 \text{ eq}$$

$$M_3 = 5014 \text{ kg}$$

ser. 20 x 50

$$r_c = 62 \text{ kg/eq} \quad r_f = 1400 \text{ kg/eq} \quad A_f = 8.3 \text{ eq}$$

Trade 3-4



$$T_3^{\text{II}} = 3691 \times \frac{3.60}{2} + \frac{5014 - 3859}{3.60} = 6643 + 320 = 6960 \text{ kg}$$

$$T_4^1 = 6323 \text{ kg}$$

$$\sum_{\text{avg}} x = \frac{6960}{\sqrt{2} \times 1400} < 6 \text{ kg/eq.}$$

$$M_{3-4} = \frac{6960^2}{2 \times 3691} - 5014 = 1550 \text{ kg}$$

annulus

$$M_{3-4} = \frac{1}{14} 3691 \times 3.60^2 = 31400 \text{ kg}$$

$$M_{3-4} = 31400 \text{ kg}$$

ser. 20 x 50

$$r_c = 49 \text{ kg/eq}$$

$$r_f = 1400 \text{ kg/eq}$$

$$A_f = 5.5 \text{ eq.}$$

$$M_4 = 3859 \text{ kg}$$

ser. 20 x 60

$$r_c = 53$$

$$r_f = 1400$$

$$A_f = 6.3 \text{ eq.}$$

Tarea 6.7.8-81

Solaris  $(\frac{3.70 + 4.50}{2}) \times 650 = 2600 \text{ kg/ha}$   
 pop trave  $= 275 \text{ u}$   
 total  $2375 \text{ kg/ha}$  } 6.7.8

Solaris  $3.70 \times 650/2 = 1200 \text{ kg/ha}$   
 sur  $330 \times 2.80 = 924 \text{ u}$   
 pp.  $0.25 \times 0.50 \times 2500 = 312 \text{ u}$   
 total  $2436 \text{ u}$

carne com.  $600 \times 3.70/2 = 1110 \text{ kg}$

$w_{7.6} = \frac{075}{320} = 0192$      $w_{7.8} = w_{87} = \frac{1}{375} = 027$      $w_{88'} = 05 \frac{1}{2.30} \frac{2.5}{3} = 0143$

$K_{7.6} = \frac{0192}{0192 + 0270} = 0415$      $K_{7.8} = 0585$

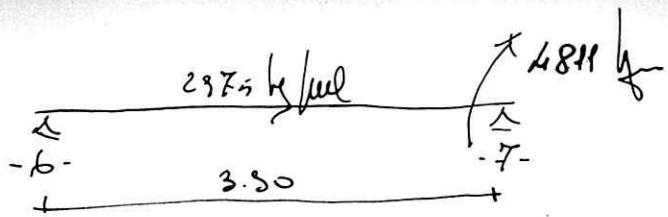
$K_{8.7} = \frac{0270}{0270 + 0143} = 065$      $K_{88'} = 035$

$\mu_{7.6} = \frac{1}{8} \cdot 330^2 \times 2375 = 5650 \text{ kg}$      $\mu_{7.8} = \mu_{87} = \frac{1}{12} \cdot 3.70^2 \times 2375 = 3400 \text{ kg}$

$\mu_{88'} = \frac{1}{12} \cdot 2.50^2 \times 2436 + \frac{1}{8} \cdot 2.30 \times 1110 = 1700 + 410 = 2110 \text{ kg}$

	$\begin{array}{r} 12 \\ -21 \\ \hline 85 \\ -933 \\ \hline 5650 \end{array}$	$\begin{array}{r} 120 \\ -205 \\ \hline -1317 \\ -3400 \end{array}$	$\begin{array}{r} -4 \\ 6 \\ \hline -12 \\ 68 \\ \hline -111 \\ -658 \\ \hline 3400 \end{array}$	$\begin{array}{r} -2 \\ -18 \\ \hline -221 \\ -2110 \end{array}$	
-6-	0415	0585	065	035	
	-7-		-8-		
	484 kg		2351 kg		

Trade 6.7



$$T_b = \frac{2975 \times 3.50}{2} - \frac{4811}{3.50} = 5800 - 1260 = 4540 \text{ kg}$$

$$T_f' = 7060 \text{ kg}$$

$$\Sigma_{ex} x = \frac{7060}{0.9 \times 30 \times 48} < 6 \text{ kg/m}$$

$$M_{6.7} = \frac{4540^2}{5950} = 3460 \text{ kg}$$

$$M_{6.7} = 3460 \text{ kg}$$

ser. 30 x 50

$$r_c = 50 \text{ kg/m} \quad r_f = 1400 \text{ kg/m}$$

$$A_f = 3.5 \text{ eq.}$$

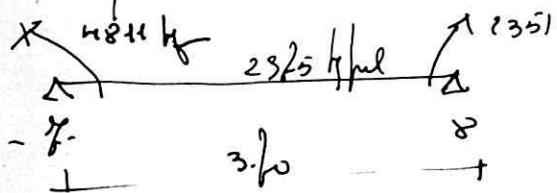
$$M_f = 4811 \text{ kg}$$

ser. 30 x 50

$$r_c = 60 \text{ kg/m} \quad r_f = 1400 \text{ kg/m}$$

$$A_f = 6.85 \text{ eq.}$$

Trade 7.8



$$\Sigma_{ex} x < 6 \text{ kg/m}$$

$$M_{7.8} = 2950 \text{ kg}$$

ser. 30 x 50

$$r_c = 45 \text{ kg/m}$$

$$r_f = 1400 \text{ kg/m}$$

$$A_f = 4.75 \text{ eq.}$$

$$M_f = 2351 \text{ kg}$$

ser. 30 x 50

$$r_c = 40 \text{ kg/m}$$

$$r_f = 1400 \text{ kg/m}$$

$$A_f = 3.75 \text{ eq.}$$

Trade 8.8'

$$M_{8.8'} = 1700 \times 1.5 + 410 \times 2 - 2351 = 1013 \text{ kg}$$

ser. 25 x 50

$$r_c < 30 \text{ kg/m}$$

$$r_f = 1400$$

$$A_f = 1.7 \text{ eq.}$$

$$\Sigma_{ex} x < 6 \text{ kg/m}$$

Trade 10-11-12

rollers  $1.30 \times \frac{650}{2} = 1357 \text{ kg/hel}$   
 lwr.  $280 \times 330 = 924 \text{ u}$   
 bale  $120 \times 700 = 840 \text{ u}$   
 prop trade  $0.30 \times 0.50 \times 2500 = 375 \text{ u}$   
 Total: 3536 kg/hel

$$M_{10-11} = M_{11-12} = \frac{1}{14} 3.80^2 \times 3536 = 3600 \text{ kg}$$

$$M_{11} = \frac{1}{8} 3.80^2 \times 3536 = 6350 \text{ kg}$$

$$T'_{11} = T''_{11} = \frac{5}{8} 3.80 \times 3536 = 8420 \text{ kg}$$

$M_{10-11} = 3600 \text{ kg}$       ser.  $30 \times 150$   
 $r_c = 50 \text{ kg/h}$        $r_f = 1400 \text{ kg/h}$   
 $A_f = 5.75 \text{ eq}$

$M_{11} = 6350 \text{ kg}$       ser.  $30 \times 50$   
 $r_c = 70 \text{ kg/h}$        $r_f = 1400 \text{ kg/h}$   
 $A_f = 10.5 \text{ eq}$

$$E_{ser x} = \frac{8420}{0.3 \times 30 \times 42} = 6.5 \text{ kg/h}$$

$$S = \frac{6.5 \times 170 \times 3}{2} = 182 \text{ t} \quad \text{H } \phi 8 / 20$$

$$S_{st} = 3 \times 2 \times 0.5 \times 1400 = 11.6 \text{ t}$$

$$A_{fp} = \frac{18.100/2}{\sqrt{2} \times 1400} = 4.7 \text{ eq}$$

izadi al piano di copertura.

Trave 2-3-4-4' ecc.

solario	$370/2 \times 650 = 1200$	kg/ml
mur. attico	$1.20 \times 330 = 396$	u
tav + teg.	$= 300$	u
col. 020 x 0.53 x 2500	$= 265$	u
pp. trave 030 x 0.50 x 2500	$= 375$	u
balc. 1.70 x 650	$= 1105$	u
totale	$3641$	u

I carichi sono i medesimi che agli ordini precedenti. per cui annuniamo le medesime armature

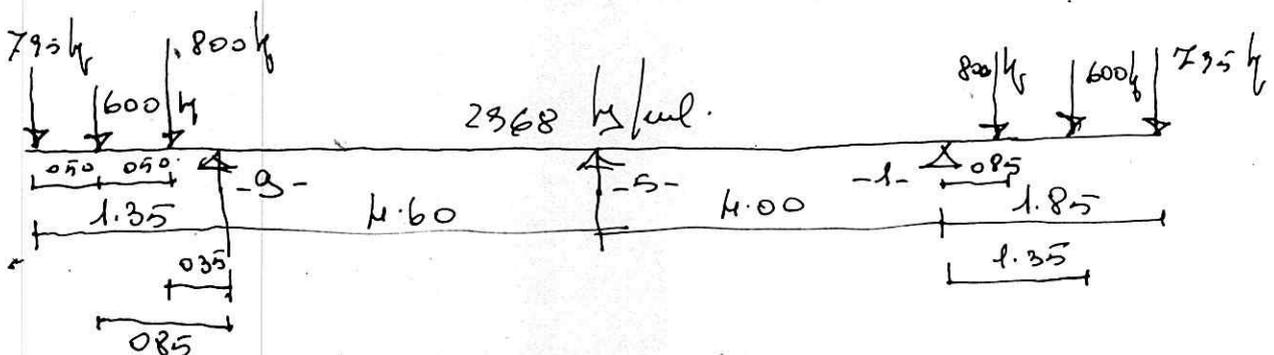
Trave 6-7-8 - Trave 10-11-12 : ideati come sopra -

Trave 1-5-9

Solario	$3.50 \times 650 = 1137$	kg/ml
Muro attico	$1.20 \times 330 = 396$	u
Colonne	$020 \times 0.53 \times 2500 = 265$	u
pp. trave	$030 \times 0.50 \times 2500 = 375$	u
Sport.	$060 \times 0.33 \times 2500 = 495$	u
tav + teg.	$= 300$	u
	$2968$	kg/ml

carichi come sulle mensole.

tavellonato  $3.00 \times 2.00 = 600$  kg  
 colonne  $020 \times 0.53 \times 2500 [2.10 + 0.95] = 495$  kg  
 mur.  $1.20 \times 330 \times 2.00 = 800$  kg.

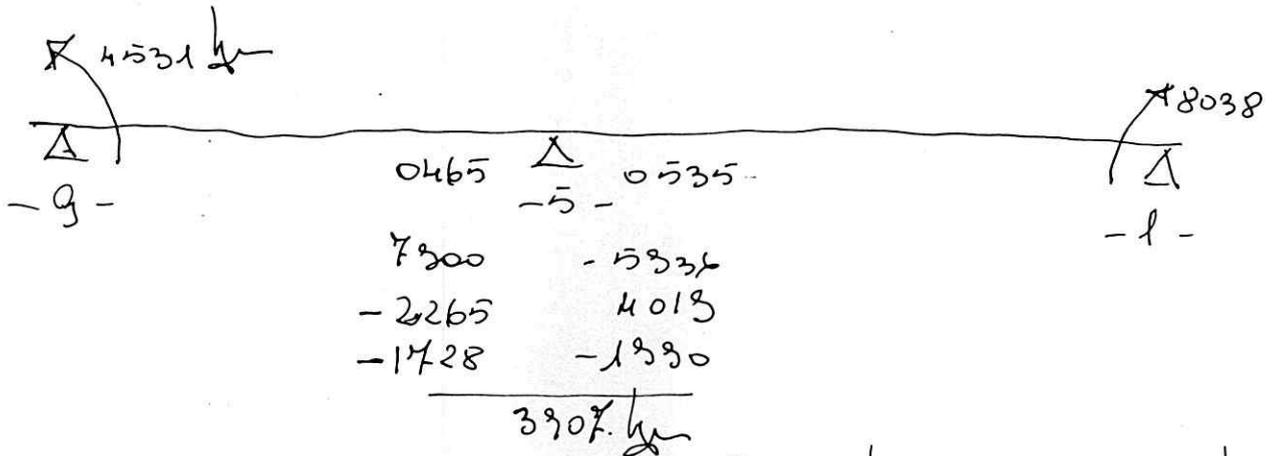


$$\mu_3 = 795 \times 1.35 + 600 \times 0.85 + 800 \times 0.35 + \frac{1.35^2}{2} \times 2968 = 4531 \text{ kg}$$

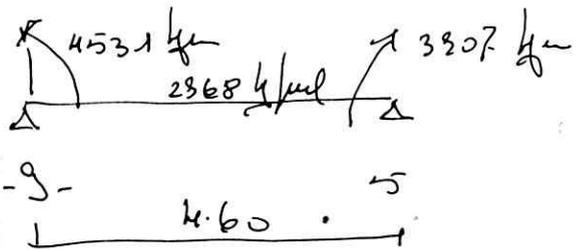
$$\mu_1 = 795 \times 1.85 + 600 \times 1.35 + 800 \times 0.85 + \frac{1.85^2}{2} \times 2968 = 8038 \text{ kg}$$

$$\mu_{3-3} = \frac{1}{8} \times 4.60^2 \times 2968 = 7200 \text{ kg}$$

$$\mu_{5-1} = \frac{1}{8} \times 4.00^2 \times 2968 = 5936 \text{ kg}$$



Trade 3-3



$$\bar{T}_3'' = 2968 \times 2.30 + \frac{4531 - 3907}{4.60} = 6861 \text{ kg}$$

$$\bar{T}_5' = 6826 - 135 = 6691 \text{ kg}$$

center 1.6 kg/m

$$\mu_{3-5} = \frac{1}{16} \times 4.60^2 \times 2968 = 3920 \text{ kg}$$

$$\mu_3 = 4531 \text{ kg}$$

ser. 20 x 50

$r_c = 58$   $r_f = 1400$

$A_f = 7.35 \text{ eq}$

$$\mu_{3-5} = 3920 \text{ kg}$$

ser. 30 x 50

$r_c = 53$   $r_f = 1400$

$A_f = 6.35 \text{ eq}$

$$- \mu_{5} = 3907 \text{ kg}$$

structure e.s

Trade 5-1

3907  
Δ

8038  
Δ

$T_{max} < 6 \text{ h/a}$

$$M_1 = 8038 \text{ kg}$$

$$T_e = 70 \text{ h/a}$$

$$A_{1f} = 10.2 \text{ eq}$$

$$A_{2f} = \frac{1790}{45 \times 14} = 2.8 \text{ eq}$$

ser. 30 x 50

$$T_f = 1420 \text{ h/a}$$

$$T'_f = 420 \text{ h/a}$$

$$M_0 = 6250 \text{ kg}$$

$$A'_f = \frac{1790}{45 \times 4.2} = 9.6 \text{ eq}$$

