IL DIRETTORE DEI LAVORI
Geom. Ing. Antonio Longo

ISTITUTO AUTONOMO CASE POPOLARI per la Provincia di BRINDISI

Dott. Ing. BERNARDO COSTANTINO
Ordine Prov. Ingegneri di Brindisi N. 190

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Costruzione di n° 20 alloggi in Francavilla Fontana, contrada Cretarossa, comparto C/9.

- CALCOLI STATICI -

ANALISI DEI CARICHI

- SOLAIO COPERTURA (MONOTRAVE 9×12 i = 50 cm TIPO ALA)

PESO PROPRIO: SOLAIO	H = (20+5) cm	325,00 Kg/mq
CARICHI PERMANENTI		150,00 "
CARICHI ACCIDENTALI		150,00 "
		625,00 Kg/mq

- BALCONI

PESO PROPRIO	325,00 Kg/mq
CARICHI PERMANENTI	50,00 "
CARICHI ACCIDENTALI	400,00 "
	775,00 Kg/mq

- SCALA

PESO PROPRIO	500,00 Kg/mq
CARICHI PERMANENTI	150,00 "
CARICHI ACCIDENTALI	400,00 "
	1050,00 Kg/mq

- SOLAIO TIPO

PESO PROPRIO	H = (20+5) cm	325,00 Kg/mq
CARICHI PERMANENTI		200,00 "
CARICHI ACCIDENTALI		200,00 "
		725,00 Kg/mq

- MURATURA 1000,00 Kg/ml
- PARAPETTO 375,00

REGIONE PUGLIA
UFFICIO DEL GENIO CIVILE DI BRINDISI
Si attesta che copia del presente atto risulta depositato presso questo ufficio ai sensi della legge 5.11.1971 n. 1086.
Brindisi li -1 MAR. 1995
IL FUNZIONARIO ADDETTO

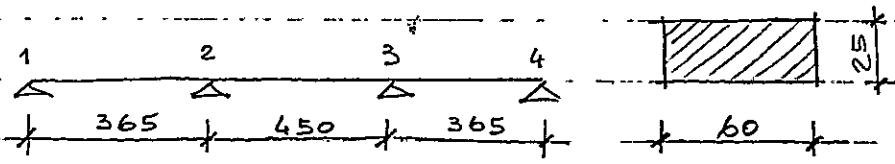
REGIONE PUGLIA - ASSESSORATO LL.PP. - BRINDISI - UFFICIO GENIO CIVILE

CARATTERISTICHE DEI MATERIALI:

- ACCIAIO: FeB 44K → σ_f = 2400 ÷ 2600 Kg/cm²
- CALCESTRUZZO: CLASSE 250. $\bar{\sigma}_b$ = 85 Kg/cm²; $\bar{\tau}_{b0}$ = 5,33 Kg/cm²; $\bar{\tau}_{b1}$ = 16,90 Kg/cm²
  σ_c = 59,5 " PER s ≤ 25 cm σ_c = 50,57 Kg/cm²

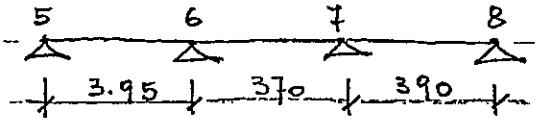
SOLAIO A QUOTA +15,05 (LASTRICI SOLARI)

- TRAVE 1-2-3-4



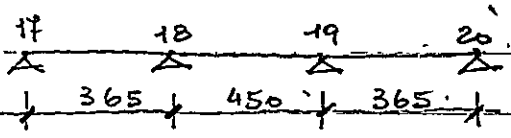
TRATTO (1.2.3)			TRATTO (3.4)	
PESO PROPRIO	0,60 × 0,25 × 1,00 × 2500	= 375,00 Kg/ml		= 375,00 Kg/ml
SOLAIO	625 × 4,35/2	= 1360,00 "	1360 + 625 × 1,50	= 2300,00 "
PARAPETTO		= 375,00 "		= 375,00 "
		2110,00 Kg/ml		3050,00 "

- TRAVE 5-6-7-8



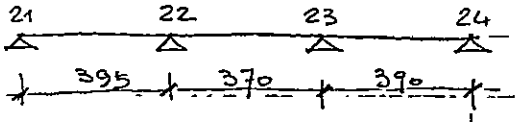
TRATTO (5.6)			TRATTO (6.7.8)	
PESO PROPRIO		= 375,00 Kg/ml		= 375,00 Kg/ml
SOLAIO	625 × (1,50 + 4,75/2)	= 2420,00 "	625 × 4,75/2	= 1490,00 "
PARAPETTO		= 375,00 "		= 375,00 "
		3170,00 Kg/ml		2240,00 Kg/ml

- TRAVE 17-18-19-20



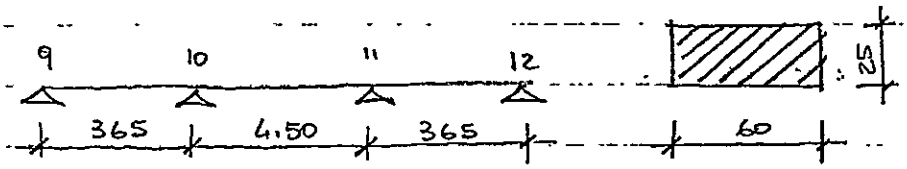
TRATTO (17.18.19)			TRATTO (19.20)	
PESO PROPRIO		= 375,00 Kg/ml		= 375,00 Kg/ml
SOLAIO	625 × 5,15/2	= 1610,00 "	1610 + 625 × 1,50	= 2550,00 "
PARAPETTO		= 375,00 "		= 375,00 "
		2360,00 Kg/ml		3300,00 Kg/ml

TRAVE 21-22-23-24



TRATTO (21.22)			TRATTO (22.23.24)	
PESO PROPRIO		= 375,00 Kg/ml		= 375,00 Kg/ml
SOLAIO	625 × (1,50 + 4,75/2)	= 2420,00 "	625 × 4,75/2	= 1490,00 "
PARAPETTO		= 375,00 "		= 375,00 "
		3170,00 Kg/ml		2240,00 Kg/ml

TRAVE 9.10.11.12



PESO PROPRIO = 375,00 Kg/ml

SOLAIO 625 × 9,70/2 = 3030,00 "

3405,00 Kg/ml.

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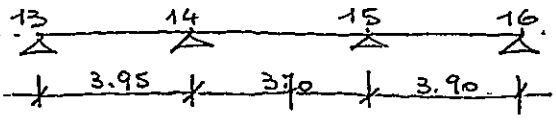
TRAVE 13.14.15.16

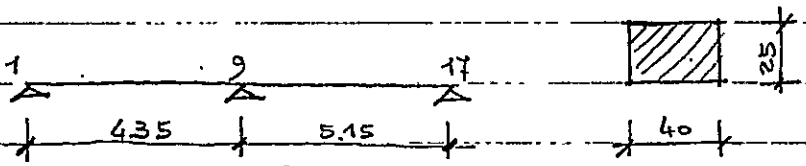


PESO PROPRIO = 375,00 Kg/ml

SOLAIO = 3030,00 "

3405,00 Kg/ml.

TRAVE 1.9.17

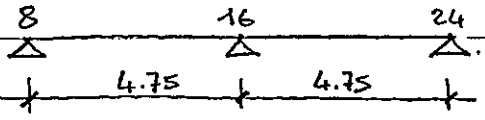


PESO PROPRIO 0,40 × 0,25 × 1,00 × 2500 = 250,00 Kg/ml.

PARAPETTO = 375,00 "

625,00 Kg/ml.

TRAVE 8.16.24

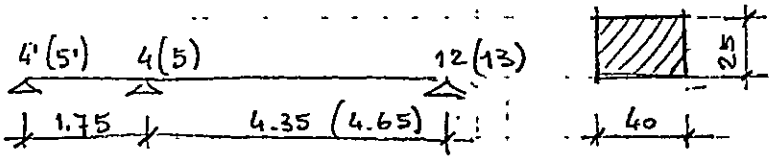


PESO PROPRIO = 250,00 Kg/ml.

PARAPETTO = 375,00 "

625,00 Kg/ml.

TRAVI 4'.4.12 - 5'.5.13.



PESO PROPRIO = 250,00 Kg/ml

MURATURA = 1000,00 "

1250,00 Kg/ml

$R_{1/2} = R_{2/1} = 2110 \times \frac{3,65}{2} = 3850$ kk

$R_{2/3} = R_{3/2} = 2110 \times \frac{4,50}{2} = 4750$ "

$R_{3/4} = R_{4/3} = 3050 \times \frac{3,65}{2} = 5570$ "

$R_{5/6} = R_{6/5} = 3170 \times \frac{3,95}{2} = 6260$ "

$R_{6/7} = R_{7/6} = 2240 \times \frac{3,70}{2} = 4150$ "

$R_{7/8} = R_{8/7} = 2240 \times \frac{3,90}{2} = 4370$ "

$R_{9/10} = R_{10/9} = 3405 \times \frac{3,65}{2} = 6220$ "

$R_{10/11} = R_{11/10} = 3405 \times \frac{4,50}{2} = 7660$ "

$R_{11/12} = R_{12/11} = 3405 \times \frac{3,65}{2} = 6220$ "

$R_{13/14} = R_{14/13} = 3405 \times \frac{3,95}{2} = 6730$ "

$R_{14/15} = R_{15/14} = 3405 \times \frac{3,70}{2} = 6300$ "

$R_{15/16} = R_{16/15} = 3405 \times \frac{3,90}{2} = 6640$ "

$R_{17/18} = R_{18/17} = 2360 \times \frac{3,65}{2} = 4310$ "

$R_{18/19} = R_{19/18} = 2360 \times \frac{4,50}{2} = 5310$ "

$R_{19/20} = R_{20/19} = 3300 \times \frac{3,65}{2} = 6020$ "

$R_{21/22} = R_{22/21} = 3170 \times \frac{3,95}{2} = 6260$ "

$R_{22/23} = R_{23/22} = 2240 \times \frac{3,70}{2} = 4150$ kk

$R_{23/24} = R_{24/23} = 2240 \times \frac{3,90}{2} = 4370$ "

$R_{1/9} = R_{9/1} = 625 \times \frac{4,35}{2} = 1360$ "

$R_{9/17} = R_{17/9} = 625 \times \frac{5,15}{2} = 1610$ "

$R_{8/16} = R_{16/8} = 625 \times \frac{4,75}{2} = 1490$ "

$R_{16/24} = R_{24/16} = 625 \times \frac{4,75}{2} = 1490$ "

$R_{4'/4} = R_{4/4'} = 1250 \times \frac{1,75}{2} = 1100$ "

$R_{4/12} = R_{12/4} = 1250 \times \frac{4,35}{2} = 2720$ "

$R_{5'/5} = R_{5/5'} = 1250 \times \frac{1,75}{2} = 1100$ "

$R_{5/13} = R_{13/5} = 1250 \times \frac{4,65}{2} = 2910$ "

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CONTINUAZIONE SOLAIO A QUOTA + 15.05 (LASTRICI SOLARI)

- CALCOLO ORDITURA TRAVI -

- TRAVE 1-2-3-4

TRATTO 1-2 $M = 2110 \times \frac{3{,}65^2}{10} = 2810$ kgm ; $\sqrt{M/b} = \sqrt{\frac{2810}{0{,}60}} = 68{,}43$; $C_h = \frac{22}{68{,}43} = 0{,}321 \xrightarrow[A_f = A'_f]{k_f = 2600} \sigma_c \cong 60$ kg/

$A_f = A'_f = 0{,}00131 \times 68{,}43 \times 60 = 5{,}38\,cm^2$

TRATTO 2-3 $M = 2110 \times \frac{4{,}50^2}{12} = 3560$ " ; $\sqrt{M/b} = \sqrt{\frac{3560}{0{,}60}} = 77{,}03$; $C_h = \frac{22}{77{,}03} = 0{,}285 \xrightarrow[A_f = A'_f]{k_f = 2600} \sigma_c \cong 66$ "

$A_f = A'_f = 0{,}00146 \times 77{,}03 \times 60 = 6{,}75\,cm^2$

TRATTO 3-4 $M = 3050 \times \frac{3{,}65^2}{10} = 4060$ " $\sqrt{M/b} = \sqrt{\frac{4060}{0{,}60}} = 82{,}26$; $C_h = \frac{22}{82{,}26} = 0{,}267 \xrightarrow[A_f = A'_f]{k_f = 2600} \sigma_c \cong 70$ "

$A_f = A'_f = 0{,}00156 \times 82{,}26 \times 60 = 7{,}70\,cm^2$

- TRAVE 5-6-7-8

TRATTO 5-6 $M = 3170 \times \frac{3{,}95^2}{10} = 4950$ " $\sqrt{M/b} = \sqrt{\frac{4950}{0{,}60}} = 90{,}83$; $C_h = \frac{22}{90{,}83} = 0{,}242 \xrightarrow[A_f = A'_f]{k_f = 2600} \sigma_c \cong 77$ "

$A_f = A'_f = 0{,}00174 \times 90{,}83 \times 60 = 9{,}48\,cm^2$

TRATTO 6-7 $M = 2240 \times \frac{3{,}70^2}{12} = 2560$ " $\sqrt{M/b} = \sqrt{\frac{2560}{0{,}60}} = 65{,}32$; $C_h = \frac{22}{65{,}32} = 0{,}337 \xrightarrow[A_f = A'_f]{k_f = 2600} \sigma_c \cong 57$ "

$A_f = A'_f = 0{,}00122 \times 65{,}32 \times 60 = 4{,}78\,cm^2$

TRATTO 7-8 $M = 2240 \times \frac{3{,}90^2}{10} = 3410$ " $\sqrt{M/b} = \sqrt{\frac{3410}{0{,}60}} = 75{,}39$; $C_h = \frac{22}{75{,}39} = 0{,}292 \xrightarrow[A_f = A'_f]{k_f = 2600} \sigma_c \cong 65$ "

$A_f = A'_f = 0{,}00143 \times 75{,}39 \times 60 = 6{,}47\,cm^2$

- TRAVE 17-18-19-20

TRATTO 17-18 $M = 2360 \times \frac{3{,}65^2}{10} = 3150$ " $\sqrt{M/b} = \sqrt{\frac{3150}{0{,}60}} = 72{,}46$; $C_h = \frac{22}{72{,}46} = 0{,}304 \xrightarrow[A_f = A'_f]{k_f = 2600} \sigma_c \cong 58$ "

$A_f = A'_f = 0{,}00137 \times 72{,}46 \times 60 = 5{,}96\,cm^2$

TRATTO 18-19 $M = 2360 \times \frac{4{,}50^2}{12} = 3980$ " $\sqrt{M/b} = \sqrt{\frac{3980}{0{,}60}} = 81{,}44$; $C_h = \frac{22}{81{,}44} = 0{,}270 \xrightarrow[A_f = A'_f]{k_f = 2600} \sigma_c \cong 70$ "

$A_f = A'_f = 0{,}00156 \times 81{,}44 \times 60 = 7{,}63\,cm^2$

TRATTO 19-20 $M = 3300 \times \frac{3{,}65^2}{10} = 4400$ " $\sqrt{M/b} = \sqrt{\frac{4400}{0{,}60}} = 85{,}63$; $C_h = \frac{22}{85{,}63} = 0{,}257 \xrightarrow[A_f = A'_f]{k_f = 2600} \sigma_c \cong 73$ "

$A_f = A'_f = 0{,}00163 \times 85{,}63 \times 60 = 8{,}38\,cm^2$

TRAVE 21.22.23.24

TRATTO 21.22 $M = 3170 \times \frac{3{,}95^2}{10} = 4950$ KGM ; $\sqrt{M/b} = \sqrt{\frac{4950}{0{,}60}} = 90{,}83$; $c_h = \frac{22}{90{,}83} = 0{,}242 \xrightarrow[A_f = A'_f]{K_f = 2600} \sigma_c \cong 77$ Kg/cm²

$A_f = A'_f = 0{,}00174 \times 90{,}83 \times 60 = 9{,}48$ cm²

TRATTO 22-23. $M = 2240 \times \frac{3{,}70^2}{12} = 2560$ " ; $\sqrt{M/b} = \sqrt{\frac{2560}{0{,}60}} = 65{,}32$; $c_h = \frac{22}{65{,}32} = 0{,}336 \xrightarrow[A_f = A'_f]{K_f = 2600} \sigma_c \cong 58$ "

$A_f = A'_f = 0{,}00125 \times 65{,}32 \times 60 = 4{,}90$ cm²

TRATTO 23-24 $M = 2240 \times \frac{3{,}90^2}{10} = 3410$ " ; $\sqrt{\frac{M}{b}} = \sqrt{\frac{3410}{0{,}60}} = 75{,}39$; $c_h = \frac{22}{75{,}39} = 0{,}292 \xrightarrow[A_f = A'_f]{K_f = 2600} \sigma_c \cong 65$ "

$A_f = A'_f = 0{,}00143 \times 75{,}39 \times 60 = 6{,}47$ cm²

TRAVE 9-10-11-12

TRATTO 9-10 $M = 3405 \times \frac{3{,}65^2}{10} = 4540$ KGM ; $\sqrt{\frac{M}{b}} = \sqrt{\frac{4540}{0{,}60}} = 86{,}99$; $c_h = \frac{22}{86{,}99} = 0{,}253 \xrightarrow[A_f = A'_f]{K_f = 2600} \sigma_c \cong 74$ "

$A_f = A'_f = 0{,}00167 \times 86{,}99 \times 60 = 8{,}72$ cm²

TRATTO 10-11 $M = 3405 \times \frac{4{,}50^2}{12} = 5750$ " ; $\sqrt{\frac{M}{b}} = \sqrt{\frac{5750}{0{,}60}} = 97{,}89$; $c_h = \frac{22}{97{,}89} = 0{,}225 \xrightarrow[A_f = A'_f]{K_f = 2600} \sigma_c \cong 82$ "

$A_f = A'_f = 0{,}00188 \times 97{,}89 \times 60 = 11{,}04$ cm²

TRATTO 11-12 $M = 3405 \times \frac{3{,}65^2}{10} = 4540$ " ; $\sqrt{M/b} = \sqrt{\frac{4540}{0{,}60}} = 86{,}99$; $c_h = \frac{22}{86{,}99} = 0{,}253 \xrightarrow[A_f = A'_f]{K_f = 2600} \sigma_c \cong 74$ "

$A_f = A'_f = 0{,}00166 \times 86{,}99 \times 60 = 8{,}66$ cm²

TRAVE 13-14-15-16

TRATTO 13-14 $M = 3405 \times \frac{3{,}95^2}{10} = 5310$ KGM ; $\sqrt{M/b} = \sqrt{\frac{5310}{0{,}60}} = 94{,}07$; $c_h = \frac{22}{94{,}07} = 0{,}234 \xrightarrow[A_f = A'_f]{K_f = 2600} \sigma_c \cong 79$ "

$A_f = A'_f = 0{,}00167 \times 94{,}07 \times 60 = 9{,}42$ cm²

TRATTO 14-15 $M = 3405 \times \frac{3{,}70^2}{12} = 3890$ " ; $\sqrt{\frac{M}{b}} = \sqrt{\frac{3890}{0{,}60}} = 80{,}52$; $c_h = \frac{22}{80{,}52} = 0{,}273 \xrightarrow[A_f = A'_f]{K_f = 2600} \sigma_c \cong 69$ "

$A_f = A'_f = 0{,}00154 \times 80{,}52 \times 60 = 7{,}44$ cm²

TRATTO 15-16 $M = 3405 \times \frac{3{,}90^2}{10} = 5180$ " ; $\sqrt{\frac{M}{b}} = \sqrt{\frac{5180}{0{,}60}} = 92{,}92$; $c_h = \frac{22}{92{,}92} = 0{,}236 \xrightarrow[A_f = A'_f]{K_f = 2600} \sigma_c \cong 79$ "

$A_f = A'_f = 0{,}00179 \times 92{,}92 \times 60 = 9{,}98$ cm²

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TRAVE 1-9-17

TRATTO 1-9 $M = 625 \times \frac{4{,}35^2}{8} = 1480$ KgM ; $\sqrt{M/b} = \sqrt{\frac{1480}{0{,}40}} = 60{,}83$; $c_h = \frac{22}{60{,}83} = 0{,}361 \xrightarrow[A_f = A'_f]{K_f = 2600} \sigma_c < 55$ Kg/cm²

$A_f = A'_f = 0{,}00119 \times 60{,}83 \times 40 = 2{,}89$ cm²

TRATTO 9-17 $M = 625 \times \frac{5{,}15^2}{8} = 2070$ " ; $\sqrt{M/b} = \sqrt{\frac{2070}{0{,}40}} = 71{,}94$; $c_h = \frac{22}{71{,}94} = 0{,}306 \xrightarrow[A_f = A'_f]{K_f = 2600} \sigma_c \cong 63$ "

$A_f = A'_f = 0{,}00137 \times 71{,}94 \times 40 = 3{,}94$ cm²

TRAVE 8-16-24

TRATTO 8-16 $M = 625 \times \frac{4{,}75^2}{8} = 1760$ KgM ; $\sqrt{M/b} = \sqrt{\frac{1760}{0{,}40}} = 66{,}33$; $c_h = \frac{22}{66{,}33} = 0{,}331 \xrightarrow[A_f = A'_f]{K_f = 2600} \sigma_c \cong 58$ "

$A_f = A'_f = 0{,}00127 \times 66{,}33 \times 40 = 3{,}37$ cm²

TRATTO 16-24 $M = 625 \times \frac{4{,}75^2}{8} = 1760$ " ; $\sqrt{M/b} = \sqrt{\frac{1760}{0{,}40}} = 66{,}33$; $c_h = \frac{22}{66{,}33} = 0{,}331 \xrightarrow[A_f = A'_f]{K_f = 2600} \sigma_c \cong 58$ "

$A_f = A'_f = 0{,}00127 \times 66{,}33 \times 40 = 3{,}37$ cm²

TRAVE 4'-4-12

TRATTO 4'-4 $M = 1250 \times \frac{1{,}75^2}{10} = 380$ KgM ;

TRATTO 4-12 $M = 1250 \times \frac{4{,}35^2}{10} = 2370$ " ; $\sqrt{M/b} = \sqrt{\frac{2370}{0{,}40}} = 76{,}97$; $c_h = \frac{22}{76{,}97} = 0{,}285 \xrightarrow[A_f = A'_f]{K_f = 2600} \sigma_c \cong 67$ "

$A_f = A'_f = 0{,}00147 \times 76{,}97 \times 40 = 4{,}53$ cm²

TRAVE 5'-5-13

TRATTO 5'-5 $M = 1250 \times \frac{1{,}75^2}{10} = 380$ KgM ;

TRATTO 5-13 $M = 1250 \times \frac{4{,}65^2}{10} = 2700$ KgM ; $\sqrt{M/b} = \sqrt{\frac{2700}{0{,}40}} = 82{,}16$; $c_h = \frac{22}{82{,}16} = 0{,}267 \xrightarrow[A_f = A'_f]{K_f = 2600} \sigma_c \cong 70$ "

$A_f = A'_f = 0{,}00156 \times 82{,}16 \times 40 = 5{,}13$ cm²

RIEPILOGO PILASTRI PIANO 4°

PILASTRO						
1	$R_{1/2} + R_{1/9}$	= 3850	+ 1360		= 5.210	KG
2	$R_{2/1} + R_{2/3}$	= 3850	+ 4750		= 8600	"
3	$R_{3/2} + R_{3/4}$	= 4750	+ 5570		= 10.320	"
4	$R_{4/3} + R_{4/4'} + R_{4/12}$	= 5570	+ 1100	+ 2720	= 9.390	"
4'	$R_{4'/4}$	= 1100			= 1.100	"
5	$R_{5/5'} + R_{5/6} + R_{5/13}$	= 1100	+ 6260	+ 2910	= 10.270	"
5'	$R_{5'/5}$	= 1100			= 1.100	"
6	$R_{6/5} + R_{6/7}$	= 6260	+ 4150		= 10.410	"
7	$R_{7/6} + R_{7/8}$	= 4150	+ 4370		= 8.520	"
8	$R_{8/7} + R_{8/16}$	= 4370	+ 1490		= 5.860	"
9	$R_{9/1} + R_{9/10} + R_{9/17}$	= 1360	+ 6220	+ 1610	= 9.190	"
10	$R_{10/9} + R_{10/11}$	= 6220	+ 7660		= 13.880	"
11	$R_{11/10} + R_{11/12}$	= 7660	+ 6220		= 13.880	"
12	$R_{12/11} + R_{12/4}$	= 6220	+ 2720		= 8.940	"
13	$R_{13/5} + R_{13/14}$	= 2910	+ 6730		= 9.640	"
14	$R_{14/13} + R_{14/15}$	= 6730	+ 6300		= 13.030	"
15	$R_{15/14} + R_{15/16}$	= 6300	+ 6640		= 12.940	"
16	$R_{16/15} + R_{16/8} + R_{16/24}$	= 6640	+ 1490	+ 1490	= 9.620	"
17	$R_{17/9} + R_{17/18}$	= 1610	+ 4310		= 5.920	"
18	$R_{18/17} + R_{18/19}$	= 4310	+ 5310		= 9.620	"
19	$R_{19/18} + R_{19/20}$	= 5310	+ 6020		= 11.330	"
20	$R_{20/19}$	= 6020			= 6.020	"
21	$R_{21/22}$	= 6260			= 6.260	"
22	$R_{22/21} + R_{22/23}$	= 6260	+ 4150		= 10.410	"
23	$R_{23/22} + R_{23/24}$	= 4150	+ 4370		= 8.520	"
24	$R_{24/23} + R_{24/16}$	= 4370	+ 1490		= 5.860	"

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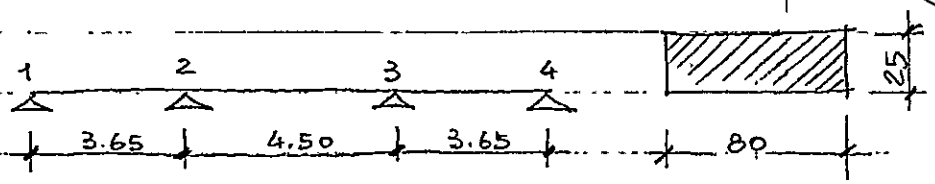
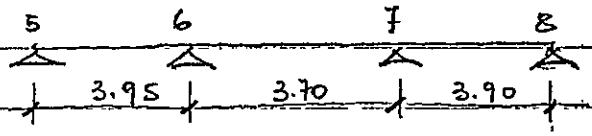
SOLAIO TIPO (A QUOTA +12,01 ; +8.97 ; +5,93 ; +2,89)

TRAVE 1.2.3.4



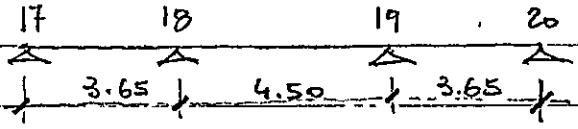
TRATTO (1.2.3)			TRATTO (3.4)	
PESO PROPRIO	: 0,80 × 0,25 × 1,00 × 2500	= 500,00 Kg/m		= 500,00 Kg/m
SOLAIO	: 725 × 4,35/2	≈ 1570,00 "	1570 + 775 × 1,50	= 2730,00 "
MURATURA		= 1000,00 "		= 1000,00 "
		3070,00 Kg/m		4230,00 Kg/m

TRAVE 5.6.7.8



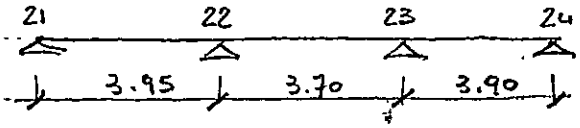
TRATTO (5.6)			TRATTO (6.7.8)	
PESO PROPRIO :		= 500,00 Kg/m		= 500,00 Kg/m
SOLAIO	: 725 × 4,75/2	= 1720,00 "		= 1720,00 "
BALCONE	775 × 1,50	= 1160,00 "		—
MURATURA		= 1000,00 "		= 1000,00 "
		4380,00 Kg/m		3220,00 Kg/m

TRAVE 17.18.19.20



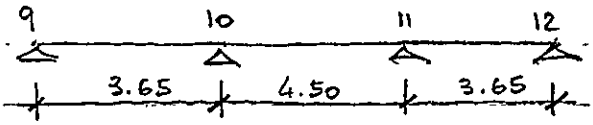
TRATTO (17.18.19)			TRATTO (19.20)	
PESO PROPRIO		= 500,00 Kg/m		= 500,00 Kg/m
SOLAIO	725 × 5,15/2	= 1870,00 "		= 1870,00 "
BALCONE		—	775 × 1,50	= 1160,00 "
MURATURA		= 1000,00 "		= 1000,00 "
		3370,00 Kg/m		4530,00 Kg/m

TRAVE 21.22.23.24



TRATTO (21.22)			TRATTO (22.23.24)	
PESO PROPRIO		= 500,00 Kg/ml.		= 500,00 Kg/ml.
SOLAIO	725 x 4,75/2	= 1720,00 "		= 1720,00 "
BALCONE	775 x 1,50	= 1160,00 "		
MURATURA		= 1000,00 "		= 1000,00 "
		4380,00 Kg/ml.		3220,00 Kg/ml.

TRAVE 9.10.11.12

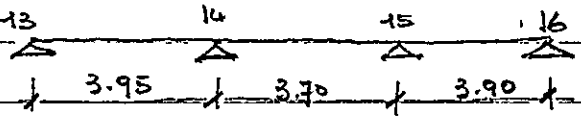


PESO PROPRIO = 500,00 Kg/ml.

SOLAIO 725 x 9,70/2 = 3520,00 "

4020,00 Kg/ml.

TRAVE 13.14.15.16

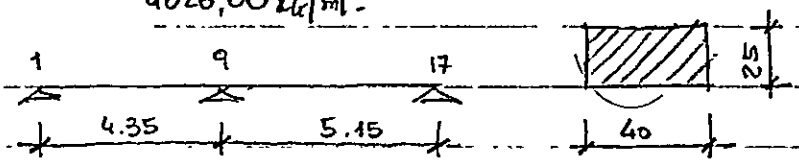


PESO PROPRIO = 500,00 Kg/ml.

SOLAIO = 3520,00 "

4020,00 Kg/ml.

TRAVE 1.9.17

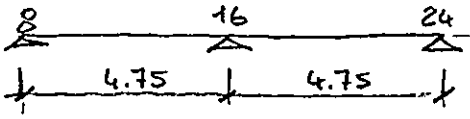


PESO PROPRIO 0,40 x 0,25 x 1,00 x 2500 = 250,00 Kg/ml.

MURATURA = 1000,00 "

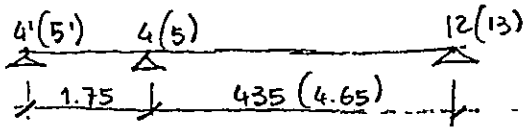
1250,00 Kg/ml.

TRAVE 8.16.24



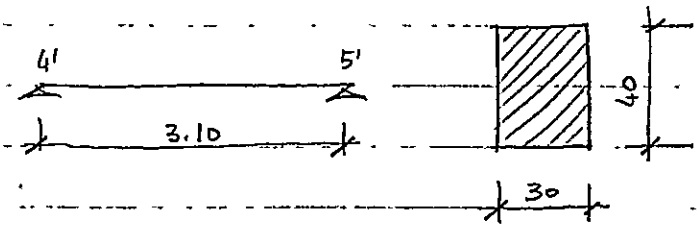
1250,00 Kg/ml.

TRAVI 4'.4.12 - 5'.5.13



1250,00 Kg/ml.

TRAVE 4'-5'



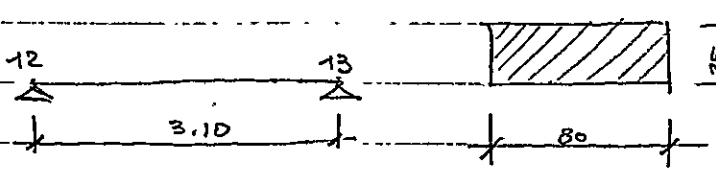
PESO PROPRIO = 0,30 x 0,40 x 1,00 x 2500 = 300,00 Kg/ml

MURATURA = 1000,00 "

SCALA 1050 x 6,10/2 = 3200,00 "

4500,00 Kg/ml.

TRAVE 12-13

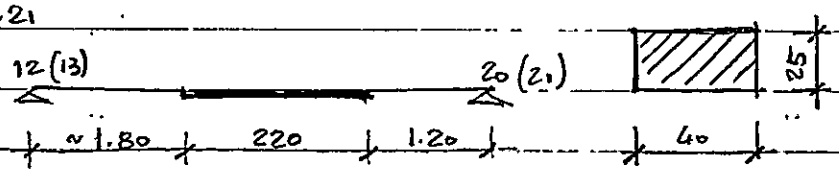


PESO PROPRIO 0,80 x 0,25 x 1,00 x 2500 = 500,00 Kg/ml.

SCALA 1050 x 7,50/2 = 3940,00 "

4440,00 Kg/ml.

TRAVI 12-20 - 13-21



PESO PROPRIO = 250,00 Kg/ml.

MURATURA = 1000,00 "

1250,00 Kg/ml.

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$R_{1/2} = R_{2/1} = 3070 \times \frac{3,65}{2} = 5600$ KG.

$R_{2/3} = R_{3/2} = 3070 \times \frac{4,50}{2} = 6910$ "

$R_{3/4} = R_{4/3} = 4230 \times \frac{3,65}{2} = 7720$ "

$R_{5/6} = R_{6/5} = 4380 \times \frac{3,95}{2} = 8650$ "

$R_{6/7} = R_{7/6} = 3220 \times \frac{3,70}{2} = 5960$ "

$R_{7/8} = R_{8/7} = 3220 \times \frac{3,90}{2} = 6280$ "

$R_{9/10} = R_{10/9} = 4020 \times \frac{3,65}{2} = 7340$ "

$R_{10/11} = R_{11/10} = 4020 \times \frac{4,50}{2} = 9050$ "

$R_{11/12} = R_{12/11} = 4020 \times \frac{3,65}{2} = 7340$ "

$R_{13/14} = R_{14/13} = 4020 \times \frac{3,95}{2} = 7940$ "

$R_{14/15} = R_{15/14} = 4020 \times \frac{3,70}{2} = 7440$ "

$R_{15/16} = R_{16/15} = 4020 \times \frac{3,90}{2} = 7840$ "

$R_{17/18} = R_{18/17} = 3370 \times \frac{3,65}{2} = 6150$ "

$R_{18/19} = R_{19/18} = 3370 \times \frac{4,50}{2} = 7580$ "

$R_{19/20} = R_{20/19} = 4530 \times \frac{3,65}{2} = 8270$ "

$R_{21/22} = R_{22/21} = 4380 \times \frac{3,95}{2} = 8650$ "

$R_{22/23} = R_{23/22} = 3220 \times \frac{3,70}{2} = 5960$ KG.

$R_{23/24} = R_{24/23} = 3220 \times \frac{3,90}{2} = 6280$ "

$R_{1/9} = R_{9/1} = 1250 \times \frac{4,35}{2} = 2720$ "

$R_{9/17} = R_{17/9} = 1250 \times \frac{5,15}{2} = 3220$ "

$R_{8/16} = R_{16/8} = 1250 \times 4,75/2 = 2970$ "

$R_{16/24} = R_{24/16} = 1250 \times 4,75/2 = 2970$ "

$R_{4'/5'} = R_{5'/4'} = 4500 \times \frac{3,10}{2} = 6980$ "

$R_{4'/4} = R_{4/4'} = 1250 \times \frac{1,75}{2} = 1090$ "

$R_{4/12} = R_{12/4} = 1250 \times \frac{4,35}{2} = 2720$ "

$R_{5'/5} = R_{5/5'} = 1250 \times \frac{1,75}{2} = 1090$ "

$R_{5/13} = R_{13/5} = 1250 \times \frac{4,65}{2} = 2910$ "

$R_{12/20} = R_{20/12} = 1250 \times \frac{5,20}{2} = 3250$ "

$R_{13/21} = R_{21/13} = 1250 \times \frac{5,20}{2} = 3250$ "

$R_{12/13} = R_{13/12} = 4440 \times \frac{3,10}{2} = 6880$ "

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CONTINUAZIONE SOLAIO TIPO

- CALCOLO ORDITURA TRAVI -

TRAVE 1.2.3.4

TRATTO 1-2 $M = 3070 \times \frac{3{,}65^2}{11} = 3720$ KGM ; $\sqrt{M/b} = \sqrt{\frac{3270}{0{,}80}} = 63{,}93$; $C_h = \frac{22}{63{,}93} = 0{,}344 \xrightarrow[A_f = A'_f]{K_f = 2600} \sigma_c \cong 55$ Kg/cm²

$A_f = A'_f = 0{,}00119 \times 63{,}93 \times 80 = 6{,}08$ cm²

TRATTO 2-3 $M = 3070 \times \frac{4{,}50^2}{12} = 5180$ " ; $\sqrt{M/b} = \sqrt{\frac{5180}{0{,}80}} = 80{,}47$; $C_h = \frac{22}{80{,}47} = 0{,}273 \xrightarrow[A_f = A'_f]{K_f = 2600} \sigma_c \cong 69$ "

$A_f = A'_f = 0{,}00154 \times 80{,}47 \times 80 = 9{,}91$ cm²

TRATTO 3-4 $M = 4230 \times \frac{3{,}65^2}{11} = 5130$ " ; $\sqrt{M/b} = \sqrt{\frac{5130}{0{,}80}} = 80{,}08$; $C_h = \frac{22}{80{,}08} = 0{,}275 \xrightarrow[A_f = A'_f]{K_f = 2600} \sigma_c \cong 69$ "

$A_f = A'_f = 0{,}00152 \times 80{,}08 \times 80 = 9{,}74$ cm²

TRAVE 5.6.7.8

TRATTO 5-6 $M = 4380 \times \frac{3{,}95^2}{11} = 6220$ KGM ; $\sqrt{M/b} = \sqrt{\frac{6220}{0{,}80}} = 88{,}18$; $C_h = \frac{22}{88{,}18} = 0{,}249 \xrightarrow[A_f = A'_f]{K_f = 2600} \sigma_c \cong 75$ Kg/cm²

$A_f = A'_f = 0{,}00169 \times 88{,}18 \times 80 = 11{,}92$ cm²

TRATTO 6-7 $M = 3220 \times \frac{3{,}70^2}{12} = 3680$ " ; $\sqrt{M/b} = \sqrt{\frac{3680}{0{,}80}} = 67{,}82$; $C_h = \frac{22}{67{,}82} = 0{,}324 \xrightarrow[A_f = A'_f]{K_f = 2600} \sigma_c \cong 59$ "

$A_f = A'_f = 0{,}00129 \times 67{,}82 \times 80 = 6{,}99$ cm²

TRATTO 7-8 $M = 3220 \times \frac{3{,}90^2}{11} = 4450$ " ; $\sqrt{M/b} = \sqrt{\frac{4450}{0{,}80}} = 74{,}58$; $C_h = \frac{22}{74{,}58} = 0{,}295 \xrightarrow[A_f = A'_f]{K_f = 2600} \sigma_c \cong 65$ "

$A_f = A'_f = 0{,}00143 \times 74{,}58 \times 80 = 8{,}53$ cm²

TRAVE 17.18.19.20

TRATTO 17.18 $M = 3370 \times \frac{3{,}65^2}{11} = 4080$ KGM ; $\sqrt{M/b} = \sqrt{\frac{4080}{0{,}80}} = 71{,}41$; $C_h = \frac{22}{71{,}41} = 0{,}308 \xrightarrow[A_f = A'_f]{K_f = 2600} \sigma_c \cong 63$ "

$A_f = A'_f = 0{,}00135 \times 71{,}41 \times 80 = 7{,}71$ cm²

TRATTO 18-19 $M = 3370 \times \frac{4{,}50^2}{12} = 5690$ " ; $\sqrt{M/b} = \sqrt{\frac{5690}{0{,}80}} = 84{,}33$; $C_h = \frac{22}{84{,}33} = 0{,}260 \xrightarrow[A'_f = A'_f]{K_f = 2600} \sigma_c = 73$ "

$A_f = A'_f = 0{,}00163 \times 84{,}33 \times 80 = 10{,}99$ cm²

TRATTO 19-20 $M = 4530 \times \frac{3{,}65^2}{11} = 5490$ " ; $\sqrt{M/b} = \sqrt{\frac{5490}{0{,}80}} = 82{,}84$; $C_h = \frac{22}{82{,}84} = 0{,}265 \xrightarrow[A_f = A'_f]{K_f = 2600} \sigma_c \cong 71$ "

$A_f = A'_f = 0{,}00159 \times 82{,}84 \times 80 = 10{,}53$ cm²

- TRAVE 21-22-23-24

TRATTO 21-22 $M = 4380 \times \frac{3{,}95^2}{11} = 6210$ kgM; $\sqrt{M/b} = \sqrt{\frac{6210}{0{,}80}} = 88{,}10$; $c_n = \frac{22}{88{,}10} = 0{,}250 \xrightarrow[A_f = A'_f]{\gamma_f = 2600} \sigma_c \cong 75$ kg/cm²

$A_f = A'_f = 0{,}00169 \times 88{,}10 \times 80 = 11{,}91\,cm^2$

TRATTO 22-23 $M = 3220 \times \frac{3{,}70^2}{12} = 3680$ " ; $\sqrt{M/b} = \sqrt{\frac{3680}{0{,}80}} = 67{,}82$; $c_n = \frac{22}{67{,}82} = 0{,}324 \xrightarrow[A_f = A'_f]{\gamma_f = 2600} \sigma_c \cong 59$ "

$A_f = A'_f = 0{,}00127 \times 67{,}82 \times 80 = 6{,}89\,cm^2$

TRATTO 23-24 $M = 3220 \times \frac{3{,}90^2}{11} = 4450$ " $\sqrt{M/b} = \sqrt{\frac{4450}{0{,}80}} = 74{,}58$; $c_n = \frac{22}{74{,}58} = 0{,}294 \xrightarrow[A_f = A'_f]{\gamma_f = 2600} \sigma_c \cong 65$ "

$A_f = A'_f = 0{,}00143 \times 74{,}58 \times 80 = 8{,}53\,cm^2$

TRAVE 9-10-11-12

TRATTO 9-10 $M = 4020 \times \frac{3{,}65^2}{11} = 4870$ kgM; $\sqrt{M/b} = \sqrt{\frac{4870}{0{,}80}} = 78{,}02$; $c_n = \frac{22}{78{,}02} = 0{,}282 \xrightarrow[A_f = A'_f]{\gamma_f = 2600} \sigma_c \cong 67$ kg/cm²

$A_f = A'_f = 0{,}00148 \times 78{,}02 \times 80 = 9{,}23\,cm^2$

TRATTO 10-11 $M = 4020 \times \frac{4{,}50^2}{12} = 6790$ " ; $\sqrt{M/b} = \sqrt{\frac{6790}{0{,}80}} = 92{,}13$; $c_n = \frac{22}{92{,}13} = 0{,}238 \xrightarrow[A_f = A'_f]{\gamma_f = 2600} \sigma_c \cong 78$ "

$A_f = A'_f = 0{,}00179 \times 92{,}13 \times 80 = 13{,}19\,cm^2$

TRATTO 11-12 $M = 4020 \times \frac{3{,}65^2}{11} = 4870$ " $\sqrt{M/b} = \sqrt{\frac{4870}{0{,}80}} = 78{,}02$; $c_n = \frac{22}{78{,}02} = 0{,}282 \xrightarrow[A_f = A'_f]{\gamma_f = 2600} \sigma_c \cong 67$ "

$A_f = A'_f = 0{,}00148 \times 78{,}02 \times 80 = 9{,}23\,cm^2$

TRAVE 13-14-15-16

TRATTO 13-14 $M = 4020 \times \frac{3{,}95^2}{11} = 5700$ kgM; $\sqrt{M/b} = \sqrt{\frac{5700}{0{,}80}} = 84{,}41$; $c_n = \frac{22}{84{,}41} = 0{,}260 \xrightarrow[A_f = A'_f]{\gamma_f = 2600} \sigma_c \cong 73$ kg/cm²

$A_f = A'_f = 0{,}00160 \times 84{,}41 \times 80 = 10{,}80\,cm^2$

TRATTO 14-15 $M = 4020 \times \frac{3{,}70^2}{12} = 4590$ " ; $\sqrt{M/b} = \sqrt{\frac{4590}{0{,}80}} = 75{,}75$; $c_n = \frac{22}{75{,}75} = 0{,}290 \xrightarrow[A_f = A'_f]{\gamma_f = 2600} \sigma_c \cong 65$ "

$A_f = A'_f = 0{,}00143 \times 75{,}75 \times 80 = 8{,}66\,cm^2$

TRATTO 15-16 $M = 4020 \times \frac{3{,}90^2}{11} = 5560$ " ; $\sqrt{M/b} = \sqrt{\frac{5560}{0{,}80}} = 83{,}37$; $c_n = \frac{22}{83{,}37} = 0{,}263 \xrightarrow[A_f = A'_f]{\gamma_f = 2600} \sigma_c \cong 72$ "

$A_f = A'_f = 0{,}00160 \times 83{,}37 \times 80 = 10{,}67\,cm^2$

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TRAVE 1.9.17

TRATTO 1.9 $M = 1250 \times \frac{4{,}35^2}{8} = 2960$ KGM ; $\sqrt{M/b} = \sqrt{\frac{2960}{0{,}40}} = 86{,}02$; $c_n = \frac{22}{86{,}02} = 0{,}255$ $\xrightarrow[A_f = A'_f]{K_f = 2600} \sigma_c \cong 74$ Kg/cm²

$A_f = A'_f = 0{,}00160 \times 86{,}02 \times 40 = 5{,}50$ cm²

TRATTO 9.17 $M = 1250 \times \frac{5{,}15^2}{10} = 3315$ " ; $\sqrt{M/b} = \sqrt{\frac{3315}{0{,}40}} = 91{,}04$; $c_n = \frac{22}{91{,}04} = 0{,}241$ $\xrightarrow[A_f = A'_f]{K_f = 2600} \sigma_c \cong 77$ "

$A_f = A'_f = 0{,}00175 \times 91{,}04 \times 40 = 6{,}37$ cm²

TRAVE 8.16.24

TRATTO 8.16 $M = 1250 \times \frac{4{,}75^2}{10} = 2820$ KGM ; $\sqrt{M/b} = \sqrt{\frac{2820}{0{,}40}} = 83{,}97$; $c_n = \frac{22}{83{,}97} = 0{,}262$ $\xrightarrow[A_f = A'_f]{K_f = 2600} \sigma_c \cong 72$ Kg/cm²

$A_f = A'_f = 0{,}00160 \times 83{,}97 \times 40 = 5{,}37$ cm²

TRATTO 16.24 $M = 1250 \times \frac{4{,}75^2}{10} = 2820$ " ; $\sqrt{M/b} = \sqrt{\frac{2820}{0{,}40}} = 83{,}97$; $c_n = \frac{22}{83{,}97} = 0{,}262$ $\xrightarrow[A_f = A'_f]{K_f = 2600} \sigma_c \cong 72$ "

$A_f = A'_f = 0{,}00160 \times 83{,}97 \times 40 = 5{,}37$ cm²

TRAVE 4'.4.12

TRATTO 4'-4 $M = 1250 \times \frac{1{,}75^2}{8} = 480$ KGM ; $\sqrt{M/b} = \sqrt{\frac{480}{0{,}40}} = 34{,}64$; $c_n = \frac{22}{34{,}64} = 0{,}635$

$A_f = A'_f =$

TRATTO 4-12 $M = 1250 \times \frac{4{,}35^2}{10} = 2365$ " ; $\sqrt{M/b} = \sqrt{\frac{2365}{0{,}40}} = 76{,}90$; $c_n = \frac{22}{76{,}90} = 0{,}286$ $\xrightarrow[A_f = A'_f]{K_f = 2600} \sigma_c \cong 66$ Kg/cm²

$A_f = A'_f = 0{,}00147 \times 76{,}90 \times 40 = 4{,}52$ cm²

TRAVE 5'.5.13

TRATTO 5'-5 $M = 1250 \times \frac{1{,}75^2}{8} = 480$ KGM ; $\sqrt{M/b} = \sqrt{\frac{480}{0{,}40}} = 34{,}64$; $c_n = \frac{22}{34{,}64} = 0{,}635$

$A_f = A'_f =$

TRATTO 5-13 $M = 1250 \times \frac{4{,}65^2}{10} = 2710$ " ; $\sqrt{M/b} = \sqrt{\frac{2710}{0{,}40}} = 82{,}20$; $c_n = \frac{22}{82{,}20} = 0{,}267$ $\xrightarrow[A_f = A'_f]{K_f = 2600} \sigma_c \cong 70$ Kg/cm²

$A_f = A'_f = 0{,}00156 \times 82{,}20 \times 40 = 5{,}13$ cm²

TRAVE 4'.5' $M = 4500 \times \frac{3{,}10^2}{11} = 3930$ " ; $\sqrt{\frac{M}{b}} = \sqrt{\frac{3930}{0{,}30}} = 114{,}45$; $c_n = \frac{37}{114{,}45} = 0{,}323$ $\xrightarrow[A'_f = 0{,}5 A_f]{K_f = 2600} \sigma_c = 65$ Kg/cm²

$A_f = 0{,}00130 \times 114{,}45 \times 30 = 4{,}46$ cm² ; $A'_f = 2{,}23$ cm²

TRAVE 12.13 $M = 4440 \times \frac{3{,}10^2}{11} = 3880$ " ; $\sqrt{M/b} = \sqrt{\frac{3880}{0{,}80}} = 69{,}64$; $c_n = \frac{22}{69{,}64} = 0{,}316$ $\xrightarrow[A_f = A'_f]{K_f = 2600} \sigma_c \cong 60$ Kg/cm²

$A_f = A'_f = 0{,}00133 \times 69{,}64 \times 80 = 7{,}40$ cm²

– RIEPILOGO PILASTRI PIANO TIPO –

PILASTRO						
1	$R_{1/2} + R_{1/9}$	= 5600	+ 2720		= 8320	kg
2	$R_{2/1} + R_{2/3}$	= 5600	+ 6910		= 12.510	"
3	$R_{3/2} + R_{3/4}$	= 6910	+ 7720		= 14.630	"
4	$R_{4/3} + R_{4/4'} + \ldots + R_{4/12}$	= 7720	+ 1090	+ — + 2720	= 11.530	"
4'	$R_{4'/4} + R_{4'/5'}$	= 1090	+ 6980		= 8.070	"
5	$\ldots + R_{5/5'} + R_{5/6} + R_{5/13}$	= —	+ 1090	+ 8650 + 2910	= 12.650	"
5'	$R_{5'/4'} + R_{5'/5}$	= 6980	+ 1090		= 8.070	"
6	$R_{6/5} + R_{6/7}$	= 8650	+ 5960		= 14.610	"
7	$R_{7/6} + R_{7/8}$	= 5960	+ 6280		= 12.240	"
8	$R_{8/7} + R_{8/16}$	= 6280	+ 2970		= 9.250	"
9	$R_{9/1} + R_{9/10} + R_{9/17}$	= 2720	+ 7340	+ 3220	= 13.280	"
10	$R_{10/9} + R_{10/11}$	= 7340	+ 9050		= 16.390	"
11	$R_{11/10} + R_{11/12}$	= 9050	+ 7340		= 16.390	"
12	$R_{12/11} + R_{12/4} + R_{12/13} + \frac{1}{3} R_{12/20}$	= 7340	+ 2720	+ 6880 + 1100	= 18.040	"
13	$R_{13/12} + R_{13/5} + R_{13/14} + \frac{1}{3} R_{13/21}$	= 6880	+ 2910	+ 7940 + 1100	= 18.830	"
14	$R_{14/13} + R_{14/15}$	= 7940	+ 7440		= 15.380	"
15	$R_{15/14} + R_{15/16}$	= 7440	+ 7840		= 15.280	"
16	$R_{16/15} + R_{16/8} + R_{16/24}$	= 7840	+ 2970	+ 2970	= 13.780	"
17	$R_{17/9} + R_{17/18}$	= 3220	+ 6150		= 9.370	"
18	$R_{18/17} + R_{18/19}$	= 6150	+ 7580		= 13.730	"
19	$R_{19/18} + R_{19/20}$	= 7580	+ 8270		= 15.850	"
20	$R_{20/19} + \frac{1}{3} R_{20/12}$	= 8270	+ 1100		= 9.370	"
21	$\frac{1}{3} R_{21/13} + R_{21/22}$	= 1100	+ 8650		= 9.750	"
22	$R_{22/21} + R_{22/23}$	= 8650	+ 5960		= 14.610	"
23	$R_{23/22} + R_{23/24}$	= 5960	+ 6280		= 12.240	"
24	$R_{24/23} + R_{24/16}$	= 6280	+ 2970		= 9.250	"

DA SOSTITUIRE QUANDO SI VA A CALCOLARE DETTAGLIATAMENTE LA COPERTURA DEL VANO SCALA E I SOLAI A QUOTA +16.26 E +19.16 DELLA SALA MACCHINE.

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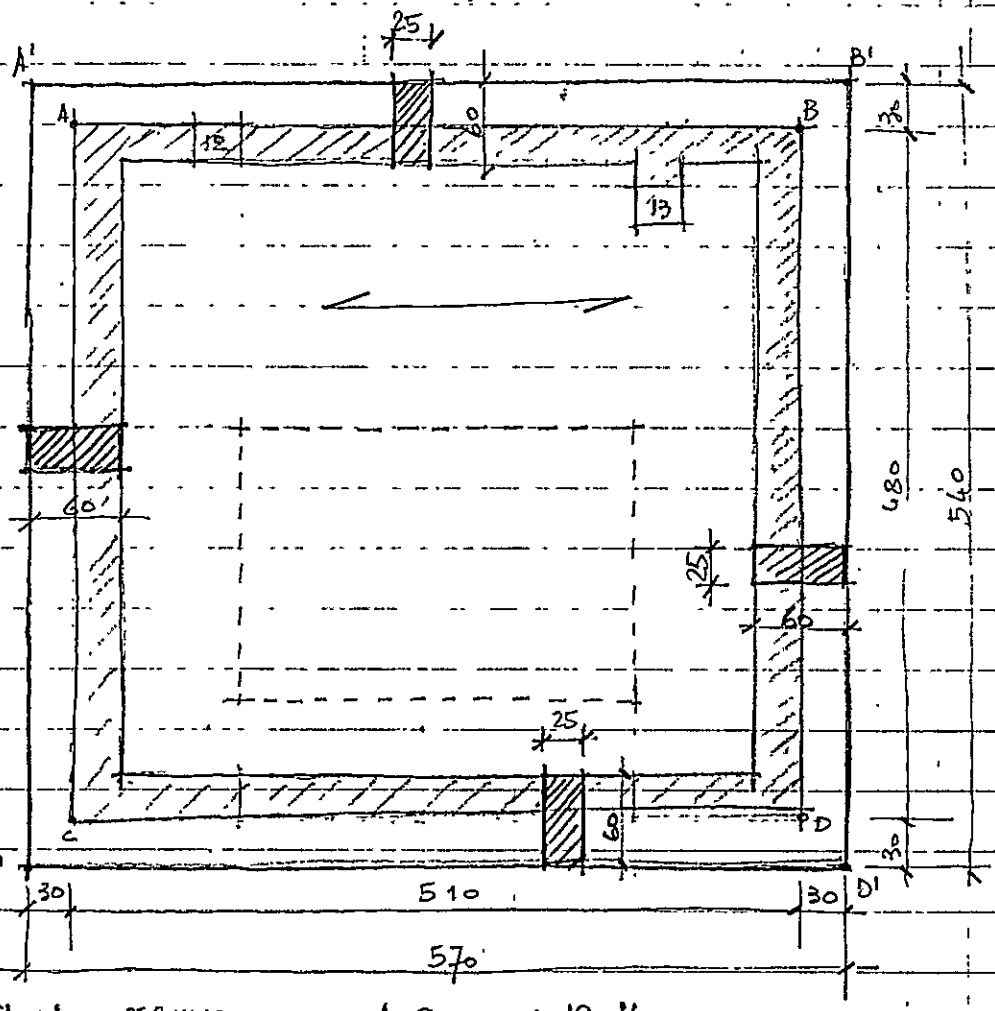
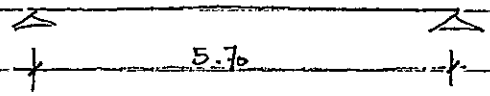


A'- B'- C'- D' PERIMETRO SOLAIO A QUOTA + 19.16

ANALISI CARICHI:



PARAPETTO : = 375,00 Kg/ml.

SOLAIO 625,00 × 5,70/2 = 1785,00 "

2060,00 Kg/ml.

N.B.: SUI PILASTRI 4'-5'-12-13 SCARICA ANCHE LA COPERTURA DEL VANO SCALA

$R_{4'-5'} = R_{5'-4'} = R_{12/13} = R_{13/12} = \left(1050 \times \frac{7,50}{2}\right) \times \frac{3,10}{2} \simeq 6100$ Kg.

A QUOTA + 16.26 $R_{4'/5'} = R_{5'/4'} = 6100$ Kg.

$R_{12/13} = R_{13/12} = 6100 + 7560 = 13.660$ Kg $\simeq 14.000$ Kg.

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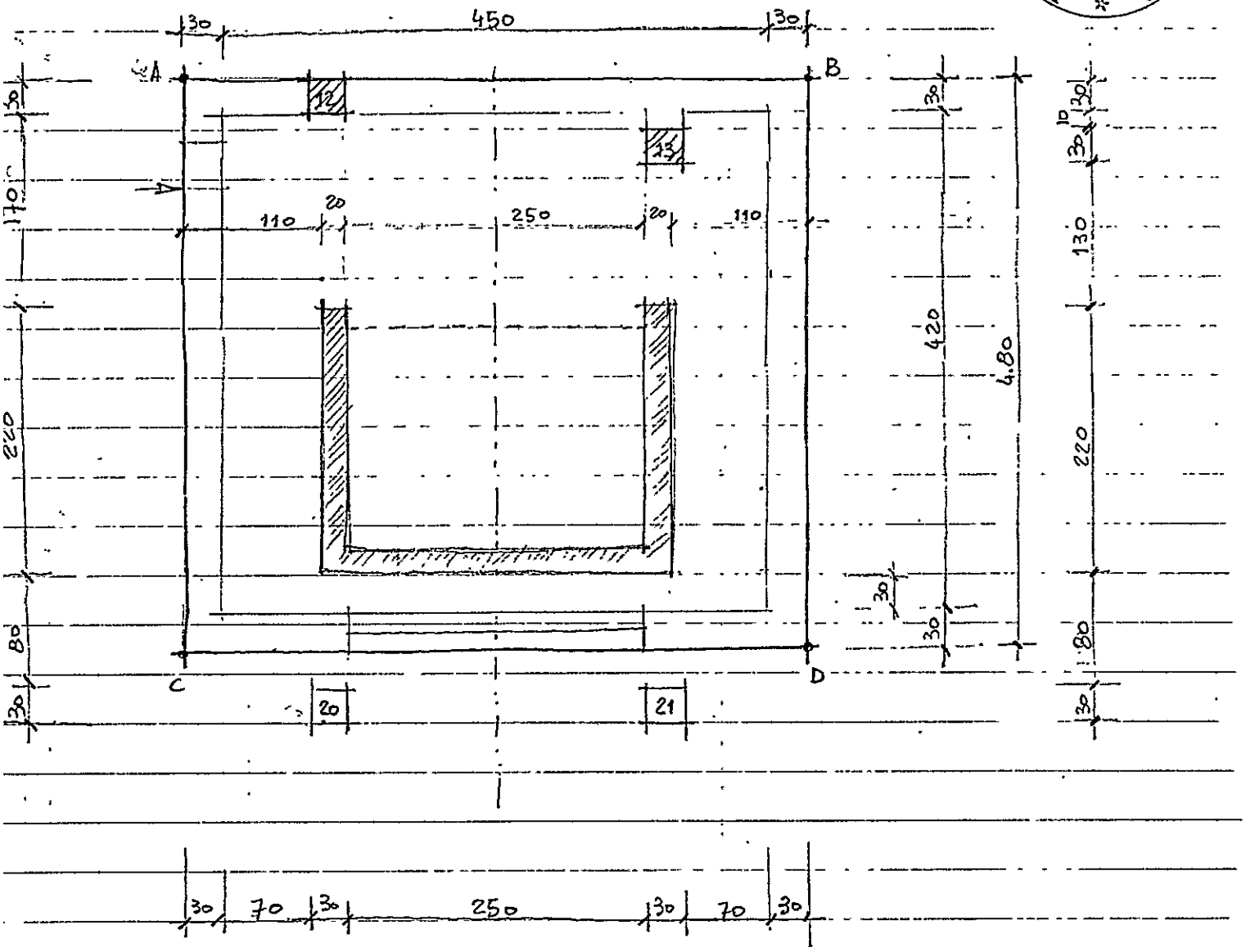
SALA MACCHINE ASCENSORE — SOLAIO A QUOTA + 16,26 (PAVIMENTO SALA MACCHINE)



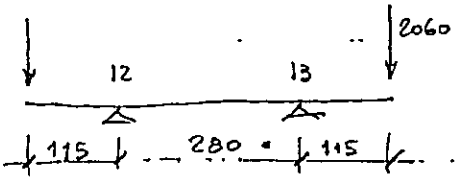
N.B.: IL SOLAIO A QUOTA + 16,26 E' PERIMETRATO DA A-B-C-D. ALL'INTERNO CORRE LA MURATURA DA CM 30 CHE PORTERÀ IL SOLAIO A QUOTA + 19.16

CIOE' IL SOLAIO A QUOTA + 19.16 SARÀ PORTATO DALLA MURATURA DI SP = 30 CM POGGIANTE PERIMETRALMENTE AL SOLAIO A + 16.26 (A-B-C-D)

SICCHE' CONVIENE PARTIRE DA QUOTA + 19.16 E POI SCENDERE A QUOTA + 16.26.

CONVIENE A QUOTA + 16.26 GETTARE TUTTA UNA SOLETTA.

TRAVE 12.13



$R_{12/13} = R_{13/12} = 2060 + 1375 \times \frac{5,10}{2} = 7560$ KG.

MURATURA = 1000,00 KG/ml

PESO PROPRIO:

0,60 x 0,25 x 1,00 x 2500 = 375,00 "

1375,00 "

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RICAPITOLO PILASTRI PORTANTI IL SOLAIO A QUOTA

PILASTRO	+15.35	Ai	+ 12.01	Ai
1	5210 + 700 = 5910 Kg	99 cm²	5910 + 8320 + 700 = 14.930 Kg	251 cm²
2	8600 + 700 = 9300 "	156 "	9300 + 12510 + 700 = 22.510 "	378 "
3	10.300 + 700 = 11000 "	185 "	11.000 + 14 630 + 700 = 26 330 "	442 "
4	9.390 + 700 = 10090 "	169 "	10.090 + 11 530 + 700 = 22320 "	375 "
5	10.270 + 700 = 10970 "	185 "	10970 + 12650 + 700 = 24.320 "	409 "
6	10.410 + 700 = 11.110 "	187 "	11110 + 14610 + 700 = 26.420 "	444 "
7	8.520 + 700 = 9 220 "	155 "	9220 + 12240 + 700 = 22.160 "	373 "
8	5.860 + 700 = 6560 "	110 "	6560 + 9250 + 700 = 16510 "	278 "
9	9.190 + 700 = 9890 "	166 "	9890 + 13280 + 700 = 23870 "	401 "
10	13880 + 700 = 14580 "	245 "	14580 + 16390 + 700 = 31670 "	532 "
11	13880 + 700 = 14580 "	245 "	14580 + 16390 + 700 = 31670 "	532 "
12	8940 + 700 = 9640 "	162 "	9640 + 18040 + 700 = 28380 "	477 "
13	9640 + 700 = 10340 "	174 "	10340 + 18830 + 700 = 29870 "	502 "
14	13030 + 700 = 13730 "	230 "	13730 + 15380 + 700 = 29 810 "	501 "
15	12.940 + 700 = 13640 "	229 "	13640 + 15280 + 700 = 29 620 "	498 "
16	9.620 + 700 = 10320 "	174 "	10320 + 13780 + 700 = 24.800 "	417 "
17	5.920 + 700 = 6620 "	112 "	6620 + 9370 + 700 = 16.690 "	280 "
18	9.620 + 700 = 10320 "	173 "	10320 + 13730 + 700 = 24750 "	416 "
19	11.330 + 700 = 12 030 "	202 "	12030 + 15850 + 700 = 28580 "	480 "
20	6.020 + 700 = 6720 "	113 "	6720 + 9370 + 700 = 16790 "	282 "
21	6.260 + 700 = 6960 "	117 "	6960 + 9750 + 700 = 17410 "	292 "
22	10.410 + 700 = 11110 "	187 "	11110 + 14610 + 700 = 26420 "	444 "
23	8520 + 700 = 9220 "	155 "	9220 + 12240 + 700 = 22160 "	373 "
24	5860 + 700 = 6560 "	110 "	6560 + 9250 + 700 = 16510 "	278 "
4'	1100 + 700 = 1800 "		1800 + 8070 + 700 = 10.570 "	178 "
5'	1100 + 700 = 1800 "		1800 + 8070 + 700 = 10570 "	178 "

CONTINUAZIONE RICAPITOLO PILASTRI PORTANTI IL SOLAIO A QUOTA:

PILASTRO	+ 8.97	Aci	+ 5.93	Aci
1	14.930 + 8320 + 700 = 23.950 kg.	402 cm²	23.950 + 8320 + 700 = 32.970 kg	554 cm²
2	22.510 + 12510 + 700 = 35.720 "	600 "	35.720 + 12510 + 700 = 48.930 "	822 "
3	26.330 + 14630 + 700 = 41.660 "	700 "	41.660 + 14630 + 700 = 56.990 "	958 "
4	22320 + 11530 + 700 = 34.550 "	580 "	34.550 + 11.530 + 700 = 46.780 "	786 "
5	24320 + 12650 + 700 = 37.670 "	633 "	37.670 + 12650 + 700 = 51.020 "	857 "
6	26420 + 14610 + 700 = 41.730 "	701 "	41.730 + 14610 + 700 = 57.040 "	959 "
7	22160 + 12240 + 700 = 35.100 "	590 "	35.100 + 12240 + 700 = 48.040 "	807 "
8	16510 + 9250 + 700 = 26.460 "	444 "	26.460 + 9250 + 700 = 36.410 "	612 "
9	23870 + 13280 + 700 = 37.850 "	636 "	37.850 + 13280 + 700 = 51.830 "	871 "
10	31670 + 16390 + 700 = 48.760 "	819 "	48.760 + 16390 + 700 = 65.850 "	1106 "
11	31670 + 16390 + 700 = 48.760 "	819 "	48760 + 16390 + 700 = 65.850 "	1106 "
12	28380 + 18040 + 700 = 47.120 "	792 "	47120 + 18040 + 700 = 65.860 "	1107 "
13	29870 + 18830 + 700 = 49.400 "	830 "	49.400 + 18830 + 700 = 68.930 "	1158 "
14	29810 + 15380 + 700 = 45.890 "	771 "	45.890 + 15.380 + 700 = 61.970 "	1041 "
15	29620 + 15280 + 700 = 45.600 "	766 "	45.600 + 15.280 + 700 = 61.580 "	1035 "
16	24800 + 13780 + 700 = 39280 "	660 "	39.280 + 13780 + 700 = 53.760 "	903 "
17	16690 + 9370 + 700 = 26.760 "	450 "	26.760 + 9370 + 700 = 36.830 "	619 "
18	24750 + 13730 + 700 = 39.180 "	658 "	39.180 + 13730 + 700 = 53.610 "	901 "
19	28580 + 15850 + 700 = 45130 "	758 "	45.130 + 15850 + 700 = 61.680 "	1036 "
20	16790 + 9370 + 700 = 26.860 "	451 "	26.860 + 9370 + 700 = 36.930 "	621 "
21	17410 + 9750 + 700 = 27.860 "	468 "	27.860 + 9750 + 700 = 38.310 "	644 "
22	26420 + 14610 + 700 = 41.730 "	701 "	41.730 + 14610 + 700 = 57.040 "	959 "
23	22160 + 12240 + 700 = 35100 "	590 "	35.100 + 12240 + 700 = 48.040 "	808 "
24	16510 + 9250 + 700 = 26460 "	444 "	26.460 + 9250 + 700 = 36.410 "	612 "
4'	10570 + 8070 + 700 = 19.340 "	325 "	19.340 + 8070 + 700 = 28.110 "	473 "
5'	10570 + 8070 + 700 = 19.340 "	325 "	19340 + 8070 + 700 = 28.110 "	473 "

CONTINUAZIONE RICAPITOLO PILASTRI PORTANTI IL SOLAIO A QUOTA :

+ 2.89

PILASTRO					Aci
1	32.970	+ 8320 + 700	=	41.990 Kg	706 cm²
2	48.930	+ 12510 + 700	=	62.140 "	1044 "
3	56.990	+ 14630 + 700	=	72.320 "	1216 "
4	46.780	+ 11530 + 700	=	59.010 "	992 "
5	51.020	+ 12650 + 700	=	64.370 "	1082 "
6	57.040	+ 14610 + 700	=	72.350 "	1216 "
7	48 040	+ 12.240 + 700	=	60.980 "	1025 "
8	36 410	+ 9250 + 700	=	46360 "	780 "
9	51 830	+ 13280 + 700	=	65.810 "	1106 "
10	65850	+ 16390 + 700	=	82.940 "	1394 "
11	65850	+ 16390 + 700	=	82.940 "	1394 "
12	65860	+ 18040 + 700	=	84.600 "	1422 "
13	68930	+ 18830 + 700	=	88.460 "	1487 "
14	61970	+ 15380 + 700	=	78.050 "	1312 "
15	61580	+ 15280 + 700	=	77.560 "	1304 "
16	53.760	+ 13780 + 700	=	68.240 "	1147 "
17	36 830	+ 9 370 + 700	=	46 900 "	788 "
18	53610	+ 13730 + 700	=	68.040 "	1144 "
19	61860	+ 15850 + 700	=	78 410 "	1318 "
20	36 930	+ 9370 + 700	=	47.000 "	790 "
21	38.310	+ 9750 + 700	=	48 760 "	820 "
22	57.040	+ 14610 + 700	=	72.350 "	1216 "
23	46 040	+ 12240 + 700	=	60.980 "	1025 "
24	36 410	+ 9250 + 700	=	46 360 "	779 "
4'	28 110	+ 8070 + 700	=	36 880 "	620 "
5'	28 110	+ 8070 + 700	=	36 880 "	620 "

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- FONDAZIONI -

- TRAVE (1-8) L = 26,05 ML

$$\Sigma P = P_1 + P_2 + P_3 + P_4 + P_5 + P_6 + P_7 + P_8 =$$

$$= 41990 + 62140 + 92.320 + 59.010 + 64.370 + 72350 + 60.980 + 46360 = 479.520 \text{ Kg.}$$

$$P/ML = \frac{\Sigma P}{L} = \frac{479.520}{26,05} = 18.400 \text{ Kg/ml.}$$

- TRAVE (9-16) L = 26,05 ML.

$$\Sigma P = P_9 + P_{10} + P_{11} + P_{12} + P_{13} + P_{14} + P_{15} + P_{16} =$$

$$= 65810 + 82940 + 82940 + 84600 + 88460 + 78050 + 77560 + 68240 = 628.600 \text{ Kg.}$$

$$P/ML = \frac{\Sigma P}{L} = \frac{628.600}{26,05} = 24.100 \text{ Kg/ml}$$

- TRAVE (17-24) L = 26,05 ML

$$\Sigma P = P_{17} + P_{18} + P_{19} + P_{20} + P_{21} + P_{22} + P_{23} + P_{24} =$$

$$= 46900 + 68040 + 78410 + 47000 + 48760 + 72.350 + 60980 + 46360 = 468.800 \text{ Kg.}$$

$$P/ML = \frac{\Sigma P}{L} = \frac{468.800}{26,05} = 18.000 \text{ Kg/ML.}$$

- TRAVE (1.17) L = 9.70 ML

$$\Sigma P = P_1 + P_9 + P_{17} = 41.990 + 65.810 + 46.900 = 154.700 \text{ Kg.}$$

$$P/ML = \frac{\Sigma P}{L} = \frac{154.700}{9,70} = 16.000 \text{ Kg/ML.}$$

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CONTINUAZIONE FONDAZIONI

- TRAVE (4'-20) L = 11,20 ML.

$\Sigma P = P_{4'} + P_4 + P_{12} + P_{20} = 36.880 + 59.010 + 84.600 + 47.000 = 227.500$ Kg.

$P/ML = \frac{\Sigma P}{L} = \frac{227.500}{11,20} = 20.300$ Kg/ML.

- TRAVE (5'-21) L = 11,20 ML

$\Sigma P = P_{5'} + P_5 + P_{13} + P_{21} = 36.880 + 64.370 + 88460 + 48.760 = 238.500$ Kg.

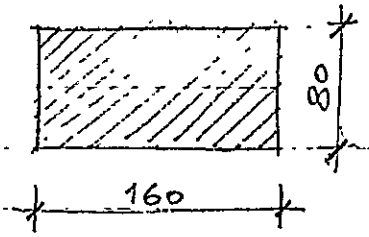
$P/ML = \frac{\Sigma P}{L} = \frac{238.500}{11,20} = 21.300$ Kg/ML

- TRAVE (8-24) L = 9,70 ML

$\Sigma P = P_8 + P_{16} + P_{24} = 46.360 + 68240 + 46360 = 161.000$ Kg.

$P/ML = \frac{\Sigma P}{L} = \frac{161.000}{9,70} = 16.600$ Kg/ML.

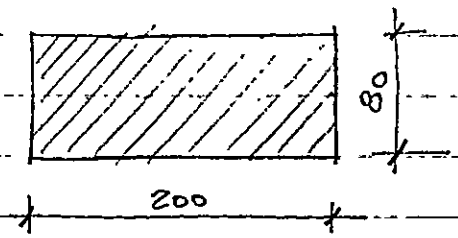
- TRAVE (1-8)



PESO PROPRIO = 1,60 x 0,80 x 1,00 x 2500 = 3200 KG/ML
SOVRACCARICO = 18400 "
21.600 KG/ML

$p_t = \frac{21.600}{160 \times 100} = 1,35 \ KG/cm^2$

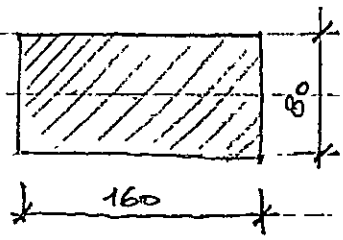
- TRAVE (9-16)



PESO PROPRIO = 2,00 x 0,80 x 1,00 x 2500 = 4000 KG/ML
SOVRACCARICO = 24100 "
28100 KG/ML

$p_t = \frac{28.100}{200 \times 100} = 1,41 \ KG/cm^2$

- TRAVE (17-24)



PESO PROPRIO = 3200 KG/ML
SOVRACCARICO = 18000 "
21.200 KG/ML

$p_t = \frac{21.200}{160 \times 100} = 1,33 \ KG/cm^2$

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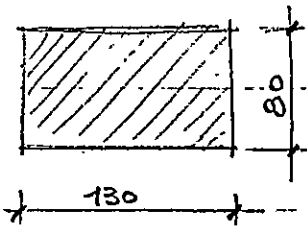
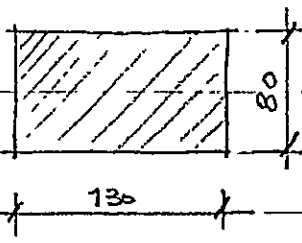
TRAVE (1-17)



PESO PROPRIO $= 1{,}30 \times 0{,}80 \times 1{,}00 \times 2500 = 2600$ Kg/ML
SOVRACCARICO $= 16000$ "
18600 Kg/ML

$$p_t = \frac{18600}{130 \times 100} = 1{,}43 \text{ Kg/cm}^2$$

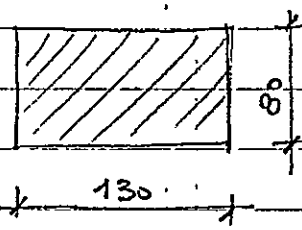
TRAVE (8-24)



PESO PROPRIO $= 2600$ Kg/ML
SOVRACCARICO $= 16600$ "
19.200 Kg/ML

$$p_t = \frac{19.200}{130 \times 100} = 1{,}48 \text{ Kg/cm}^2$$

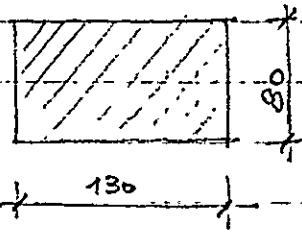
TRAVE (4'-20)



PESO PROPRIO $= 2600$ Kg/ML
SOVRACCARICO $= 20300$ "
22 900 Kg/ML

$$p_t = \frac{22900}{130 \times 100} = 1{,}76 \text{ Kg/cm}^2$$ (in effetti tale valore è minore in quanto i pilastri 4-12-20 sono interessati da altre travi).

TRAVE (5'-21)



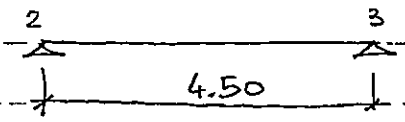
PESO PROPRIO $= 2600$ Kg/ML
SOVRACCARICO $= 21300$ "
23.900 Kg/ML

$$p_t = \frac{23.900}{130 \times 100} = 1{,}84 \text{ Kg/cm}^2$$ (in effetti tale valore è minore per gli stessi motivi della trave 4'-20).

- CALCOLO ORDITURA -

- TRAVE (1-8)

· TRATTO [2-3]

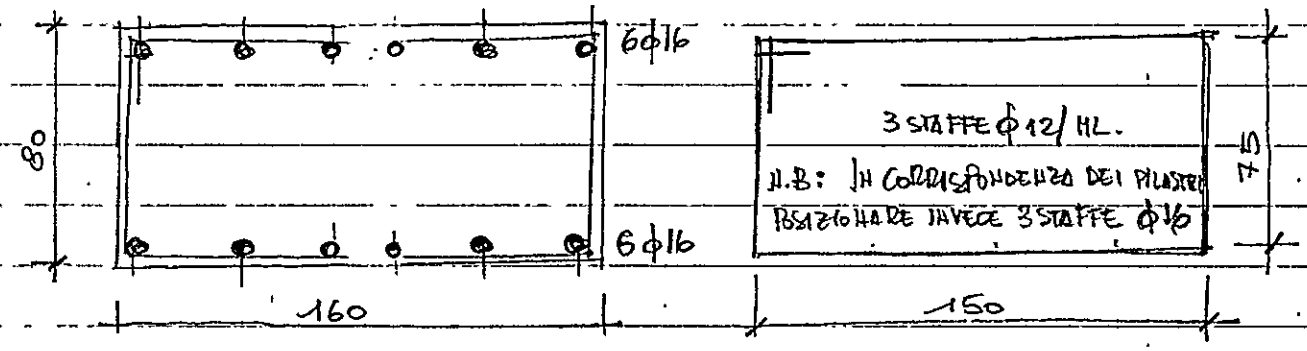


$M = \frac{q l^2}{12} = 18400 \times \frac{4{,}50^2}{12} = 31.050$ KGM

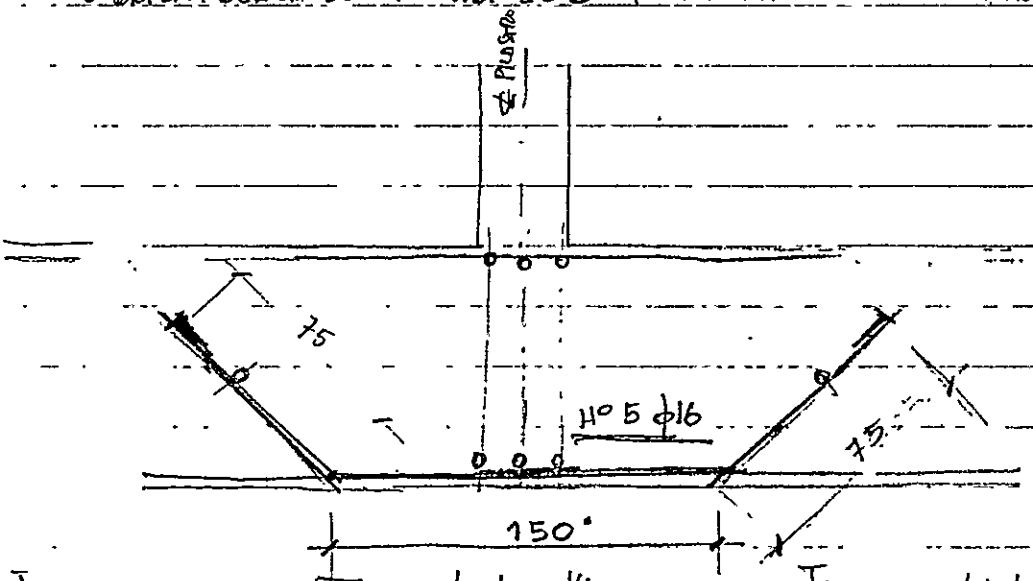
$\sqrt{\frac{M}{b}} = \sqrt{\frac{31.050}{1{,}60}} = 139{,}30$; $c_n = \frac{76}{139{,}30} = 0{,}545 \xrightarrow[A'_f = 0{,}5 A_f]{K_f = 2600} \sigma_c \leq 50$ Kg/cm² (≈35 ")

$A_f = 0{,}00090 \times 139{,}30 \times 160 = 20{,}05$ cm² ($10\phi16 = 20{,}11$ cm²)

$A'_f = 0{,}5 A_f = 0{,}5 \times 20{,}05 = 10{,}03$ " ($5\phi16 = 10{,}05$ cm²)



IN CORRISPONDENZA DEI PILASTRI 2 E 3 POSIZIONARE N° 5 CAVALLOTTI φ16

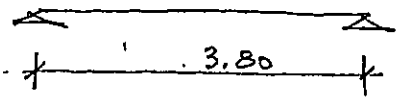


$T_{max} = 18400 \times \frac{4{,}50}{2} = 41.400$ Kg ; $\tau_{max} = \frac{T_{max}}{b h_0} = \frac{41.400}{160 \times 0{,}9 \times 76} = 3{,}78$ Kg/cm² < 5,33

CONTINUAZIONE FONDAZIONI.

- TRAVE (1-8)

ALTRI TRATTI:

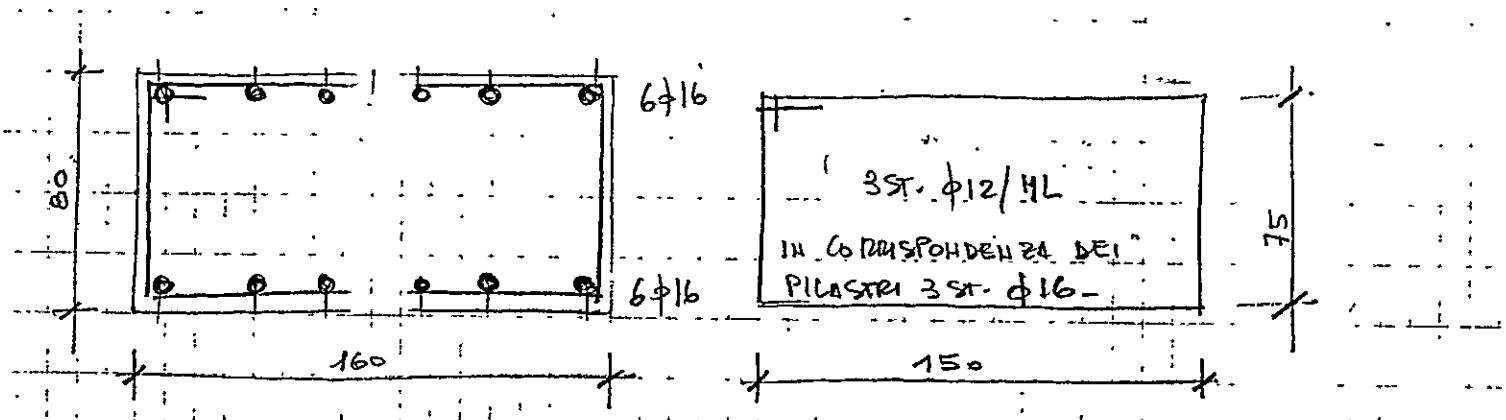


$M = \frac{q l^2}{12} = 18400 \times \frac{3.80^2}{12} = 22.141$ KGM.

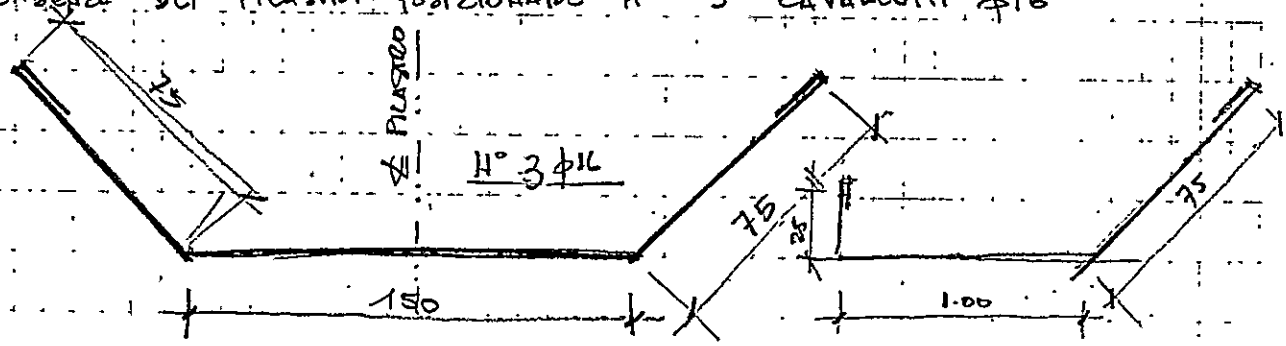
$\sqrt{\frac{M}{b}} = \sqrt{\frac{22.141}{1.60}} = 117,63$; $C_h = \frac{76}{117,63} = 0,646$ $\xrightarrow[A'f = 0,5 Af]{Kf = 2600}$ $\sigma_c = < 50$ Kg/cm² (~ 35 Kg/cm²)

$Af = 0,00085 \times 117,63 \times 160 = 15,99$ cm² → $8\phi16 = 16,08$ cm²

$A'f = 0,5 \times 15,99 = 8,00$ cm² → $5\phi16 = 10,05$ cm²



IN CORRISPONDENZA DEI PILASTRI POSIZIONARE N° 3 CAVALLOTTI φ16



TRAVE (17-24) : VEDI TRAVE PRECEDENTE (1-8)

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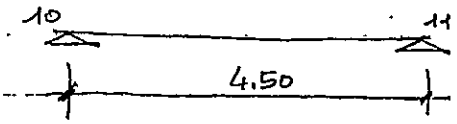
TRAVE (9-16)

TRATTO [10-11]

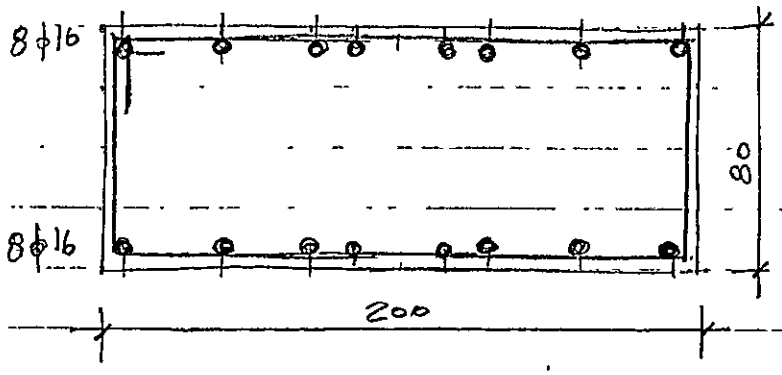


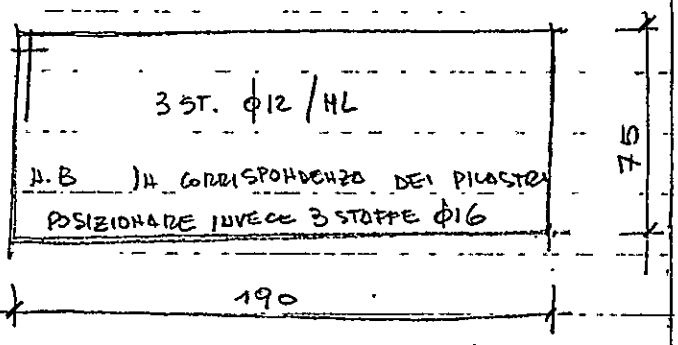
$M = \frac{q l^2}{12} = 24.100 \times \frac{\overline{4,50}^2}{12} = 40.668$ KGM.

$\sqrt{\frac{M}{b}} = \sqrt{\frac{40668}{2,00}} = 142,60$; $c_h = \frac{76}{142,60} = 0,534$ $\xrightarrow[A'_f = 0,5 A_f]{k_f = 2600}$ $\sigma_c < 50$ Kg/cm² ($\sigma_c \simeq 40$ Kg/cm²)

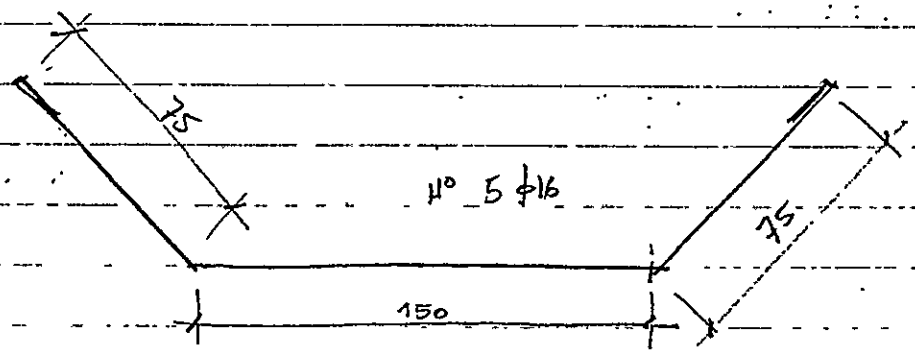
$A_f \simeq 0,00090 \times 142,60 \times 200 = 25,66$ cm² → 13 ϕ16 = 26,13 cm²

$A'_f = 0,5 A_f = 0,5 \times 25,66 = 12,83$ cm² → 7 ϕ16 = 14,07 cm²

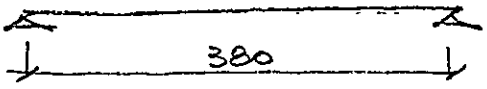




IN CORRISPONDENZA DEI PILASTRI 10 E 11 POSIZIONARE N° 5 CAVALLOTTI ϕ16 -



ALTRI TRATTI.

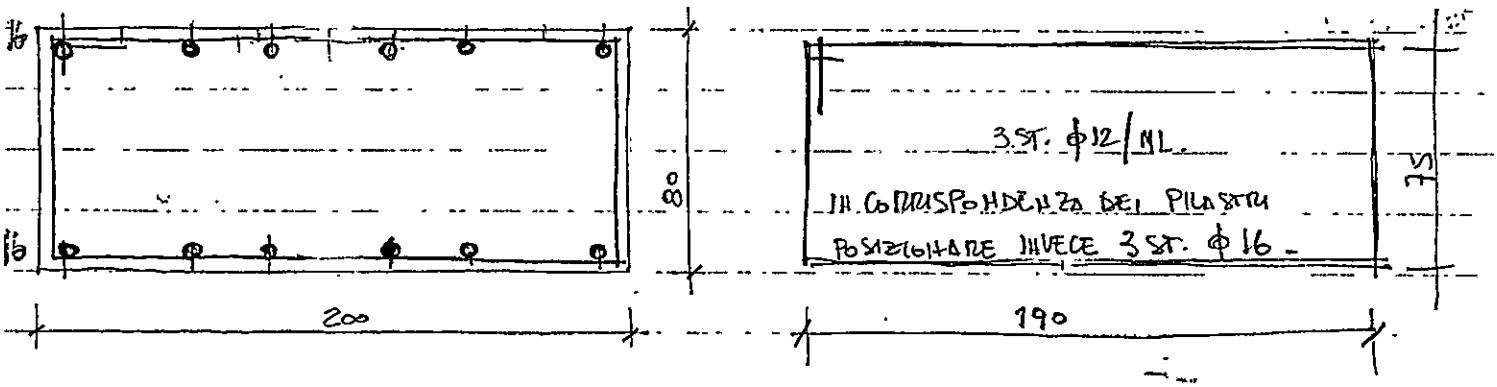


$M = \frac{q l^2}{12} = 24.100 \times \frac{\overline{3,80}^2}{12} = 29.000$ KGM.

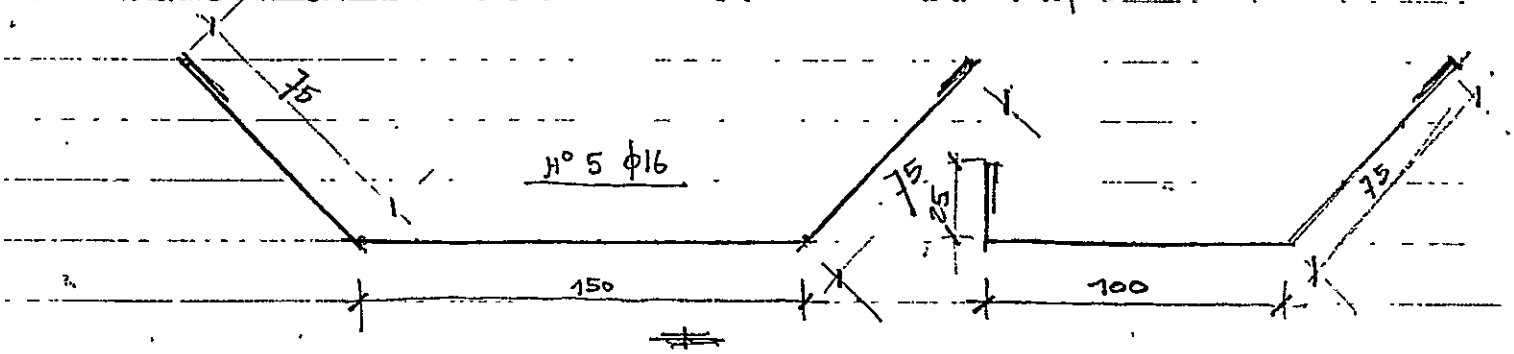
$\sqrt{\frac{M}{b}} = \sqrt{\frac{29000}{2,00}} = 120,41$; $c_h = \frac{76}{120,41} = 0,631$ $\xrightarrow[A'_f = 0,5 A_f]{k_f = 2600}$ $\sigma_c < 50$ Kg/cm² (~ 30 Kg/cm²)

$A_f \simeq 0,00080 \times 120,41 \times 200 = 19,26$ cm² ; 10 ϕ16 = 20,10 cm²

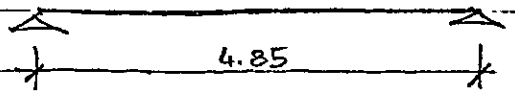
$A'_f = 0,5 A_f = 0,5 \times 19,26 = 9,63$ " ; 5 ϕ16 = 10,05 "



IN CORRISPONDENZA DEI PILASTRI POSIZIONARE N° 5 CAVALLOTTI ϕ16



TRAVI (1-17) - (8-24)



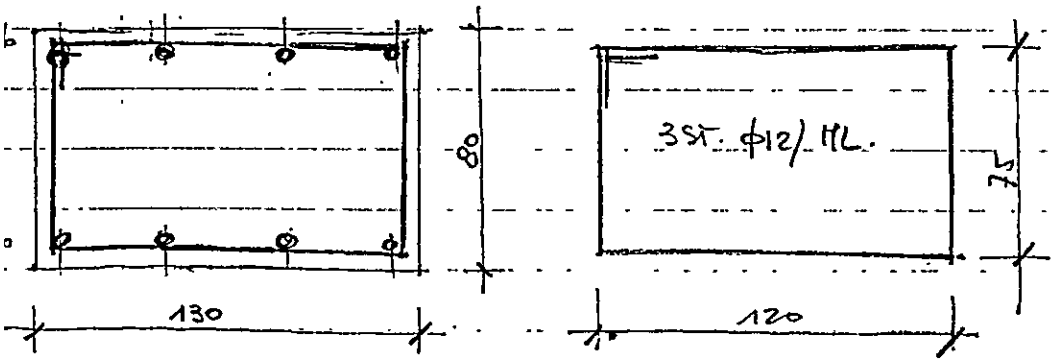
$M = \frac{q l^2}{12} = 16.600 \times \frac{4.85^2}{12} = 32.539$ kgM.

$\frac{M}{b} = \sqrt{\frac{32539}{1,30}} = 158,21$; $c_h = \frac{76}{158,21} = 0,480$ $\xrightarrow{\chi_f = 2600}$ $\sigma_c \simeq 40$ kg/cm²

$A'_f = 0,5 A_f$

$A_f = 0,00085 \times 158,21 \times 130 = 17,48$ cm² → 9 ϕ16 = 18,09 cm²

$A'_f = 0,5 \times 17,48 = 8,74$ cm² → 4 ϕ16 = 8,04 cm²



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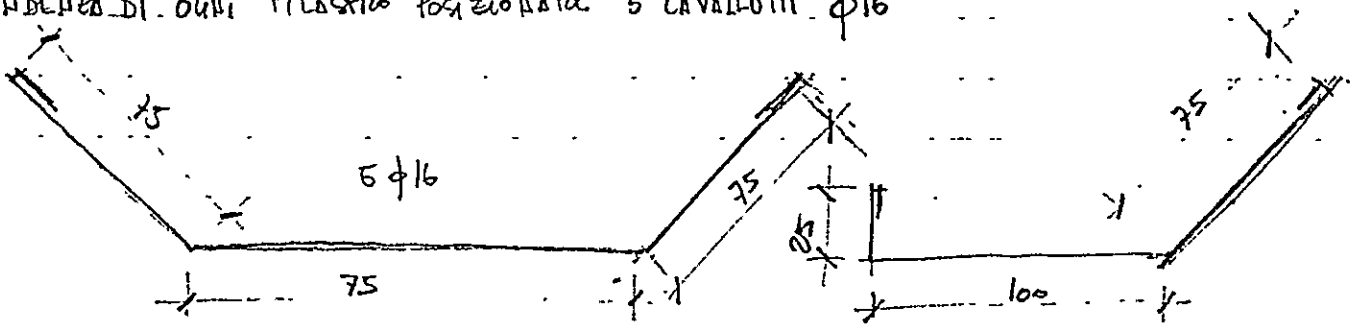
IN CORRISPONDENZA DI OGNI PILASTRO POSIZIONARE 5 CAVALLOTTI ϕ16



TRAVI (4'-20) - (5'-21) VEDI TRAVI (1-17) - (8-24)

PILASTRI PIANO TERRA (SOLAIO + 2.89)

	Aci	Af = 0,8% Aci	AR	AfR ≥ 0,3% AR	STAFFE
1	706 cm²	5,65 cm²	30 x 40	4 ϕ16 = 8,04 cm²	ϕ8/24"
2	1044 "	8,35 "	30 x 40	6 ϕ16 = 12,06 "	"
3	1216 "	9,73 "	30 x 50	6 ϕ16 = 12,06 "	"
4	992 "	7,34 "	30 x 40	6 ϕ16 = 12,06 "	"
5	1082 "	8,66 "	30 x 40	6 ϕ16 = 12,06 "	"
6	1216 "	9,73 "	30 x 50	6 ϕ16 = 12,06 "	"
7	1025 "	8,20 "	30 x 40	6 ϕ16 = 12,06 "	"
8	780 "	6,24 "	30 x 40	4 ϕ16 = 8,04 "	"
9	1106 "	8,85 "	30 x 40	6 ϕ16 = 12,06 "	"
10	1394 "	11,15 "	30 x 50	6 ϕ16 = 12,06 "	"
11	1394 "	11,15 "	30 x 50	6 ϕ16 = 12,06 "	"
12	1422 "	11,37 "	30 x 60	8 ϕ16 = 16,08 "	"
13	1487 "	11,89 "	30 x 60	8 ϕ16 = 16,08 "	"
14	1312 "	10,50 "	30 x 50	6 ϕ16 = 12,06 "	"
15	1304 "	10,43 "	30 x 50	6 ϕ16 = 12,06 "	"
16	1147 "	9,18 "	30 x 40	6 ϕ16 = 12,06 "	"
17	788 "	6,30 "	30 x 40	4 ϕ16 = 8,04 "	"
18	1144 "	9,15 "	30 x 40	6 ϕ16 = 12,06 "	"
19	1318 "	10,54 "	30 x 50	6 ϕ16 = 12,06	"
20	790 "	6,32 "	30 x 40	4 ϕ16 = 8,04 "	"
21	820 "	6,56 "	30 x 40	4 ϕ16 = 8,04 "	"
22	1216 "	9,73 "	30 x 50	6 ϕ16 = 12,06 "	"
23	1025 "	8,20 "	30 x 40	6 ϕ16 = 12,06 "	"
24	779 "	6,23 "	30 x 40	4 ϕ16 = 8,04 "	"
4'	620 "	4,96 "	30 x 30	4 ϕ16 = 8,04 "	"
5'	620 "	4,96 "	30 x 30	4 ϕ16 = 8,04 "	"

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PILASTRI PIANO PRIMO (SOLAIO A +5,93)

	A_{ci}	$A_f = 0,8\% A_{ci}$	A_R	$A_{fR} \geq 0,3\% A_R$	STAFFE
1	554 cm^2	4,43 cm^2	30 x 30 = 900 cm^2	4φ16 = 8,04 cm^2	φ8/24
2	822 "	6,58 "	30 x 40	4φ16	"
3	958 "	7,66 "	30 x 40	4φ16	"
4	786 "	6,29 "	30 x 30	4φ16	"
5	857 "	6,86 "	30 x 30	4φ16	"
6	959 "	7,67 "	30 x 40	4φ16	"
7	807 "	6,46 "	30 x 40	4φ16	"
8	612 "	4,90 "	30 x 30	4φ16	"
9	871 "	6,97 "	30 x 40 = 1200 cm^2	4φ16	"
10	1106 "	8,85 "	30 x 40	6φ16 = 12,06 cm^2	"
11	1106 "	8,85 "	30 x 40	6φ16	"
12	1107 "	8,86 "	30 x 50	6φ16	"
13	1158 "	9,26 "	30 x 50	6φ16	"
14	1041 "	8,33 "	30 x 40	6φ16	"
15	1035 "	8,28 "	30 x 40	6φ16	"
16	903 "	7,23 "	30 x 40	4φ16	"
17	619 "	4,95 "	30 x 30	4φ16	"
18	901 "	7,21 "	30 x 40	4φ16	"
19	1036 "	8,29 "	30 x 40	6φ16	"
20	621 "	4,97 "	30 x 30	4φ16	"
21	644 "	5,15 "	30 x 30	4φ16	"
22	959 "	7,67 "	30 x 40	6φ16	"
23	808 "	6,46 "	30 x 40	4φ16	"
24	612 "	4,90 "	30 x 30	4φ16	"
4'	473 "	3,79 "	30 x 30	4φ16	"
5'	473 "	3,79 "	30 x 30	4φ16	"

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PILASTRI PIANO SECONDO (SOLAIO A QUOTA + 8,97)

	A_{ci}	$A_f = 0,8\% A_{ci}$	A_R	$A_{fR} \geq 0,3\% A_R$	STAFFE
1	402 cm²	3,21 cm²	30×30 = 900 cm²	4 ϕ16 = 8,04 cm²	ϕ8/24"
2	600 "	4,80 "	"	"	"
3	700 "	5,60 "	"	"	"
4	580 "	4,64 "	"	"	"
5	633 "	5,06 "	"	"	"
6	701 "	5,61 "	"	"	"
7	590 "	4,72 "	"	"	"
8	444 "	3,55 "	"	"	"
9	636 "	5,09 "	"	"	"
10	819 "	6,55 "	"	"	"
11	819 "	6,55 "	"	"	"
12	792 "	6,34 "	"	"	"
13	830 "	6,64 "	"	"	"
14	771 "	6,17 "	"	"	"
15	766 "	6,13 "	"	"	"
16	660 "	5,28 "	"	"	"
17	450 "	3,60 "	"	"	"
18	658 "	5,26 "	"	"	"
19	758 "	6,06 "	"	"	"
20	451 "	3,61 "	"	"	"
21	468 "	3,75 "	"	"	"
22	701 "	5,61 "	"	"	"
23	590 "	4,72 "	"	"	"
24	444 "	3,55 "	"	"	"
25	325 "	2,60 "	"	"	"
26	325 "	2,60 "	"	"	"

PILASTRI PIANO TERZO (SOLAIO A QUOTA +12,01) E PIANO QUARTO (SOLAIO A +15.35)

	A_{ci}	$A_f = 0,8\% A_{ci}$	A_R	$A_{fR} \geq 0,3\% A_R$	STAFFE
	251 cm²	2,00 cm²	30×30 = 900 cm²	4φ12 = 4,52 cm²	φ8/18"
2	378 "	3,02 "	"	"	"
3	442 "	3,54 "	"	"	"
4	375 "	3,00 "	"	"	"
5	409 "	3,27 "	"	"	"
6	444 "	3,55 "	"	"	"
7	373 "	2,98 "	"	"	"
8	278 "	2,22 "	"	"	"
9	401 "	3,21 "	"	"	"
10	532 "	4,26 "	"	"	"
11	532 "	4,26 "	"	"	"
12	477 "	3,82 "	"	"	"
13	502 "	4,02 "	"	"	"
14	501 "	4,01 "	"	"	"
15	498 "	3,98 "	"	"	"
16	417 "	3,34 "	"	"	"
17	280 "	2,24 "	"	"	"
18	416 "	3,33 "	"	"	"
19	480 "	3,84 "	"	"	"
20	282 "	2,26 "	"	"	"
21	292 "	2,34 "	"	"	"
22	444 "	3,55 "	"	"	"
23	373 "	2,98 "	"	"	"
24	278 "	2,22 "	"	"	"
4'	178 "	1,42 "	"	"	"
5'	178 "	1,42 "	"	"	"

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