

GESTIONE GASE LAVORATORI (legge 14.2.1963 n° 60)		INTERVENTO n° 82		STAZIONE APPALTANTE: I. A. C. P.	
RIONE COMMENDA - BRINDISI - EDILIZIA SOVVENZIONATA AREA PALAZZINA D				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. C. P.		controllo	visto:	

Palazzina D - Colonnade

Alcalini di carico dei pilastri

Pilastro 1 :

4° ordine :

Solai	$5.00/2 \times 650 \times 3.80/2 =$	3087 kg
balcone	$1.20 \times 3.80/2 \times 650 =$	1482 kg
colme	$(\frac{5.30}{2} + 1.35) 060 \times 650 =$	1560 kg
bordo colme	$0.53 \times 0.20 \times 2500 (\frac{3.80}{2} + 0.95) =$	755 kg
	$(\frac{5.30}{2} + 1.35) 0.53 \times 0.20 \times 2500 =$	1060 kg
muro attico	$(\frac{3.80}{2} + \frac{5.30}{2}) 1.20 \times 330 =$	1801 kg
lav. + tegole	$300 (\frac{3.80}{2} + 1.35 + 1.20) =$	1835 kg
pp/trave	$0.30 \times 0.50 \times 2500 (\frac{5.00}{2} + \frac{3.50}{2}) =$	1593 kg
pp/ml	$0.30 \times 0.30 \times 2500 \times 3.30 =$	740 kg
	<u>-totale.</u>	<u>13413 kg</u>

3-2-1 ordine.

Solai	$5.00/2 \times 650 \times 3.80/2 =$	3087 kg
balcone	$1.20 \times 7.00 \times 3.80/2 =$	1596 kg
muratura	$330 \times 3.80 \times 3.50/2 =$	1617 kg
	$330 \times (\frac{5.00}{2} + 1.20) =$	1221 kg
pp/trave	$0.30 \times 0.50 \times 2500 \times (\frac{3.50}{2} + \frac{5.00}{2} + 1.37) =$	2107 kg
pp/ml	$0.30 \times 0.40 \times 2500 \times 3.30 =$	990 kg
marcapiano	$(\frac{5.30}{2} + 1.35) 020 \times 0.15 \times 2500 =$	300 kg
	<u>-totale.</u>	<u>10918</u>

4° ordine :	P = 13413 kg
3° " :	P = 24331 kg
2° ordine :	P = 35248 kg
1° ordine :	P = 46167 kg

Pilastro 24^o ordine.

$$\text{Solai} (4.70 + 3.80) / 2 \times 5.00 / 2 \times 650 = 6906 \text{ kg}$$

$$(4.70 + 3.80) / 2 \times 1.20 \times 650 = 3315 \text{ kg}$$

$$\text{cornice} (4.70 + 3.80) / 2 \times 0.53 \times 0.20 \times 2500 = 1126 \text{ kg}$$

$$\text{muro attico} (4.70 + 3.80) / 2 \times 1.20 \times 330 = 1683 \text{ kg}$$

$$\text{tavella + tej.} (4.70 + 3.80) / 2 \times 300 = 1275 \text{ kg}$$

$$\text{pp/trave} 0.30 \times 0.50 \times 2500 (4.40 + 3.50) / 2 = 1481 \text{ kg}$$

$$\text{pp/pil} 0.30 \times 0.30 \times 2500 \times 3.30 = 740 \text{ kg}$$

$$\text{- totale. } 16.526 \text{ kg}$$

3.7-1 ordine.

$$\text{Solai} (4.70 + 3.80) / 2 \times 5.00 / 2 \times 650 = 6906 \text{ kg}$$

$$\text{talc.} (4.70 + 3.80) / 2 \times 1.20 \times 700 = 3570 \text{ kg}$$

$$\text{Muret.} 2.80 \times 330 (4.40 + 3.50) / 2 = 3649 \text{ kg}$$

$$\text{pp/trave} 0.30 \times 0.50 \times 2500 (4.40 + 3.50) / 2 = 1481 \text{ kg}$$

$$\text{pp/pil.} 0.30 \times 0.40 \times 2500 \times 3.30 = 990 \text{ kg}$$

$$\text{- totale. } 16.596 \text{ kg}$$

$$\text{4^o ordine: } P = 16.526 \text{ kg}$$

$$\text{3^o ordine: } P = 33.122 \text{ kg}$$

$$\text{2^o ordine: } P = 49.718 \text{ kg}$$

$$\text{1^o ordine: } P = 66.314 \text{ kg}$$

Pilastro 3-4

4^o ordine

Solai	$4.70 \times (5.00/2 + 1.20) \times 650 =$	11300 kg
cornice	$4.70 \times 0.20 \times 0.53 \times 2500 =$	1245 kg
muro attico	$1.20 \times 330 \times 4.70 =$	1861 kg
tegole + ad.	$300 \times 4.70 =$	1410 kg
pp. trave	$0.30 \times 0.50 \times 2500 \times 4.70 =$	1762 kg
pp. pil.	$0.30 \times 0.30 \times 2500 \times 3.30 =$	740 kg
	- totale.	<u>18.318 kg</u>

3^o - 2^o - 1^o ordine.

Solai	$4.70 \times 5.00/2 \times 650 =$	7637 kg
bale.	$1.20 \times 4.70 \times 700 =$	3948 kg
muratura	$4.40 \times 330 \times 2.80 =$	4065 kg
trav. x.	$(3.00/2 + 1.20) \times 600 =$	2220 kg
pp. trave	$0.30 \times 0.50 \times 2500 \times 4.40 =$	1650 kg
mezzogi	$1.37 \times 0.30 \times 0.50 \times 2500 =$	513 kg
pp. pil.	$0.30 \times 0.40 \times 2500 \times 3.30 =$	990 kg
	- tot.	<u>21023 kg</u>

$$\underline{4^{\circ} \text{ ordine: } P = 18.318 \text{ kg}}$$

$$\underline{3^{\circ} \text{ ordine: } P = 39.341 \text{ kg}}$$

$$\underline{2^{\circ} \text{ ordine: } P = 60.364 \text{ kg}}$$

$$\underline{1^{\circ} \text{ ordine: } P = 81.387 \text{ kg}}$$

Pilastro 5

4^o ordine

$$\begin{aligned} \text{Solai} & 3.80/2 \times 5.00/2 \times 650 = 3087 \text{ kg} \\ & 3.80/2 \times 4.40/2 \times 650 = 2717 \text{ kg} \\ \text{colonne} & (4.40 + 5.30)/2 \times 0.80 \times 650 = 2522 \text{ kg} \\ \text{bordo} & 0.20 \times 0.53 \times 2500 \times (4.40 + 5.30)/2 = 1285 \text{ kg} \\ \text{attico} & (4.40 + 5.30)/2 \times 1.20 \times 330 = 1920 \text{ kg} \\ \text{leg. + tav.} & (4.40 + 5.30)/2 \times 300 = 1455 \text{ kg} \\ \text{pp trav.} & 0.30 \times 0.50 \times 2500 \times (4.10 + 5.00 + 3.50)/2 = 2362 \text{ kg} \\ \text{pp pil.} & 0.30 \times 0.30 \times 2500 \times 3.30 = 740 \text{ kg} \\ & \text{- totale} \quad 16.088 \end{aligned}$$

3^o - 2^o - 1^o ordine

$$\begin{aligned} \text{Solai} & 3.80/2 \times 5.00/2 \times 650 = 3087 \text{ kg} \\ & 3.80/2 \times 4.40/2 \times 650 = 2717 \text{ kg} \\ \text{muratura} & (5.00 + 4.10)/2 \times 330 \times 2.80 = 4204 \text{ kg} \\ \text{mura pilastro} & 0.15 \times 0.20 \times 2500 \times (5.30 + 4.40)/2 = 363 \text{ kg} \\ \text{pp trav.} & 0.30 \times 0.50 \times 2500 \times (5.00 \times 4.10)/2 = 1706 \text{ kg} \\ \text{pp pil.} & 0.30 \times 0.40 \times 2500 \times 3.30 = 990 \text{ kg} \\ & \text{- totale} \quad 13067 \text{ kg} \end{aligned}$$

$$\begin{aligned} 4^{\text{o}} \text{ Ordine} & : P = 16.088 \text{ kg} \\ \hline 3^{\text{o}} \text{ Ordine} & : P = 29.155 \text{ kg} \\ \hline 2^{\text{o}} \text{ Ordine} & : P = 42.222 \text{ kg} \\ \hline 1^{\text{o}} \text{ Ordine} & : P = 55.289 \text{ kg} \end{aligned}$$

Pilastri 6.

4^o - 3^o - 2^o - 1^o Ordine.

$$\text{Solais } (3.80 + 4.80) / 2 \times (5.00 + 4.10) / 2 \times 650 = 12.717 \text{ kg}$$

$$\text{poptanah: } (3.50 + 4.50) / 2 \times 0.30 \times 0.50 \times 2500 = 1500 \text{ kg}$$

$$4.10 / 2 \times 0.30 \times 0.50 \times 2500 = 768 \text{ kg}$$

$$\text{poptanah: } 0.30 \times 0.40 \times 2500 \times 3.30 = 990 \text{ kg}$$

$$\underline{\underline{15975 \text{ kg}}}$$

$$4^{\text{o}} \text{ ordine: } P = 15975 \text{ kg}$$

$$3^{\text{o}} \text{ ordine: } P = 31950 \text{ kg}$$

$$2^{\text{o}} \text{ ordine: } P = 47925 \text{ kg}$$

$$1^{\text{o}} \text{ ordine: } P = 63900 \text{ kg}$$

Plastro

1^o - 2^o - 3^o - 4^o ordine.

$$\text{Solaino } (3.20 + 4.80) / 2 \times (5.00 + 4.10) / 2 \times 650 = 11.830 \text{ kg}$$

$$\text{pp. trav. } 030 \times 050 \times 2500 (2.90 + 4.50) / 2 = 1387 \text{ kg}$$

$$\text{pp. pil. } 030 \times 040 \times 2500 \times 3.30 = 990 \text{ kg}$$

$$14.207 \text{ kg}$$

$$4^{\text{o}} \text{ ordine: } P = 14.207 \text{ kg}$$

$$3^{\text{o}} \text{ ordine: } P = 28.414 \text{ kg}$$

$$2^{\text{o}} \text{ ordine: } P = 42.621 \text{ kg}$$

$$1^{\text{o}} \text{ ordine: } P = 56.828 \text{ kg}$$

P. castro 8

- Copertura seals

ppr ml.	$0.30 \times 0.30 \times 2.00 \times 2500 =$	450 kg.
Solais	$\frac{4.40}{2} \times \frac{2.70}{2} \times 500 =$	1485 kg.
ppr trade	$0.20 \times 0.53 \times 2500 \times \left(\frac{4.40}{2} + 0.35\right) =$	675 kg.
	$0.30 \times 0.50 \times 2500 \times \left(\frac{4.40}{2} + 0.52\right) =$	1020 kg.
	$0.20 \times 0.53 \times 2500 \times 3.00/2 =$	397 kg.
		<u>4027 kg.</u>

- 4^o ordine - 3^o - 2^o - 1^o

Solais	$5.00/2 \left(\frac{2.70}{2} + \frac{3.20}{2} \right) \times 650 =$	4793 kg.
	$3.20/2 \times 4.40/2 \times 650 =$	2288 kg.
Solais seals	$\frac{4.10}{2} \times 1.20 \times 1200 =$	2952 kg.
Muratura	$2.30 \times 4.10/2 \times 0.20 \times 1400 =$	1320 kg.
	$2.40/2 \times 2.80 \times 0.20 \times 1400 =$	940 kg.
ppr trade	$0.25 \times 0.50 \times 2500 \times 2.40/2 =$	375 kg.
	$0.20 \times 0.50 \times 2 \times 4.10/2 \times 2500 =$	1025 kg.
ppr ml	$0.30 \times 0.40 \times 2500 \times 3.30 =$	990 kg.
murat. dis. app.	$600 \times 5.00/2 =$	1500 kg.
	- Totale	<u>16180 kg.</u>

<u>5^o ordine cop. seals</u>	: P = 4027 kg.
<u>4^o ordine</u>	: P = 20.207 kg.
<u>3^o ordine</u>	: P = 36.387 kg.
<u>2^o ordine</u>	: P = 52.567 kg.
<u>1^o ordine</u>	: P = 68.747 kg.

Pilaster 2

4^o ordline.

$$\text{Solais. } (1.50 + 4.40/2) \cdot 3.80/2 \times 650 = 4569 \text{ kg.}$$

$$(1.50 + 4.40/2) \cdot 0.80 \times 650 = 1924 \text{ kg.}$$

$$\text{bordo cornice } 0.20 \times 0.53 \times 2500 \left(\frac{3.80}{2} + 0.95 + 1.50 + 4.40/2 \right) = 1735 \text{ kg.}$$

$$\text{muraturs. } 1.20 \times 330 \left(\frac{3.80}{2} + 0.70 + 4.40/2 \right) = 1888 \text{ kg.}$$

$$\text{tefole + tal. } 300 \left(\frac{3.80}{2} + 0.80 + \frac{4.40}{2} + 1.50 \right) = 1920 \text{ kg.}$$

$$\text{trade } \left(\frac{4.10}{2} + 1.30 \right) \cdot 0.30 \times 0.60 \times 2500 = 1507 \text{ kg.}$$

$$\text{p/p pil. } 0.30 \times 0.30 \times 2500 \times 3.30 = 740 \text{ kg.}$$

$$\text{- totale. } \underline{14283 \text{ kg.}}$$

3^o - 2^o - 1^o ordline.

$$\text{Solais } \left(4.30/2 + 1.15 \right) \cdot 3.80/2 \times 650 = 4.075 \text{ kg.}$$

$$\text{Cordolo } 0.20 \times 0.40 \times 2500 \times 3.50/2 = 350 \text{ kg.}$$

$$\text{marcapiano } \left(1.15 + \frac{4.40}{2} \right) \times 0.20 \times 0.15 \times 2500 = 251 \text{ kg.}$$

$$\text{muraturs. } 330 \times 2.80 \left(\frac{4.10}{2} + 0.85 \right) = 2679 \text{ kg.}$$

$$3.30 \times 2.80 \times 3.50/2 = 1617 \text{ kg.}$$

$$\text{p/p trade } 0.30 \times 0.50 \times \left(\frac{4.10}{2} + 1.17 \right) \times 2500 = 1207 \text{ kg.}$$

$$\text{p/p pil } 0.30 \times 0.40 \times 2500 \times 3.30 = 990 \text{ kg.}$$

$$\text{- totale. } \underline{11.69 \text{ kg.}}$$

$$\text{4^o ordline : } P_1 = 14283 \text{ kg}$$

$$\text{3^o ordline : } P_2 = 25.452 \text{ kg}$$

$$\text{2^o ordline : } P = 36.621 \text{ kg.}$$

$$\text{1^o ordline : } P = 47.890 \text{ kg.}$$

P. Castrolto

4^o ordine.

$$\begin{aligned} \text{Solai} & (1.50 + 4.40/2) \left(\frac{3.80 + 3.95}{2} \right) \times 650 = 9319 \text{ kg.} \\ \text{bordo cornice} & 0.53 \times 0.20 \times 2500 \times \left(\frac{3.80 + 3.95}{2} \right) = 1018 \text{ kg.} \\ \text{mur. attico} & 330 \times 1.20 \times \left(\frac{3.80 + 3.95}{2} \right) = 1712 \text{ kg.} \\ \text{tavole + teg.} & 300 \times \left(\frac{3.80 + 3.95}{2} \right) = 1162 \text{ kg.} \\ \text{pp trade} & \left(\frac{3.65}{2} + 1.35 + 4.10/2 \right) \times 0.30 \times 0.50 \times 2500 = 1958 \text{ kg.} \\ \text{pp/m} & 0.30 \times 0.30 \times 2500 \times 3.30 = \frac{740}{15903} \text{ kg.} \end{aligned}$$

3^o - 2^o - 1^o ordine.

$$\begin{aligned} \text{-Solai} & \left(\frac{3.65}{2} \times \frac{4.40}{2} \right) \times 650 = 2609 \text{ kg.} \\ & \frac{3.80}{2} \left(\frac{4.40}{2} + 1.15 \right) \times 650 = 4137 \text{ kg.} \\ \text{bale.} & \frac{3.95}{2} \times 1.35 \times 700 = 1866 \text{ kg.} \\ \text{muratura} & \left(0.85 + \frac{3.80}{2} + \frac{3.50}{2} \right) \times 3.00 \times 3.30 = 4455 \text{ kg.} \\ \text{pp trade} & 0.30 \times 0.50 \times 2500 \left(1.17 + \frac{4.10}{2} + \frac{3.50}{2} \right) = 1863 \text{ kg.} \\ \text{pp/m.} & 0.30 \times 0.40 \times 2500 \cdot 3.30 = \frac{990}{15920} \text{ kg.} \end{aligned}$$

$$\text{4^o ordine : } P = 15903 \text{ kg.}$$

$$\text{3^o ordine : } P = 31823 \text{ kg.}$$

$$\text{2^o ordine : } P = 47743 \text{ kg.}$$

$$\text{1^o ordine : } P = 63663 \text{ kg.}$$

Pilastro 11

4^o ordine

Pip. Pilastro	$030 \times 050 \times 2500 \times 3.30 = 740 \text{ kg}$
Solai	$(1.40/2 \times 3.95) \times 650 = 5648 \text{ kg}$
	$1.35 \times 3.95 \times 650 = 3466 \text{ kg}$
mur. attico	$1.20 \times 330 \times 3.95 = 1564 \text{ kg}$
teg. + tad.	$3.95 \times 300 = 1185 \text{ kg}$
bordo cornice	$053 \times 020 \times 2500 \times 3.95 = 1046 \text{ kg}$
pp trave	$030 \times 050 \times 2500 \times 3.65 = 1368 \text{ kg}$
	<hr/>
	15.017 kg

3^o - 2^o - 1^o ordine

Solai	$(1.40/2 \times 3.95) \times 650 = 5648 \text{ kg}$
bale.	$1.35 \times 3.95 \times 700 = 3732 \text{ kg}$
muratura	$330 \times 2.80 \times 365 = 3372 \text{ kg}$
pp trave	$030 \times 050 \times 2500 \times 3.65 = 1368 \text{ kg}$
pp pil	$030 \times 040 \times 2500 \times 3.30 = 990 \text{ kg}$
	<hr/>
	15.110 kg

4^o ordine : $P = 15.017 \text{ kg}$

3^o ordine : $P = 30.127 \text{ kg}$

2^o ordine : $P = 45.237 \text{ kg}$

1^o ordine : $P = 60.347 \text{ kg}$

Pilastri 12

Colportura seals

pp. ml. $030 \times 030 \times 2500 \times 2.00 = 450 \text{ kg.}$
 Solais $(4.40/2 + 1.50) \times 2.60/2 \times 500 = 2405 \text{ kg.}$
 pp. trade $030 \times 050 \times 2500 \times (1.50 + 4.40/2) = 1387 \text{ kg.}$
 bordo $020 \times 053 \times 2500 \times (1.50 + 4.40/2 + 2.60/2) = 1325 \text{ kg.}$
 - totale 5567 kg.

H^o ordline.

Solais $3.95/2 \times 4.40/2 \times 650 = 2824 \text{ kg.}$
 $1.35 \times 3.95/2 \times 650 = 1733 \text{ kg.}$
 bord. $020 \times 053 \times 2500 \times (3.95 + 2.90)/2 = 907 \text{ kg.}$
 mur. attico $1.20 \times 330 \times 3.65/2 = 722 \text{ kg.}$
 tav + tegole $300 \times 3.65/2 = 547 \text{ kg.}$
 mur. seals $(\frac{4.10}{2} + 1.15 + \frac{2.60}{2}) \times 3.30 \times 2.00 = 2970 \text{ kg.}$
 pp. trade $(3.65/2 + 1.35 + 4.10/2 + 2.60/2) \times 030 \times 050 \times 2500 = 2445 \text{ kg.}$
 $(1.32 + 4.10/2) \times 030 \times 050 \times 2500 = 1263 \text{ kg.}$
 Solais seals $(4.40/2 + 1.30) \times 1.40 \times 1200 = 5040 \text{ kg.}$
 pp. ml $030 \times 030 \times 2500 \times 3.30 = 740 \text{ kg.}$
19.191 kg.

3^o - 2^o - 1^o ordline.

Solais $3.95/2 \times 4.40/2 \times 650 = 2824 \text{ kg.}$
 bale. $1.35 \times 3.95/2 \times 700 = 1866 \text{ kg.}$
 mur. $2.80 \times 3.65/2 \times 330 = 1686 \text{ kg.}$
 $(2.60/2 + 2.30) \times 1.15 \times 330 = 1366 \text{ kg.}$
 $4.10/2 \times 020 \times 1400 \times 2.30 = 1320 \text{ kg.}$
 pp. trade $(1.15 + 4.10/2) \times 2 \times 030 \times 050 \times 2500 = 2400 \text{ kg.}$
 $3.65/2 \times 030 \times 050 \times 2500 = 684 \text{ kg.}$
 Solais seals $1.20 \times (1.30 + 4.40/2) \times 1200 = 5040 \text{ kg.}$
 pp. ml $030 \times 030 \times 2500 \times 3.30 = 990 \text{ kg.}$
 totale 18.176 kg.

5^o ordline: P = 5567 kg.

H^o ordline: P = 24758 kg.

3^o ordline: P = 42934 kg.

2^o ordline: P = 61110 kg.

1^o ordline: P = 79.286 kg.

Fondazioni

Dati 1-2-3-4 - 3' ecc

$$P_1 = 46.167 \text{ kg}; P_2 = 66.314 \text{ kg}; P_3 = P_4 = 81.387 \text{ kg}.$$

Carico dovuto ai pilastri (Reazione del terreno considerata di valore costante data la elevata indeformabilità delle strutture di fondazione)

$$p = \sum P/e = \frac{P_1/2 + P_2 + P_3 + P_4/2}{13.30} = 16 \text{ t./ml.}$$

Carico distribuito muratura. pot.

$$030 \times 1400 \times 3.70 = 1.6 \text{ t./ml.}$$

$$20.002.00 \times 3000 \times 3.70 = 0.2 \text{ t./ml.}$$

$$\text{tot.} \quad 0.015 \times 1500 \times 3.70 = 0.1 \text{ t./ml.}$$

$$1.9 \text{ t./ml.}$$

$$\text{suola} \quad 040 \times 1.80 \times 2500 = 1.8 \text{ t./ml.}$$

$$\text{anima} \quad 040 \times 1.10 \times 2500 = 1.1 \text{ t./ml.}$$

$$2.9 \text{ t./ml.}$$

Carico distribuito $\approx 5 \text{ t./ml.}$

$$p_{\text{tot}} = 21.000 \text{ t./ml.} \quad b = 21.000 / (1.2 \times 10^4) = 1.75 \text{ m}$$

! che portiamo ad un carisma di 1.80 m.

A gli effetti del calcolo delle caratteristiche di sollecitazione

consideriamo soltanto la reazione del terreno dovuta

ai carichi concentrati: - 16 t./ml

A) - Tr. 1-2

$$M = \frac{1}{12} 3.90^2 \times 16 = 20.3 \text{ t.m} \quad b = 40 \text{ cm} \quad h = 150 \text{ cm}$$

$$R_c = 33 \text{ kg/cm}^2 \quad R_f = 1400 \text{ kg/cm}^2 \quad A_f = 10.6 \text{ cm}^2.$$

$$T_{\text{max}} = 16.00 \times 3.90 / 2 = 31.200 \text{ kg} \quad \sigma_{\text{max}} = \frac{31.200}{03 \times 40 \times 145} = 6 \text{ kg/cm}^2$$

$$S_{\text{seccamento}} = 6.00 \times 390 \times 40 = 23.400 \text{ kg}$$

st $\phi 8/20$

$$n = 9$$

$$S_{\text{staffe}} = n \times 2 \times A_f \times \rho_f =$$

$$9 \times 2 \times 0.5 \times 1400 = 12.600 \text{ kg}$$

$$A_{fp} = \frac{S_e/2}{\sqrt{2} \times \rho_f} = \frac{23.400/2}{\sqrt{2} \times 1400} = 5.85 \text{ cm}^2$$

- TR. 2-3 ; 3-4

$$M = \frac{1}{12} 4.60^2 \times 16 = 28.3 \text{ t.m.} \quad b = 40 \text{ cm} \quad H = 150 \text{ cm}$$

$$\rho_c = 40 \text{ kg/cm}^3 \quad \rho_f = 1400 \text{ kg/cm}^3 \quad A_f = 15 \text{ cm}^2$$

$$T_{\text{max}} = 16.00 \times 2.30 = 36.8 \text{ t.} \quad T_{\text{max}} = \frac{36.800}{0.3 \times 40 \times 145} =$$

$$= \frac{36.800}{5220} = 7.05 \text{ kg/cm}^3$$

$$S_{\text{seccamento}} = 7.05 \times 40 \times 230/2 = 32.430 \text{ kg}$$

st $\phi 8/20$

$$S_{\text{st.}} = n \times 2 \times 0.5 \times 1400 = 15400 \text{ kg}$$

$$A_{fp} = \frac{32.430 - 15400}{\sqrt{2} \times 1400} = 8.5 \text{ cm}^2$$

$$- \quad S_{\text{noles}} \quad M = \left(\frac{1.80 - 0.40}{2} \right)^2 \times 12.000 = 3940 \text{ kg m/m}^2$$

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

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

$$\rho_c = 30 \text{ kg/cm}^3 \quad \rho_f = 1400 \text{ kg/cm}^3$$

$$A_f = 5.8 \text{ cm}^2/\text{ofin m}^2$$

1 $\phi 12$ e 1 $\phi 8$ alternati
ogni 14 cm

Trave 5-6-7-8-8' ecc

$$P_5 = 55.289 \text{ kg} ; P_6 = 63.900 \text{ kg} ; P_7 = 56.828 \text{ kg} ; P_8 = 68.747 \text{ kg}$$

Reazione del terreno dovuta ai carichi

concentrati dei pilastri

$$p = \frac{\sum P}{l} = \frac{27.640 + 63900 + 56.828 + 34373}{13.30} = 14.1 \text{ t/m}^2$$

Cuneo dovuto alla sovrapposizione + p/p + magro $\approx 5 \text{ t/m}^2$

$$b = \frac{14.000 + 5000}{1.2 \cdot 10^4} \approx 1.60 \text{ m}$$

-TR 5-6

$$\mu = 1/12 \cdot 380^2 \times 14.000 = 17.000 \text{ } \mu\text{m} \quad b = 40 \text{ cm} \quad H = 150 \text{ cm}$$

$$r_c = 30 \text{ } \mu\text{/cm} \quad r_f = 1400 \text{ } \mu\text{/cm} \quad A_f = 8.85 \text{ cm}.$$

$$T = 14.000 \times 1.90 = 26.600 \text{ } \mu \quad \Sigma_{max} = \frac{26.600}{0.3 \times 40 \times 145} = 5 \text{ } \mu\text{/cm}.$$

-TR 6-7

$$\mu = 1/12 \cdot 4.70^2 \times 14.000 = 25700 \text{ } \mu\text{m} \quad b = 40 \text{ cm} \quad H = 150 \text{ cm}$$

$$r_c = 37 \text{ } \mu\text{/cm} \quad r_f = 1400 \text{ } \mu\text{/cm} \quad A_f = 13.6 \text{ cm}$$

$$T = 14.000 \times 2.35 = 32900 \text{ } \mu. \quad \Sigma_{max} = \frac{32900}{0.9 \times 40 \times 145} = 6.32 \text{ } \mu\text{/cm}$$

$$\Sigma_{corr.} = 6.32 \times 235 \times 40 / 2 = 29.704 \text{ } \mu$$

$$\Sigma_{st} (\phi 8/20. \mu = 11) \quad 11 \times 2 \times 0.5 \times 1400 = 15400 \text{ } \mu$$

$$A_{fp} = \frac{29.704 / 2}{\sqrt{2} \times 1400} = 7.43 \text{ cm}.$$

-TR 7-8

$$\mu = 1/12 \cdot 3.30^2 \times 14.000 = 12600 \text{ } \mu\text{m} \quad b = 40 \text{ cm}$$

$$r_c < 30 \text{ } \mu\text{/cm} \quad r_f = 1400 \text{ } \mu\text{/cm}; \quad A_f = 6.4 \text{ cm}; \quad H = 150 \text{ cm}$$

$$T = 14.000 \times 1.65 = 23.100 \text{ } \mu \quad \Sigma_{max} < 6 \text{ } \mu\text{/cm}.$$

-TR 8-8'

$$\mu = 1/12 \cdot 3.50^2 \times 14.000 = 17.300 \text{ } \mu\text{m} \quad b = 40 \text{ cm}$$

$$r_c < 30 \text{ } \mu\text{/cm} \quad r_f = 1400 \text{ } \mu\text{/cm} \quad A_f = 3.7 \text{ cm} \quad H = 150 \text{ cm}$$

$$T = 1.25 \times 14.000 = 17500 \text{ } \mu \quad \Sigma_{max} < 6 \text{ } \mu\text{/cm}.$$

Алгоритм расчета.

$$\mu = \left(\frac{1.60 - 0.40}{2} \right)^2 \times 12.000 = 2160 \text{ } \mu\text{m/м}.$$

$$b = 1 \text{ м} \quad H = 40 \text{ см} \quad r_c < 30 \text{ } \mu\text{/см} \quad r_f = 1400 \text{ } \mu\text{/см}$$

$$A_f = 4.25 \text{ см/опн} \text{ м}.$$

1φ12 + 1φ8 опн 35 см альтернат.

- TRAVE 9-10-11-12-12' ecc

$$P_9 = 42.790 \text{ kg} ; P_{10} = 63.663 \text{ kg} ; P_{11} = 60.347 \text{ kg}$$

$$p = \sum p/l$$

$$P_{12} = 79.286$$

$$p = \frac{23.890 + 63.663 + 60.347 + 39.643}{13.30} = 14.000 \text{ kg/ml.}$$

b = 1.60 come trave 5-6 ecc.

- TR 9-10 come trave 5-6

TR 10-11 ; TR 11-12

$$M = 3.65^2 / 12 \times 14.000 = 15.600 \text{ kgm}$$

$$H = 150 \text{ cm}$$

$$b = 40 \text{ cm}$$

$$r_e < 30 \text{ kg/cm}$$

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

$$A_f = 8.05 \text{ cm}^2$$

$$T = 14.000 \times 3.65 / 2 = 25.575 \text{ kg}$$

$$\sum \sigma_x = 25.575 / 0.9 \times 40 \times 145 < 6 \text{ kg/cm}.$$

TR 12-12'

$$M = 3.10^2 / 12 \times 14.000 = 11.250 \text{ kgm} \quad b = 40 \text{ cm}$$

$$r_e < 30 \text{ kg/cm}$$

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

$$H = 150 \text{ cm}$$

$$A_f = 5.75 \text{ cm}^2$$

$$T = 3.10 / 2 \times 14.000 = 21.700 \text{ kg}$$

$$\sum \sigma_x < 6 \text{ kg/cm}.$$

La trave di fondazione è armata come la 5-6 ecc.

TRAVE 8-12

$P_8 = 68.74 \text{ t}$ $P_{12} = 79.28 \text{ t}$

$p = 15.7 \approx 16 \text{ t./ml.}$

$M = 4.40^2 / 12 \times 16.000 = 25.700 \text{ kgm}$ $b = 40 \text{ cm}$

$r_c = 37 \text{ kg/cm}$ $r_f = 1400 \text{ kg/cm}$ $H = 150 \text{ cm}$

$A_f = 13.3 \text{ cm}^2$

$T = 16.000 \times 2.20 = 35.200 \text{ kg}$ $\epsilon_{max} = 35.200 / (0.9 \times 40 \times 145) = 6.8 \text{ kg/cm}$

Seorr. $6.8 \times 220 \times 40 / 2 = 29.920 \text{ t}$

$1 \text{ t } \phi 8 / 20''$ $S_{st} = 11 \times 1400 \times 2 \times 0.5 = 15.400 \text{ kg}$

$A_{fp} = 29.920 / (\sqrt{2} \times 1400 \times 2) = 7.5 \text{ cm}^2$

Suola:

$M = \frac{1}{12} \cdot 2.60^2 \times 12.000 = 6800 \text{ kgm}$ $b = 1 \text{ m}$

$H = 50 \text{ cm}$ $r_c = 36 \text{ kg/cm}$ $r_f = 1400 \text{ kg/cm}$

$A_f = 10.7 \text{ cm}^2 / 0.9 \text{ ml.}$

$2 \phi 16 \text{ } 0.9 \text{ m } 38 \text{ cm}$

TRAVE 1-5-3

$P_1 = 46.167 \text{ kg}$

$P_5 = 35.289 \text{ kg}$

$P_9 = 47.790 \text{ kg}$

$\rho = 74.228 / 10.00 = 7.5 \text{ t./ml.}$

Carico distribuito dovuto al peso proprio + mur. $e_c = 4 \text{ t./ml}$
 $b \approx 1 \text{ m}$

TR 1-5

$\mu = 5.30^2 / 12 \times 7.500 = 17.500 \text{ kgm}$ $b = 30 \text{ cm}$ $H = 150 \text{ cm}$

$r_c = 35 \text{ kg/cm}$

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

$A_f = 9.2 \text{ cm}$

$T = 2.65 \times 7.500 = 19.875 \text{ kg}$ $\epsilon_{max} = \frac{19.875}{0.3 \times 30 \times 145} = 5.1 < 6 \text{ kg/cm}$

TR 5-9

$\mu = 4.20^2 / 12 \times 7.500 = 11.000 \text{ kgm}$ $b = 30 \text{ cm}$

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

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

$H = 150 \text{ cm}$

$A_f = 5.75 \text{ cm}$

$T = 7.500 \times 2.10 = 15.750 \text{ kg}$ $\epsilon_{max} < 6 \text{ kg/cm}$

Suols

$\mu = 0.70^2 / 2 \times 12.000 = 2950 \text{ kgm}$

$b = 1 \text{ m}$

$H = 40 \text{ cm}$

$r_c = 29.5 \text{ kg/cm}$

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

$A_f = 5.8 \text{ cm} / \text{ogni m l.}$

$1 \phi 12 / 30$

$1 \phi 8 / 30$

Solai e balconate

Sottracciano accidentale 250 kg/m
 " permanente 200 kg/m
 |sp. 200 kg/m
 -totale 650 kg/m.

1) luce m. 3.80

$$M = \frac{1}{12} \cdot 3.80^2 \times 650 = 780 \text{ kgm.} \quad l = 1 \text{ m} \quad H = 16 + 4$$

$$R_e = 31.5 \text{ kg/cm.} \quad R_f = 1600 \text{ kg/cm.} \quad A_f = 1.32 \text{ cm} / 40 \text{ cm}$$

1 φ 8 + 1 φ 10

2) luce m. 4.40

$$M = \frac{1}{12} \cdot 4.40^2 \times 650 = 1040 \text{ kgm.} \quad l = 1 \text{ m} \quad H = 20 \text{ cm}$$

$$R_e = 37 \text{ kg/cm} \quad R_f = 1600 \text{ kg/cm} \quad A_f = 1.54 \text{ cm} / 40 \text{ cm}$$

2 φ 10

3) luce m. 5.30

$$M = \frac{1}{12} \cdot 5.30^2 \times 650 = 1520 \text{ kgm}$$

$$R_e = 46 \text{ kg/cm} \quad R_f = 1600 \text{ kg/cm} \quad A_f = 2.26 \text{ cm} / 40 \text{ cm}$$

2 φ 12

4) fascia prima per una prof. di 40 cm

balconi

Sottr. accid. 400 kg/m

" perm. 100 "

proprio 200 "
 700 kg/m

$$M = \frac{1.35^2}{2} \times 700 = 635 \text{ kgm} \quad H = 16$$

$$R_e = 37 \text{ kg/cm} \quad R_f = 1600 \text{ kg/cm} \quad A_f = 1.22 \text{ cm} / 40 "$$

$$M = \frac{1.20^2}{2} \times 700 = 505 \text{ kgm} \quad R_e = 33 \text{ kg/cm} \quad R_f = 1600 \text{ kg/cm}$$

$$A_f = 0.95 \text{ cm} / 40 \text{ cm.}$$

Solai al piano di copertura.

$$l = 3.00 + 0.30$$

$$\begin{aligned} - m &= \frac{3.30^2}{12} \times 650 = 1520 \text{ kg/m} & b &= 1 \text{ m} & H &= 33 = 28 + 5 \\ & r_c < 30 \text{ kg/cm} & r_f &= 1600 \text{ kg/cm} & A_f &= 1.66 \text{ cm} / \text{ogni } 50 \text{ cm}. \end{aligned}$$

$$l = 3.80$$

$$\begin{aligned} - m &= \frac{3.80^2}{12} \times 650 = 1720 \text{ kg/m} & b &= 1 \text{ m} & H &= 28 + 5 \\ & r_c < 30 \text{ kg/cm} & r_f &= 1600 \text{ kg/cm} & A_f &= 0.85 \text{ cm}. \end{aligned}$$

$$l = 4.40$$

$$\begin{aligned} - m &= \frac{4.40^2}{12} \times 650 = 1050 \text{ kg/m} \\ & r_c < 30 \text{ kg/cm} & r_f &= 1600 \text{ kg/cm} & A_f &= 1.15 \text{ cm}. \end{aligned}$$

$$- \text{balzo } l: 1.35 \text{ m}$$

$$650 \times 1.35^2 / 12 + 400 \times 1.35 = 1130 \text{ kg/m}$$

$$r_c < 30 \text{ kg/cm} \quad r_f = 1600 \text{ kg/cm} \quad A_f = 1.22 \text{ cm}.$$

Structure seals:

- gradino	pp. $0.17 \times 0.30 / 2 \times 2500$	$+ 0.34 \times 0.06 \times 2500 = 115$ kg/ml.
	lutameo $0.015 \times 1500 \times 0.34$	$= 8$ kg/ml
	massello $0.02 \times 1400 \times 0.30$	$= 9$ kg/ml
	pedata	$= 31$ kg/ml
	fronimo	$= 8$ kg/ml
	Sobracarico accidentale 400×0.3	$= 120$ kg/ml
	-totale	<u>290 kg/ml</u>

$$m = 1.20^2 / 2 \times 290 = 223 \text{ kg/m}$$

$$b = 34 \text{ cm} \quad H = 14 \text{ cm} \quad r_c = 46 \text{ kg/cm}$$

$$r_f = 1400 \text{ kg/cm} \quad A_f = 1.4 \text{ cm} \quad 1\phi 12 + 1\phi 8$$

Caso gradino riportato sulla trave

$$2.90 / 0.30 \times 1.20 \approx 1160 \text{ kg/ml.}$$

$$m = 223 / 0.30 = 740 \text{ kg/ml.}$$

- Piastrino di riposo e di arrivo

$$\text{peso proprio } 0.20 \times 2500 = 500 \text{ kg/m.}$$

$$\text{Sobr. accidentale} = 400 \text{ u}$$

$$\text{Pav + int. + manetto} = 100 \text{ u.}$$

$$\text{totale } 1000 \text{ kg/m}$$

$$m = 2.90^2 / 12 \times 1000 = 700 \text{ kg/m}$$

$$b = 1 \text{ m} \quad h = 18 \text{ cm} \quad r_f = 1400$$

$$r_c = 31 \text{ kg/cm} \quad A_f = 2.95 \text{ cm} / \text{ogni metro}$$

Trave a T

$$\text{Carico solerti seals} = 1000 \times 1.20 = 1200 \text{ kg/ml.}$$

$$\text{p/p } 0.20 \times 0.50 \times 2500 = 250. \text{ kg/ml.}$$

$$\text{Misure } 1.00 \times 1.00 \times 0.20 = 280 \text{ kg/ml}$$

$$\text{- Totale } 1730 \text{ kg/ml.}$$

$$- M = \frac{1}{12} 1730 \times 3.00^2 = 1300 \text{ kgm}$$

$$b = 20 \text{ cm}$$

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

$$r_c = 36 \text{ kg/cm} \quad r_f = 1400 \text{ kg/cm}$$

$$A_f = 3.1 \text{ cm.}$$

$$- T = 1730 \times 1.50 \text{ kg} = 2600 \text{ kg.}$$

$$\Sigma \text{cur } x = 2600 / 0.9 \times 20 \times 48 = 3 \text{ kg/g} < 6$$

$$- \text{Torsione} \quad M_{t \text{ cur } x} = 740 \times 2.20 / 2 = 814 \text{ kgm}$$

$$\Sigma = \alpha \frac{M_t}{ab^2} = 3.88 \frac{81400}{50 \times 20^2} = 15.74 / \text{cm.}$$

$$\Sigma f_f = \frac{M_{tH}}{2 r_f F} = \frac{81400 \times 124}{2 \times 736 \times 1400} = 4.29 \text{ cm.}$$

$$\Sigma f_s = \frac{M_t}{2 r_f \cdot F} = \frac{81400}{2 \times 736 \times 1400} = 0.0407 \text{ cm/g/cm.l.}$$

$$\Delta x = 0.50 / 0.0407 = 12 \text{ cm.}$$

- Misure

†

Carico distribuito

$$\text{solerti } 130 \times 1000 = 1300 \text{ kg/ml}$$

$$\text{p/p. } 0.20 \times 0.50 \times 2500 = 250 \text{ kg/ml.}$$

$$\text{mur. } 1.15 \times 330 = 378 \text{ kg/ml}$$

$$\text{- Totale } 2060 \text{ kg/ml}$$

Carico concentrato delle misure.

$$330 \times 3.10 \times 1.60 = 1640 \text{ kgm.}$$

$$M = 1.30^2/2 \times 2060 + 1640 \times 1.15 = 1740 + 1886 \text{ kg} = 3626 \text{ kg}$$

$$b = 30 \text{ cm} \quad H = 50 \text{ cm} \quad R_c$$

$$R_c = 48 \text{ kg/cm} \quad R_f = 1200 \text{ kg/cm} \quad A_f = 6.9 \text{ cm}$$

$$\Sigma_{max} = \frac{2060 \times 1.30 + 1640}{0.9 \times 30 \times 48} < 6 \text{ kg/cm}$$

Trade a porta solais (8-12)

$$\text{Soletta scala} \quad 1200 \text{ kg/ml}$$

$$\text{luminaria} \quad 2.30 \times 0.20 \times 1400 = 644 \text{ kg/ml}$$

$$\text{pp. } 2 \times 0.20 \times 0.50 \times 2500 = 500 \text{ kg/ml}$$

$$\text{-totale} \quad 2344 \text{ kg/ml}$$

$$M = 0.083 \times 4.40^2 \times 2344 = 3750 \text{ kg}$$

$$b = 20 \quad H = 50 \text{ cm}$$

$$R_c = 62 \text{ kg/cm} \quad R_f = 1200 \text{ kg/cm}$$

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

$$\Sigma_{max} = \frac{2344 \times 220}{0.9 \times 48 \times 20} = 5.75 \text{ kg/cm} < 6$$

- Mensola a porta 1° - 2° - 3° ordine di ordine di ordine.

$$\text{pp.} = 0.30 \times 0.50 \times 2500 = 375 \text{ kg/ml}$$

$$\text{luminaria} \quad 1.15 \times 330 = 380 \text{ kg/ml}$$

$$\text{-totale} \quad 755 \text{ kg/ml}$$

$$M = 1.30^2/2 \times 755 = 640 \text{ kg} \quad \text{tef.}: 30 \times 50 \text{ cm}$$

$$R_c < 30 \text{ kg/cm}$$

$$R_f = 1400 \text{ kg/cm} \quad A_f = 1 \text{ cm}$$

- Mensola a porta coperture.

$$\text{pp.} = 375 \text{ kg/ml}$$

paneo con cemento

$$\text{lunr.} \quad 330 \times 2.20 = 726 \text{ kg/ml}$$

$$\text{lunr.} \quad 726 \times 1.50 = 1089 \text{ kg}$$

$$\text{tef.} \quad 300 \times 1.50 = 450 \text{ kg}$$

$$\text{bordo} \quad 650 \times 1.50 = 975 \text{ kg}$$

$$\text{totale} \quad 7100 \text{ kg/ml}$$

$$1914 \text{ kg}$$

$$M = 1914 \times 1.50 + \frac{1.50^2}{2} \times 1100 = 2871 + 1232 = 4103 \text{ kg}$$

$$b = 30 \text{ cm} \quad H = 50 \text{ cm} \quad R_c = 54 \text{ kg/cm} \quad R_f = 1400 \text{ kg/cm} \quad A_f = 6.7 \text{ cm}$$

Trav: di copertura - primo scale

Δ	Δ
4.40	$\frac{12}{2}$ 1.30

Solai: $u = 2.90 \frac{2}{12} \times 500 = 350 \text{ kg/m}$

$b = 1 \text{ m}$ $H = 16 + 4$ $l = 40$

$r_c < 30 \text{ kg/cm}$ $r_f = 1600 \text{ kg/cm}$ $A_f = 0.52 / 40 \text{ cm}$

Pavimento sulle travi: Solai $\frac{2.90}{2} \times 500 = 725 \text{ kg/m.l}$

per $0.30 \times 0.50 \times 2500 = 375 \text{ u}$

cornice $0.20 \times 0.40 \times 2500 = 200 \text{ u}$

1300 kg/ml

$M_{12} = 1300 \frac{2}{2} \times 1300 = 1098 \text{ kgm}$

$T_8 = 1300 \times 2.20 - \frac{1098}{4.40} = 2860 - 249 = 2611 \text{ kg}$

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

$T_{12} = 2860 + 249 = 3109 \text{ kg}$

$M_{8-12} = \frac{2611^2}{2600} = 2622 \text{ kgm}$

- $u = 1098 \text{ kgm}$ $b = 30 \text{ cm}$ $h = 50 \text{ cm}$

$r_c < 30 \text{ kg/cm}$; $r_f = 1400 \text{ kg/cm}$ $A_f = 1.41 \text{ cm}$

- $u = 2622 \text{ kgm}$ $b = 30 \text{ cm}$ $h = 50 \text{ cm}$

$r_c = 42 \text{ kg/cm}$ $r_f = 1400 \text{ kg/cm}$ $A_f = 4.15 \text{ cm}$

Travi a 1° - 2° - 3° ordine

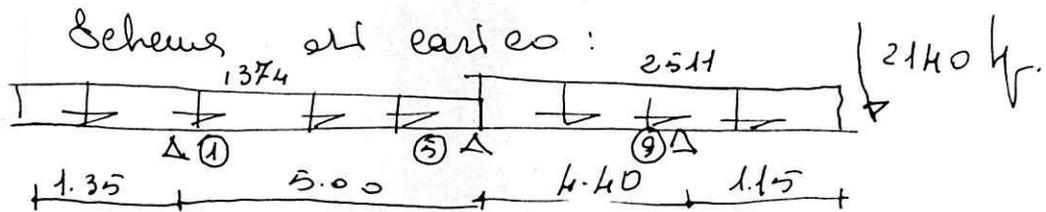
Trave 1-5-9

1.5	muratura 330 x 2.80	= 924	kg/ml
↙	p/p 030 x 050 x 2500	= 375	kg/ml
	mura. 015 x 020 x 2500	= 75	kg/ml
	- totale.	<u>1374</u>	kg/ml.

5-9 → es + solai = 1374 kg/ml
 $3.50 \times 650 / 2 = 1137$ kg/ml
 - totale 2511 kg/ml

Carico concentrato sulle murature

Muratura $\frac{3.50 \times 330 \times 3.10}{2} = 1790$ kg
 Load $0.20 \times 0.40 \times \frac{3.50}{2} \times 2500 = 350$ kg
 - totale 2140 kg



$\bar{\mu}_1 = \frac{1.35^2}{2} \times 1374 = 1260$ kgm

$\bar{\mu}_3 = \frac{1}{8} \times 4.40^2 \times 2511 = 6100$ kgm

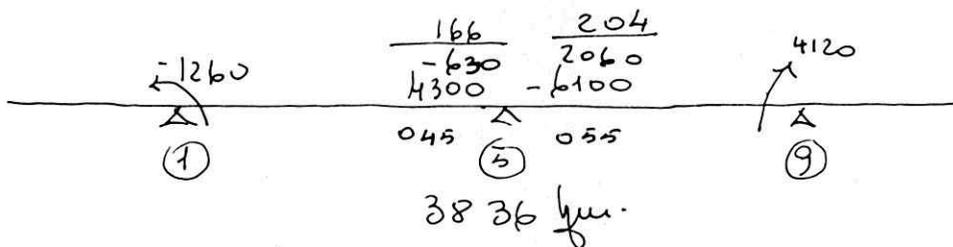
$\bar{\mu}_5 = \frac{1}{8} \times 5.00^2 \times 1374 = 4300$ kgm

$\bar{\mu}_9 = \frac{1.15^2}{2} \times 2511 + 2140 \times 1.15 = 4120$ kgm

Rigidità e coeff. di ripart. per il cross.

$K_{5-1} = \frac{1}{\frac{1}{5.00} + \frac{1}{4.40}} = 0.45$

$K_{5-9} = 1 - K_{5-1} = 0.55$



- TR 1-5

$T_1' = 1.35 \times 1374 = 1854 \text{ kg}$ $\sigma_{max} < 6 \text{ kg/cm}$

$T_1'' = 1374 \times 2.50 - \frac{(3836 - 1260)}{5.00} = 3435 - 515 = 2924 \text{ kg}$

$T_5^1 = 3946 \text{ kg}$ $\sigma_{max} < 6 \text{ kg/cm}$

$M_{1-5} = \frac{2924^2}{2 \times 1374} - 1260 = 1855 \text{ kgm}$

assumiamo un momento non inferiore a $1/16 \text{ pl}^2$
e cioè 2150 kgm.

$M_1 = 1260 \text{ kgm}$ sez. $30 \times 50 \text{ cm}$

$\sigma_c < 35 \text{ kg/cm}^2$ $\sigma_f = 1400 \text{ kg/cm}^2$ $A_f = 3 \text{ cm}^2$

$M_{1-5} = 1855 \text{ kgm}$ sez. $30 \times 50 \text{ cm}$

$\sigma_c = 35 \text{ kg/cm}^2$ $\sigma_f = 1400 \text{ kg/cm}^2$ $A_f = 2.93 \text{ cm}^2$

- TR 5-9

$T_5'' = 2511 \times 220 + \frac{3836 - 4120}{4.40} = 5524 + 64 = 5460 \text{ kg}$

$T_9^1 = 5588 \text{ kg}$

$\sigma_{max} = \frac{5588}{0.5 \times 48 \times 30} = \frac{5588}{1296} < 6 \text{ kg/cm}$

$M_{5-9} = \frac{5460^2}{2 \times 2511} - 3836 = 1757 \text{ kgm}$

assumiamo un momento non inferiore a $1/16 \text{ pl}^2$
e cioè 3050 kgm.

$M_5 = -3836 \text{ kgm}$ sez. $30 \times 50 \text{ cm}$

$\sigma_c = 35 \text{ kg/cm}^2$ $\sigma_f = 1400 \text{ kg/cm}^2$ $A_f = 6.15 \text{ cm}^2$

$M_{5-9} = 3050 \text{ kgm}$ sez. $30 \times 50 \text{ cm}$

$\sigma_c = 46 \text{ kg/cm}^2$ $\sigma_f = 1400 \text{ kg/cm}^2$ $A_f = 4.95 \text{ cm}^2$

$M_9 = 4120 \text{ kgm}$ sez. $30 \times 50 \text{ cm}$

$\sigma_c = 55 \text{ kg/cm}^2$ $\sigma_f = 1400 \text{ kg/cm}^2$ $A_f = 6.7 \text{ cm}^2$

$T_9'' = 2110 + 2511 \times 1.35 = 5529 \text{ kg}$ $\sigma_{max} = \frac{5529}{0.5 \times 48 \times 30} < 6 \text{ kg/cm}$

St $\phi 8$ ogni 20 cm $S_{st} = 0.5 \times 2 \times 1400 \times 9 = 13.6t$.

$$A_{fp} = \frac{13.950/2}{\sqrt{2} \times 1400} = 5.00 \text{ cm}^2$$

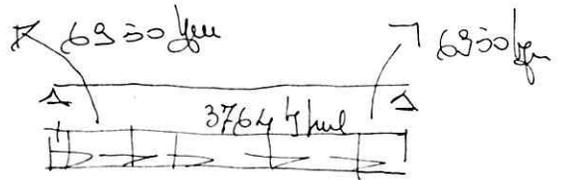
Trave 2-3

$$M_2 = M_3 = -6950 \text{ kgm}$$

$$T_2'' = 3764 \times 4.70/2 = T_3' = 8845 \text{ kg}$$

$$M_{2.3} = \frac{1}{8} 4.70^2 \times 3764 - 6950 = 3400 \text{ kgm}$$

Assumiamo un momento non inferiore a $\frac{1}{16} 3764 \times 4.70^2 = 5200 \text{ kgm}$



- $M_2 = M_3 = -6950 \text{ kgm}$ $b = 30 \text{ cm}$ $h = 50 \text{ cm}$

occorre la doppia armatura $M_0 = 4850 \text{ kgm}$

$$\Delta M = 2100 \text{ kgm} \quad A_{f1} = 8 \text{ cm}^2 \quad r_e = 60 \text{ kg/cm} \quad r_f = 1400 \text{ kg/cm}$$

$$r_f' = 350 \text{ kg/cm}$$

$$A_{f2} = \frac{2100}{45 \times 14} = 3.4 \text{ cm}^2$$

Armatura in trave: $3.4 + 8 = 11.4 \text{ cm}^2$

$$A_f' = \frac{2100}{45 \times 3.5} = \frac{3100}{158} = 13.2 \text{ cm}^2$$

- $M_{2.3} = 5200 \text{ kgm}$

$$b = 30 \text{ cm} \quad h = 50 \text{ cm} \quad M_0 = 4850 \text{ kgm}$$

$$A_{f1} = 8 \text{ cm}^2 \quad r_e = 60 \text{ kg/cm} \quad r_f = 1400 \text{ kg/cm}$$

$$AM = 350 \text{ kgm}$$

$$r_f' = 350 \text{ kg/cm}$$

$$A_{f2} = \frac{350}{45 \times 14} = 0.55 \text{ cm}^2$$

$$A_f' = \frac{350}{45 \times 3.5} = 2.22 \text{ cm}^2$$

Verifica \rightarrow - verifica

$$E_{sx} = \frac{8845}{0.9 \times 30 \times 48} = 6.8 \text{ kg/cm}$$

$$S = 6.8 \times \frac{4.70}{4} \times 30 = 23.970 \text{ kg}$$

St $\phi 8$ / 20

$$S_{st} = 11 \times 2 \times 0.5 \times 1400 = 15.400 \text{ kg}$$

$$A_{fp} = \frac{23.970/2}{\sqrt{2} \times 1400} = 6 \text{ cm}^2$$

Trade 3-4 armature come in precedenza.

Trade 5-6-7-8-8'

$$\begin{array}{l}
 (5-6): \text{ pp trade } 0.30 \times 0.30 \times 2300 = 375 \text{ kg/ml.} \\
 \text{Solais } 5.00/2 \times 650 = 1625 \text{ "} \\
 \hline
 \text{- totale } 2000 \text{ kg/ml.}
 \end{array}$$

$$\begin{array}{l}
 (6-7; 7-8) \text{ pp trade } 0.3 = 375 \text{ kg/ml.} \\
 \text{Solais } (5.00 + 4.20) \times 650 = 2990 \text{ "} \\
 \hline
 \text{- totale } 3365 \text{ kg/ml.}
 \end{array}$$

$$\begin{array}{l}
 (8-8') \text{ pp trade } 0.25 \times 0.25 \times 2300 = 312 \text{ kg/ml} \\
 \text{Solais } 5.00/2 \times 650 = 1625 \text{ "} \\
 \hline
 \text{- totale } 1937 \text{ kg/ml}
 \end{array}$$

carico concentrato

$$600 \times 5.00/2 = 1500 \text{ kg}$$

Caratteristiche elastiche e geometriche:

$$w_{5-6} = \frac{0.75}{3.80} \times 0.30 = 0.059$$

$$w_{6-7} = w_{7-6} = \frac{1}{4.77} \times 0.30 = 0.062$$

$$w_{7-8} = w_{8-7} = \frac{1}{3.25} \times 0.30 = 0.092$$

$$w_{8-8'} = \frac{0.5}{2.60} \times 0.25 = 0.052$$

$$\text{modo } 6 \left\{ \begin{array}{l}
 K_{6-5} = \frac{0.059}{0.121} = 0.487 \\
 K_{6-7} = 1 - K_{6-5} = 0.513
 \end{array} \right.$$

$$\text{modo } 7 \left\{ \begin{array}{l}
 K_{6-7} = \frac{0.062}{0.154} = 0.40 \\
 K_{7-8} = 1 - K_{6-7} = 0.60
 \end{array} \right.$$

$$\bar{\mu}_{6-5} = \frac{1}{8} 3.80^2 \times 2000 = 3600 \text{ kgm}$$

$$\bar{\mu}_{6-7} = \bar{\mu}_{7-6} = \frac{1}{12} 4.77^2 \times 3365 = 6400 \text{ kgm}$$

$$\bar{\mu}_{7-8} = \bar{\mu}_{8-7} = \frac{1}{12} 3.25^2 \times 3365 = 2960 \text{ kgm}$$

$$\bar{\mu}_{8-8'} = \frac{1}{12} 2.60^2 \times 1937 - \frac{1}{8} \times 2.60 \times 1500 = 1090 + 490 = 1580 \text{ kgm}$$

$$\text{modo } 8 \left\{ \begin{array}{l}
 K_{8-7} = \frac{0.092}{0.144} = 0.640 \\
 K_{8-8'} = 1 - K_{8-7} = 0.360
 \end{array} \right.$$

≠ riprendiamo il corso dello trade continuo.

5386 kg

2	3
13	-5
403	18
1364	-33
3600	426
	-831
	1436
	-6400

5621 kg

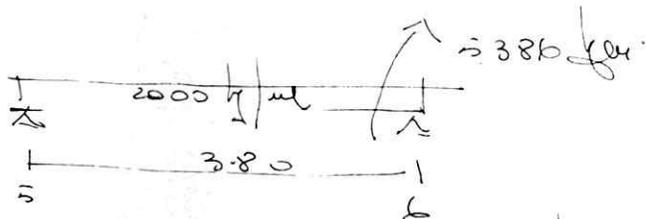
9	-15
213	16
-1663	-101
718	-46
6400	-2493
	-2860

1600 kg

5	3
-7	18
32	-40
-50	
-93	
-1247	
2960	-1580

5	6	7	8
0487	0313	040	060
			0640
			0360

Trade 5-6



$T_5 = \frac{5386}{3.80} + 2000 \times \frac{3.80}{2} = 3800 \cdot 1417 = 2383 \text{ kg}$

$T_6 = 5217 \text{ kg}$ $\text{Energy} = \frac{5217}{0.5 \times 30 \times 48} < 6 \text{ kg/eq}$

$M_{5-6} = \frac{2383^2}{4000} = 1413 \text{ kg}$

anunciando un momento non inferiore a $\frac{1}{14} \cdot 3.80^2 \cdot 2000 = 2050 \text{ kg}$

- 2050 kg tel. 30 x 50

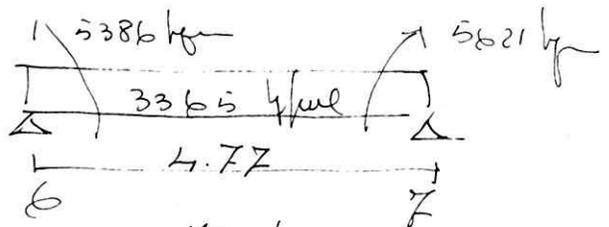
$\rho_0 = 27 \text{ kg/m}^3$ $\rho_f = 1400 \text{ kg/m}^3$ $A_f = 3.24 \text{ cm}^2$

- $M = 5386 \text{ kg}$ tel. 30 x 50

$\rho_0 = 60 \text{ kg/m}^3$ $\rho_f = 1200 \text{ kg/m}^3$

$A_f = 10.5 \text{ cm}^2$

Trade 6-7



$T_6'' = 4.77/2 \times 3365 - \frac{5621 - 5386}{4.77} = 8035 - 49 = 7986 \text{ kg}$

$T_7' = 8084 \text{ kg}$ $\text{Energy} = \frac{8084}{0.5 \times 30 \times 48} < 6 \text{ kg/eq}$

$M_{6-7} = \frac{7986^2}{2 \times 3365} - 5386 = 4088 \text{ kg}$

anunciando un momento non inferiore a 5500 kg

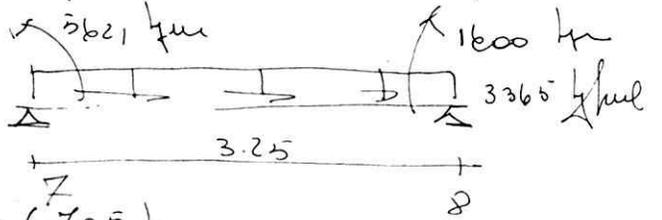
- $M = 5621 \text{ kgm}$ ser. 20×50

$R_c = 62 \text{ kg/cm}$ $R_f = 1200$ $A_f = 11 \text{ eq.}$

- $M = 5300 \text{ kgm}$ ser. 20×50

$R_c = 61 \text{ kg/cm}$ $R_f = 1200 \text{ kg/cm}$ $A_f = 10.6 \text{ eq.}$

Trade 7-8



$T_f'' = \frac{3.25^2 \times 3365}{2} + \frac{5621 \cdot 1600}{3.25} = 5468 + 1237 = 6705 \text{ kg}$

$F_8' = 4231 \text{ kg}$

$\sigma_{max} = 6705 / 0.9 \times 30 \times 48 = 6 \text{ kg/cm}$

$M_{7-8} = \frac{6705^2}{6730} - 5621 = 1059 \text{ kgm}$

assumiamo un momento non inferiore a

$\frac{1}{14} 3.25^2 \times 3365 = 2550 \text{ kgm}$

- $M_{7-8} = 2550 \text{ kgm}$

ser. 20×50

$R_c = 41 \text{ kg/cm}$

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

$A_f = 4.05 \text{ eq.}$

- $M_p = 1600 \text{ kgm}$

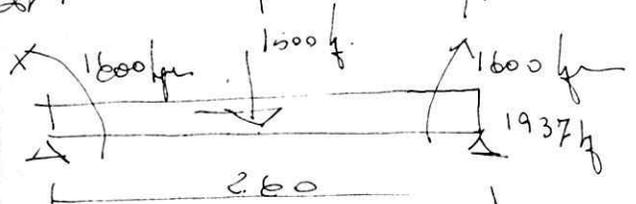
ser. 20×50

$R_c = 32 \text{ kg/cm}$

$R_f = 1200 \text{ kg/cm}$

$A_f = 6.5 \text{ eq.}$

Trade 8-8'



$T_8'' = T_8' = 1.30 \times 1937 = 2518 + 750 = 3268 \text{ kg}$ $\sigma_{max} < 6 \text{ kg/cm}$

$M_{8-8'} = \frac{1}{8} 2.60^2 \times 1937 + \frac{1}{4} 2.60 \times 1500 - 1600 = 1640 + 975 - 1600 = 1015 \text{ kgm}$

- $M_p = 1600 \text{ kgm}$

ser. 25×50

$R_c = 35 \text{ kg/cm}$

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

$A_f = 2.6 \text{ eq.}$

- $M = 1015 \text{ kgm}$

ser. 25×50

$R_c < 30 \text{ kg/cm}$

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

$A_f = 1.6 \text{ eq.}$

Trade 10-11-12

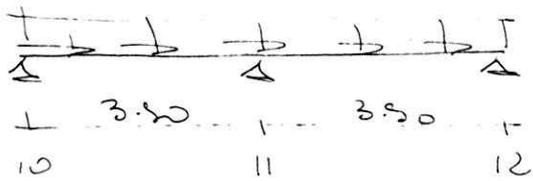
Solaria $4.20 \times 650 = 1365 \text{ y/ul}$

mur. $3.30 \times 280 = 924 \text{ y/amb}$

balcone $1.20 \times 700 = 840 \text{ u}$

porte $0.30 \times 0.50 \times 2500 = 375 \text{ u}$

- totale 3504 y/amb



$M_{10-11} = \frac{1}{14} 3.90^2 \times 3504 = 3800 \text{ y/amb}$

$M_{11} = \frac{1}{2} 3.50^2 \times 3504 = 6700 \text{ y/amb}$

$T_{10} = \frac{3}{8} 3.50 \times 3504 = 5124 \text{ y/amb}$

$T_{11} = \frac{3}{8} 3.50 \times 3504 = 5124 \text{ y/amb}$

$\text{Cost} = \frac{8541}{0.9 \times 48 \times 30} = 6.5 \text{ y/amb}$

$S = \frac{6.5 \times 1.95 \times 30}{2} = 19 \text{ t}$

$\Delta \phi = 20 \quad \text{St} = 9 \times 1400 = 12.6 \text{ t}$

$A_{fp} = \frac{9500}{\sqrt{2} \times 1400} = 4.75 \text{ amb}$

- $M_{10-11} = 3800 \text{ y/amb} \quad \text{der. } 30 \times 50$

$\tau_c = 49 \text{ y/amb}$

$\tau_f = 1400 \text{ y/amb}$

$A_f = 6.15 \text{ amb}$

- $M_{11} = 6700 \text{ y/amb}$

$\tau_c = 63 \text{ y/amb}$

$\tau_f = 1200 \text{ y/amb}$

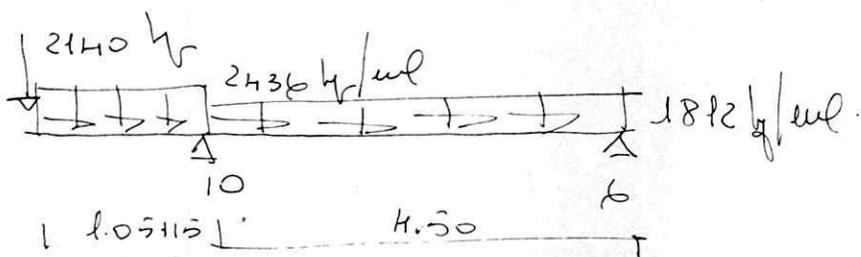
$A_f = 13 \text{ amb}$

Trade 6-10 - Murob

Solaris $\frac{3.50}{2} \times 650 = 1137 \text{ kg/ml}$
 pp. trave $0.30 \times 0.50 \times 2500 = 375 \text{ u}$
 Muro. $= \frac{300}{1812} \text{ kg/ml}$

Sulla murob. Solaris $c_s = 1137 \text{ kg/ml}$
 Muro. $2.80 \times 330 = 924 \text{ u}$
 pp. muro. $c_s = \frac{375}{2436} \text{ u}$

laineo concentrato Cozobolo $0.40 \times 0.20 \times 2500 \times \frac{3.50}{2} = 350 \text{ kg}$
 Muro. $330 \times 3.10 \times \frac{3.50}{2} = 1790 \text{ kg}$
 2140 kg



$M_{10} = 2140 \times 1.20 + \frac{1.20^2}{2} \times 2436 = 2568 + 1753 = 4321 \text{ kgm}$

$T_{10} = 2140 + 2436 \times 1.20 = 5063 \text{ kg}$

$T_{10}^H = 1812 \times \frac{4.50}{2} + \frac{4321}{4.50} = 4077 + 960 = 5037 \text{ kg}$

$T_{16} = 3117 \text{ kg}$ $2.80 \times 6 \text{ kg/es}$

$M_{10-6} = \frac{5037^2}{3624} - 4321 = 2673 \text{ kgm}$

- $M_{10} = 4321 \text{ kgm}$
 $A_f = 7 \text{ es}$

ser. 30 x 50

$R_c = 56 \text{ kg}$
 $R_f = 1400 \text{ kg}$

- $M_{10-6} = 2673 \text{ kgm}$

ser. 30 x 50

$R_c = 43 \text{ kg}$
 $R_f = 1400 \text{ kg}$

$A_f = 4.3 \text{ es}$

Trade 3 - measurements - 129 ft measure 3-10

$$\text{Wp. } 0.40 \times 0.20 \times 2500 = 200 \text{ y/hul.}$$

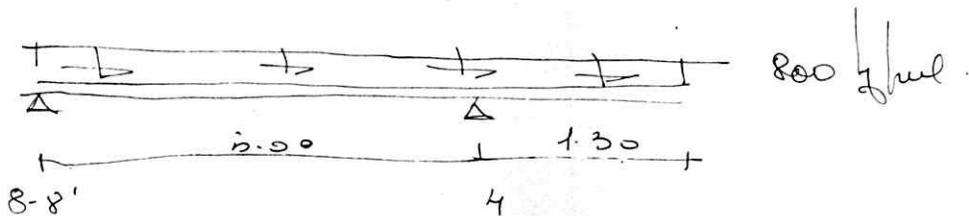
$$\text{msr. } 3.10 \times 330 = 1023 \text{ y/hul}$$

$$\underline{1223 \text{ y/hul}}$$

$$M = \frac{3.80^2}{12} \times 1223 = 1450 \text{ y}$$

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

Trade 4 - measure



$$M_H = \frac{1.30^2}{2} \times 800 = 676 \text{ y/hul. } \text{ter. } 30 \times 50 \quad A_f = 1.1 \text{ eq.}$$

$$T_H' = 800 \times 2.50 + \frac{676}{5.00} = 2000 + 136 = 2136 \text{ y}$$

$$M_{8-4} = \frac{2136^2}{1600} - 676 = 2174 \text{ y}$$

$$b = 60 \text{ cm.}$$

$$A_f = 9.5 \text{ eq.}$$

Travi al piano di copertura

Trave 1-2-3-4-4' ecc.

$$\text{soffitto } \frac{5.00}{2} \times 650 = 1625 \text{ g/mel}$$

$$\text{cornice } 1.20 \times 700 = 840 \text{ g/mel.}$$

$$\text{muro attico } 1.20 \times 330 = 396 \text{ g/mel}$$

$$\text{bordo cornice } 0.53 \times 0.20 \times 2500 = 265 \text{ g/mel.}$$

$$\text{tavole + tegole} = 300 \text{ g/mel}$$

$$\text{pp. trave } 0.30 \times 0.50 \times 2500 = 375 \text{ g/mel}$$

$$\underline{\underline{3801 \text{ g/mel}}}$$

I carichi e le dimensioni sono le stesse dell'ordine sottostante. Si adottano pertanto le medesime armature -

Trave 5-6-7-8-8'

Carichi e dimensioni come ordine sottostante

Trave 10-11-12

idem come sopra

Trave 1.5-9-11/12

$$\text{(1.5):} \quad \text{Cornice} : 0.60 \times 0.33 \times 2500 = 495 \text{ g/mel.}$$

$$\text{muro di attico} : 1.20 \times 330 = 396 \text{ u}$$

$$\text{tavole + teg.} : = 300 \text{ u}$$

$$\text{pp. trave } 0.30 \times 0.50 \times 2500 = 375 \text{ u}$$

$$\underline{\underline{1566 \text{ g/mel.}}}$$

(5-3): es + tolais:

$$\begin{array}{r} 1566 \text{ g/ml} \\ \text{tolais } 3.50/2 \times 650 : 1137 \text{ g} \\ \hline \text{-totale } 2703 \text{ g/ml} \end{array}$$

Carico concentrato sulle membrane:

$$020 \times 053 \times 2500 \left(\frac{3.80 + 1.10}{2} \right) = 795 \text{ g}$$

Caratteristiche elastiche e geometriche come trave 1.5-3 all'ordine rotto stante

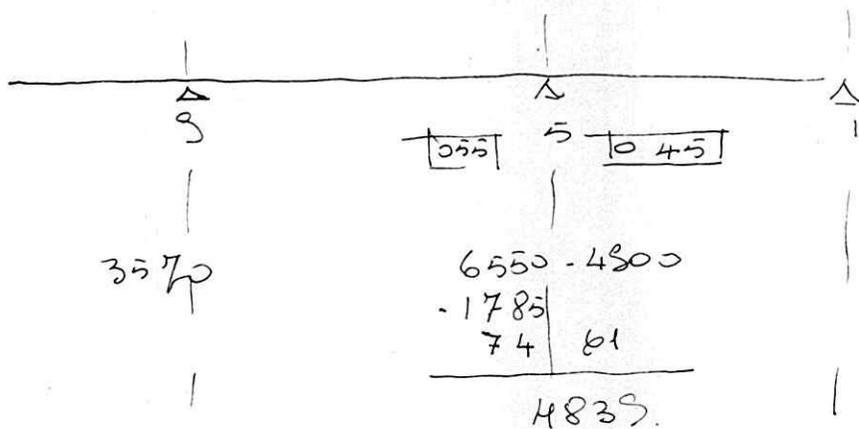
$$K_{5-1} = 045$$

$$K_{5-3} = 055$$

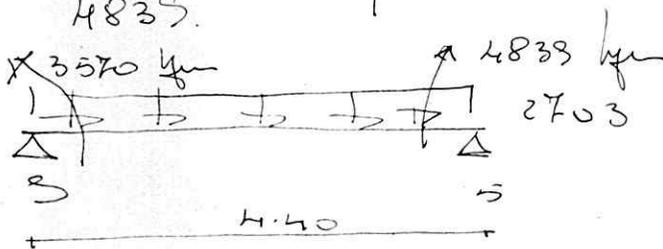
$$\bar{\mu}_{5-1} = \frac{1}{8} 5.00^2 \times 1566 = 4800 \text{ g}$$

$$\bar{\mu}_{5-3} = \frac{1}{8} 4.40^2 \times 2703 = 6550 \text{ g}$$

$$\mu_g = \frac{1.35^2}{2} \times 2703 + 795 \times 1.35 = 2500 + 1070 = 3570$$



Trave 3-5:



$$T_{35}'' = 2703 \times 2.20 - \frac{4839 - 3570}{4.40} = 5946 - 288 = 5658 \text{ g}$$

$$T_{5'} = 6234 \text{ g}$$

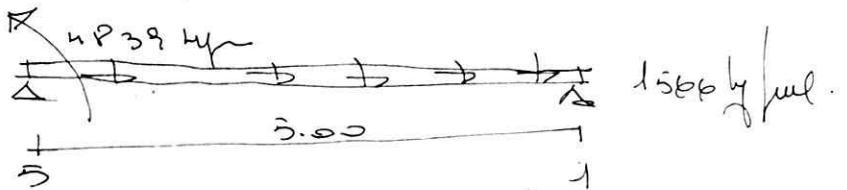
$$\mu_{g-5} = \frac{5658^2}{5406} - 3570 = 2351 \text{ g}$$

$$\text{per } 30 \times 50 \quad r_c = 40 \text{ g/g} \quad r_f = 1400 \text{ g/g}$$

$$\mu_g = 3570 \text{ g}; \text{ per } 30 \times 50 \quad r_c = 50 \text{ g/g} \quad r_f = 1400 \text{ g/g} \quad A_f = 3.75 \text{ cm} \quad A_f = 57.5 \text{ cm}$$

$u_5 = -4839 \text{ kg}$ per. 30×50 $\rho_c = 60 \text{ kg/m}^3$ $\rho_f = 1400 \text{ kg/m}^3$
 $A_f = 7.85 \text{ eq.}$

Trade 5-1



$$T_5'' = 1566 \times 2.50 + \frac{4839}{5.00} = 3915 + 967 = 4882 \text{ kg}$$

$$T_1' = 2948 \text{ kg}$$

$$u_{5-1} = \frac{4882^2}{3132} - 4839 = 2802 \text{ kg}$$

$$u_{5-1} = 2802 \text{ kg}$$

per. 30×50

$$\rho_c = 44 \text{ kg/m}^3 \quad \rho_f = 1400 \text{ kg/m}^3$$

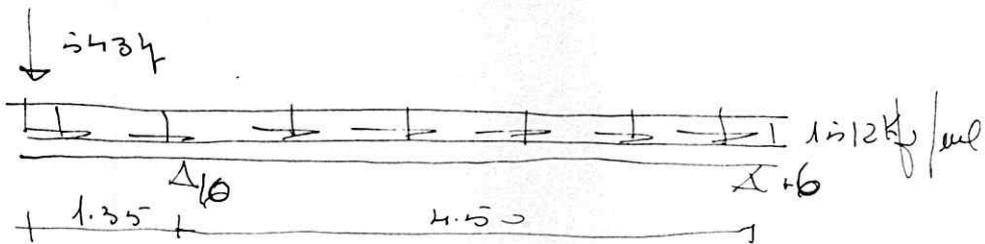
$$A_f = 4.5 \text{ eq.}$$

Trade 6-10 - Muro de

(6.10):	per.	$0.30 \times 0.50 \times 2500 = 375$	kg/m
	Sobrio	$3.50/2 \times 1650 = 1137$	"
		<hr/>	
		1512	"

Cargos concentrados sobre muros.

$$0.20 \times 0.50 \times 2500 \times \left(\frac{3.80}{2} + 0.15 \right) = 543 \text{ kg}$$



$$u_{10} = 543 \times 1.35 + \frac{1.35^2}{2} \times 1512 = 733 + 1377 = 2110 \text{ kg}$$

per. 30×50 $\rho_c = 37 \text{ kg/m}^3$ $\rho_f = 1400 \text{ kg/m}^3$ $A_f = 3.4 \text{ eq.}$

$$T_{10}' = 543 + 1512 \times 1.35 = 2041 + 543 = 2584 \text{ kg}$$

$$T_{10}'' = 1512 \times 4.50/2 + 2110/4.50 = 3402 + 468 = 3870 \text{ kg}$$

$$T_6 = 2934 \text{ kg}$$

$$= 2842 \text{ kg}$$

per. 30×50

$$A_f = 4.6 \text{ eq.}$$

$$\rho_c = 44 \text{ kg/m}^3$$

$$\rho_f = 1400 \text{ kg/m}^3$$

3024

$$u_{10-6} = \frac{3870^2}{3024} - 2110 =$$