IL DIRETTORE TECNICO
(Dott. Ing. Antonio Longo)

	DATA	SIGLA	PROGETTO N.		STUDIO TECNICO
DISEGN.					Ing. Antonio E. Corrado
CONTR.					
VISTO :					Brindisi - Corso Roma, 99 - Tel. 22085 - 27483

VERIFICARE MISURE E QUOTE	
COMMITTENTE : I.A.C.P. -Brindisi- ALLOGGI POPOLARI QUARTIE- RE S.ELIA EST.	**PROGETTO DELLE STRUTTURE**
SOSTITUISCE IL N.	**RELAZIONE DI CALCOLO**
SOSTITUITO DAL N.	
IL COMMITTENTE :	
IL PROGETTISTA :	

Analisi elementari:

- Muratura perimetrale: $300 \, kg/mq$.

$$900 \, kg/ml$$

- Solaio calpestio abitazioni

  peso proprio   250
  sovr. permanente   150
  "   acc.   250
$$\overline{650 \, kg/mq.}$$

- Soletta balconi

  - pp: $300 \, kg/m$
  - perm   100
  - acc.   400
$$\overline{800 \, kg/mq.}$$

- pianerottolo scala   (sovr. acc.: $400 \, kg/mq$)
$$270 \, kg/ml$$

carico a ml $900 = \dfrac{270}{930} \, kg/mq.$

Il medesimo carico si adotta
per i pianerottoli.

<u>Materiali</u> = tondino Feb 38 K controll.

   $\sigma_{amm} = 2200 \, kg/mq$ (in fald. $\sigma_{amm} = 1800 \, kg/mq$

  - Conglomerato:

_____ IN LINEA (Tol. d'aujolo in analysis di caut...

Copertura sala: $(q\ 20.00 \div 20.41)$

Solaio: $\dfrac{8.80}{2} \times 600 = 840$

muratura portante: $2.40 \times 400 = 960$

muretto di attico sovr.: $\dfrac{300}{2100}\ \text{q/ml}$

$R_4 = \left(\dfrac{4.20}{2} + 0.15\right) \times 2100 = 4725\ \text{q/ml}$

$R_8 = \dfrac{9.60}{2} \times 2100 = 10'080\ \checkmark$

$R_{12} = \left(\dfrac{5.40}{2} + 0.15\right) \times 2100 = 5985\ \text{q}$

$\downarrow$ modifiche
luce. per 2
carico sul pil.
(V. pag. 5)

Solaio Copertura   Quota 17.40

TRAVE 1.2.3-4-4' ecc

(1-2): — trave $0.80 \times 0.22 \times 2500 = 440$

tolz. $1.00 \times 0.80 = 320$

$h = 3.57$ mur. add: $1.85 \times 2150 = 312$

$l = 3.52$ solaio: $\dfrac{3.50 \times 650}{2} = 1137$

$T = \cancel{}\ \text{q}\ 3887 \quad \cancel{2209}\ \text{q/ml}$

$M = \cancel{}\ \text{q.mt}\ 1230 \quad A_f = \cancel{}\ 5.8\ \text{cmq.} \qquad \overline{\tau = 57/2200}$

(2-3)
trave   440
tolz.   320
mur.   250
sol.   1137
sol/1? Pcorl.20 = 960
— Tot.   3107 q/ml

$T = 1972\ \text{q/ml} \qquad M = 1958\ \text{q/mt} \qquad A_f = 5\ \text{cq}\ 80 \times 20$

(3-4)
t.g. 440
sols. 320
Soletta: 1.10×800 = 880
solaio 1137
m. attico 1.55×250 = 387
$$\overline{3164 \ \text{y/ml}}$$

y/ml

$l = 4.00$

T = 6338   M = 4218   80×22
        Af = 10.65 c.y. $\sigma = 83/2200$

(4-4)
- pp + sols = 1320
- solett. 0.60×800 = 480
- mur. attico = 500
$$\overline{2300 \ \text{y/ml}}$$

$l = 2.70$

T = 3105.   80×22

TRAVE 9-10-11-12

(9-10) :   pp + sols = 736

$l = 3.\frac{5}{2}$ solaio: $\frac{4.70×650}{2}$ = 1527
        muro attico : 312
$$\overline{2579 \ \text{y/ml}}$$

T = 1539 $\sigma = 62/2200$
M = 2162   Af = 6.8 c.y   80×22

(10-11) :   pp + sols = 760

$l = 3.95$ solaio 1527
        muro 250
        soletta 1.25×800 = 1000
$$\overline{3197 \ \text{y/ml}}$$

T = 6906 y

M = 4546 y/m   Af = 12 c.y. $\sigma = 86/2200$

(11-12) :   pp + sols. = 760
        sol. 1527
$l = 3.80$ soletta: 1.15×800 = 920
        muro : 1.55×250 = 387

$T = 1.40 \times 3.554 = 4975\,y$

$M = 3381\,ym$ $A_f = 5.86\,cy.$ $\tau = 5/2200$

TRAVE 5-6-7-8-8' ecc

$pp + sol2 = 760$

$sol. \dfrac{(4.70 + 3.50) \times 650}{2} = \dfrac{8665}{3485}\,yme$

(5-6)

$\ell = 3.52.$

$T = 6028\,y$ $M = 3536\,ym$

$A_f = 8.94\,cy.$ 80×22

(6-7) $\ell = 2.75$

$T = 4709\,y$ $M = 2158\,ym$

$A_f = 5.45\,cy.$ 80×22

(7-8)

$\ell = 4.00$ $T = 6850\,y$

$M = 4566\,ym$ $A_f = 13\,cy.$ 80×22

(8-8') : sol.te reale: $\dfrac{4.70}{2} \times 900 = 2115$

$\dfrac{1.00}{2} \times 900 = 450$

$\ell = 2.70$ $pp + sol2 : 440 + 500 = \dfrac{940}{3505\,y}$

$T = 4731\,y$

$M = 2129$ $A_f = 5.4\,cy.$ (80×22)

TRAVE 12-12' (s sbalz.2/pp10)

$pp : 060 \times 020 \times 2500 = 300$

$sol2 : 500 \times 060 = 300$

$muset = 900$

$bals reale = \dfrac{2115}{3615}\,M$

$l = 8.70$ $\quad T = 4880\ y$ $\quad M = 3294\ y_m$

$\frac{1}{8}$ $\quad 60 \times 22$.

$A_f = 9.25\ cq$

$q_{max} = \frac{9.20 \times 650}{2} = 1365$

500 $\quad 1120\ y$ $\quad 500$

$0.90 \quad 1.90 \quad 500/$mtre $\quad 1.40$

TRAVE 4-8-12

$(4-8)$ $\quad pp = 500$

$mur. = 900$

Sol. $ascens: \dfrac{8.40}{2} \times 6750 = 8100$
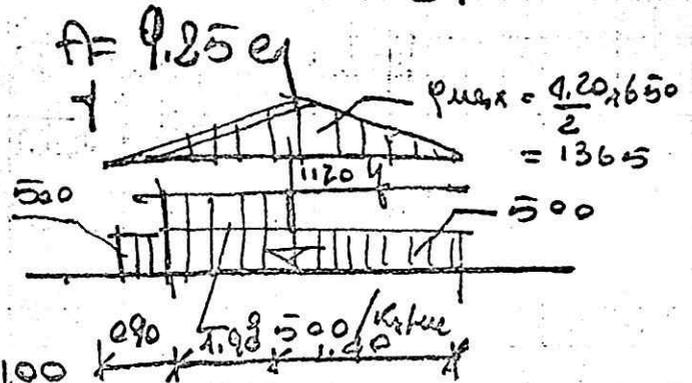
$\overline{9600\ y/m}$

($si\ ipotizza\ la\ trave\ app.$
$data\ la\ asse\ continuità\ con$
$Cq\ 8-12$)

$R_A = R_B = \dfrac{8.60}{2} \times 9500 = 19.95\ t. + 0585$

$Carico\ conc.\ copert.\ lc\ macchine: \dfrac{8.60 \times 3.00 \times 600}{4} = 1170\ y$.

$Agli\ eff.\ delle\ reazioni\ sul\ pil.: R_B = \dfrac{500 \times 2.10 + 1170 \times 1.40}{4.20} + \dfrac{9000 \times 1.90 \times (1.40 + 0.95)}{4.20} =$

$M_{max}(2.01\ mt.)\ (vedi\ T = 0) = 11\ t$

$M = 11 \times 2.01 - 500 \times \dfrac{2.01^2}{2} - 9000 \dfrac{(1.111)^2}{} = 13.555 \quad R_A = \dfrac{500 \times 2.10 + 1170 \times 2.80}{4.20} + \dfrac{9000 \times 1.90(0.90 + 0.95)}{4.20}$

$(12-8)$ $\quad 20 \times 92 \quad A_f = 9.4 \quad \sigma = 72/2200$ $= 9.36\ t.$

$pp = 0.20 \times 0.70 \times 2500 = 350$

$\sigma_{max} = \dfrac{11.000}{0.90 \times 20 \times 88} = 6.94\ y/cq$

$st 98/15\ (\tau_{4t} = 11.61)$

$mur. = 900$

$\overline{1250\ y/m}$

$Carico\ triang.\ solaio:$

$q_{max} = \dfrac{540}{2} \times 650 = 1755$

$T_1 = \dfrac{1755 \times 540}{4} = 2369\ y$.

$T_2 = 1250 \times \dfrac{540}{2} = 3375\ y$

$T_3 = 2000 \times 540 = 5400 \longrightarrow 11.144\ y.$

$M_{max} = \dfrac{540^2}{12} \times 1200 + \dfrac{5}{96} \times 540^2 \times 1755 = 3037 + 2665$

$= 5702\ y_m +$

$\sigma = 62 \quad \tau = 2200 \quad \dfrac{540^2}{12} \times 2000 =$

Nell'ipotesi di mur. us port. $\quad A_f = 6.3\ cq$ $\quad 10.568\ y_m$

- peso mur. $8.40 \times 400 = 860\ y/m$ $\quad 20 \times 70 \quad \sigma = 77\ \tau = 2200$

- cordolo: $0.30 \times 0.40 \times 2500 = 300$ $\quad A_f = 8.2\ cq$

Solaio $500 \times 1.40 = 700$

$\overline{\tau = 2000\ y/m}$ $\quad \tau_{4t} = 2.05 \times 2200 \times \dfrac{0.9 \times 64}{15} = 8.84$

$\sigma_{max} = 11.144 / \dfrac{}{0.9 \times 20 \times 72} = 9.24 \quad st\ 98/15 \quad A_f = 11$

TRAVE 1-5-9

$pp = 060 \times 022 \times 2500 = 330$ Kg/ml

sol2: $100 \times 060 = 240$ u

muro att: $1.25 \times 250 = \underline{312}$ u

$\overline{882}$ u

(1-5)

$l = 4.20$ $T = 2.10 \times 882 = 1852$ Kg

$M_{7x} = 1296$ $Af = 3.3$ cq

60×22

(5-9)

$l = 5.40$ $T = 2381$ Kg

$M_{d7x} = 2143$ Kg/ml $Af = 5.42$ cq.

60×22

Soletta attelutore

Dimensione 1.70×2.60 — Condizioni di vincolo: appoggio-

praxi2g

$q = 6750$ Kg/ml

$q_a = 6750 \times \dfrac{1.70^4}{1.70^4 + 2.60^4} = 1043$ Kg/ml $M = 881$ Kg/ml

$q_b = 5707$ Kg/ml $M = 2061$ Kg/ml

$A_{f1} = \dfrac{881.00}{0g \times 23 \times 800} = 5.32$ cq/ml $5.32 \times 1.50 = 7.98$ cq

$A_{f2} = \dfrac{2061.00}{0g \times 23 \times 800} = 12.44$ cq/ml $12.44 \times 2.40 = 29.86$ cq

Solaio Tipo

TRAVE 1-2-3-4

(1-2) peso p.p. + sovr.: 760

$l = 3.52$ intonac.   200
           sol.   1137
                    ──────────
                    2797 $/$mℓ

$T = 4923$ $/$. $M_{Mx} = 2887$ $/$mℓ
                    $A_f = 7.4$ cq.

(2-3)   c.s. +   = 2797
$l = 2.75$ tr.: 1.20 × 800 = 960
        intonac. 1.05×250 =   262
                    ──────────
                    4019 $/$mℓ

$T = 5526$ $/$.
        $M_{v.r.} = 2532$ $/$m $A_f = 7.03$ cq

(3-4)   c.s +   2797
        1.10 × 800   880
        0.40×0.22×2500   220
$l = 4.00$ sol.: 0.40×400 : 160
                    ──────────
                    4057 $/$

$T = 4057 × 2 = 8114$ $/$

        $M_{Mx} = 5402$ $/$m $A_f = 14$ cq.

mensole 2-3-4; 10; 11; 12;

        $l = 1.20 + 0.34 = 1.54$

carico: peso proprio 250
        intonac.   900
                    ──────
                    1150

(riconduce la mensola 2-10
alle rimanenti per
semplicità.)

carico concentrato: 1120×2

$T = 1150 × 1.54 = 1771$ $/$ + 1120×2 = 4011
                                        20×50
$M_{Mx} = \frac{1.54^2}{2} × 1150 + (1120×2) × 1.54 = 4813$ $/$m $A_f = 5.3$ cq

TRAVE 5-6-7-8

    Come sopra.

TRAVE 9-10-11-12

(9·10)
$l = 3.52$

$T = 5609$

pp + solaio = 760
muratura. 800
solaio   1527
—————
3187

$M_{max} = 3890$ Kgm

$A_f = 9.14$ cq

(10-11)
$l = 3.95$

$T = 8707$

cs = 3187
mur.   262
soletta   960
—————
4409

$M_{max} = 5843$

$A_f = 15.54$ cq

(11-12)
$l = 2.80$

$T = 6225$

cs = 3187 r
soletta   880
trave aff. 820
tovz.   160
—————
4447

$M_{max} = 2905$ Kgm

$A_f = 8$ cq

TRAVE 4-8

pptrave   250
muvat.   900
soletta $900 \times 1.20 = 1080$
$$\overline{3060} \; y$$

Carichi muvat. aje.:
conc

$$\frac{1000 \times 4 \times 8.00}{2} = 4t.$$

se ri consideriamo le parti
portanti del aleante indipendenti:

$$T = \frac{4.20}{2} \times 1150 = 2415 \; y$$

$$T = \frac{4.20}{2} \times 3060 + 4000 = 10426$$

$q =$ trave 250
uur. $\dfrac{900}{1150}$ y/ue

$$U_{Bx} = \frac{4.20^2}{12} \times 1150 + \frac{5}{96} \times 4.20^2 \times 650 \times 2.10 = 1690 + 1254 = 2944 \; y_u$$

$20 \times 50 - \sigma_c = 54 \quad \beta_f = 2200 \quad A_f = 3.15 \; q.$

TRAVE $1'-5'-9'$

pptrave   : $060 \times 022 \times 2500 = 330$
muvat   900
sov2 $\underline{240}$
          1470

$(1-5)$
$\ell = 420$ $T = 3087 \; y$ $U_{Bx} = 2160$
                             $A_f = 6.00 \; q$

$(5-9)$
$\ell = 5.40$ $T = \cancel{2750} \; y \; 3969$ $U_{Bx} = 3572$
                                $A_f = 9.92 \; q.$

TRAVE 1-5-9

pp = $020 \times 022 \times 2500 = 110$
muvat. $\dfrac{300}{\simeq 05 \, t/ul}$

$(1-5)$
$T = \dfrac{4.20}{2} \times 05 = 1050 \; y$

$(5-9) \quad T = 5.40 \times 500 = 1350 \; y$

Analisi di carico per i pilastri delle pal. in linea

Copertura	Piano tipo (n.4)	peso pr. pil.	Carico alla base	
P_1 : 3887	5973	2x900+3x675	31.604	30x40
P_2 : 8159	12219		60.860	30x40
P_3 = 10.510	15.410		75.975	30x40
P_4 : 18.793	12.299		71.819	30x40
P_5 = 6028	8488		43.565	30x40
P_6 = 10.737	10737		57.510	30x40
P_7 = 11559	11.559		61.620	30x40
P_8 : 31.256	17.096	1135+2x900+2x675	103.690	30x50
P_9 : 4533	6959		36.200	30x40
P_{10} : 11.445	16.084		79.614	30x40
P_{11} : 11.881	16.702		82514	30x40
P_{12} : 16.944	11.095		65.149	30x40
P_1' : 5733	8010		37.779	30x40
P_5' : 10.261	13.084		66422	30x40
P_9' : 6920	9578		49.057	30x40

Verifica pil. più caricati :

$P_{11}/1°$ ord = 82514

$P_{11}/2°$ ordine : 64912

$P_{11}/3°$ ordine : 47310

P_8 1° ordine : 103690

P_8 2° ordine : 85470

$$\sigma_c = \frac{82514}{1200 + 12 \times 15} = 59.78 \ kg/cm^2$$

$$\sigma_c = \frac{64912}{1200 + 8 \times 15} = 50 \ kg/cm^2$$

$$\sigma_c = \frac{47310}{900 + 120} < 50 \ kg/cm^2$$

$$\sigma_c = \frac{103690}{1500 + 12 \times 15} = 61.72 \ kg/cm^2$$

$$\sigma_c = \frac{85470}{1200 + 8 \times 15} = 62 \ kg/cm^2$$

Piano tipo TRAVE 1-2-3-4

2,8 t/ml   4 t/me   (V. analisi prec.)

① 3.45 ②   2.75 ③   4.00 ④
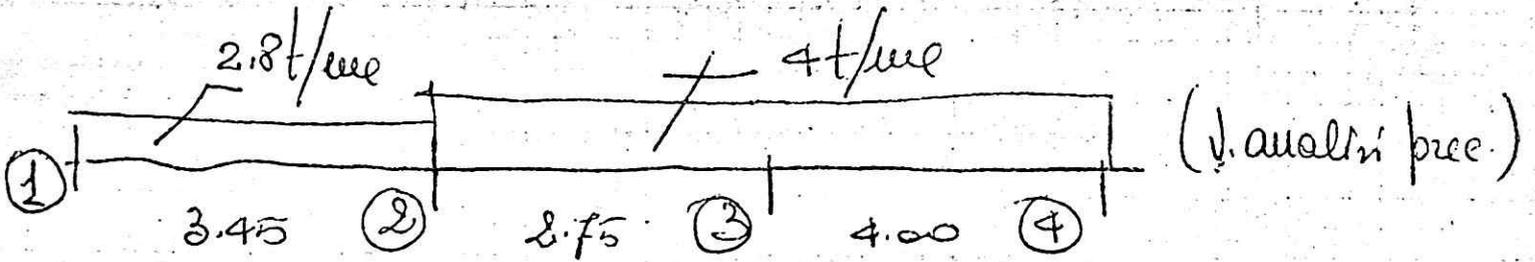
Caratt. elastiche: Sez. cost. 80x22

$W_{2-1} = \dfrac{0.75}{3.45} = 0217$

$W_{3-4} = \dfrac{0.5}{4} = 0.1875$

$W_{2-3} = \dfrac{1}{2.75} = 0363$

$K_{2-1} = \dfrac{0217}{0217+0363} = 037$; $K_{2-3} = 063$.
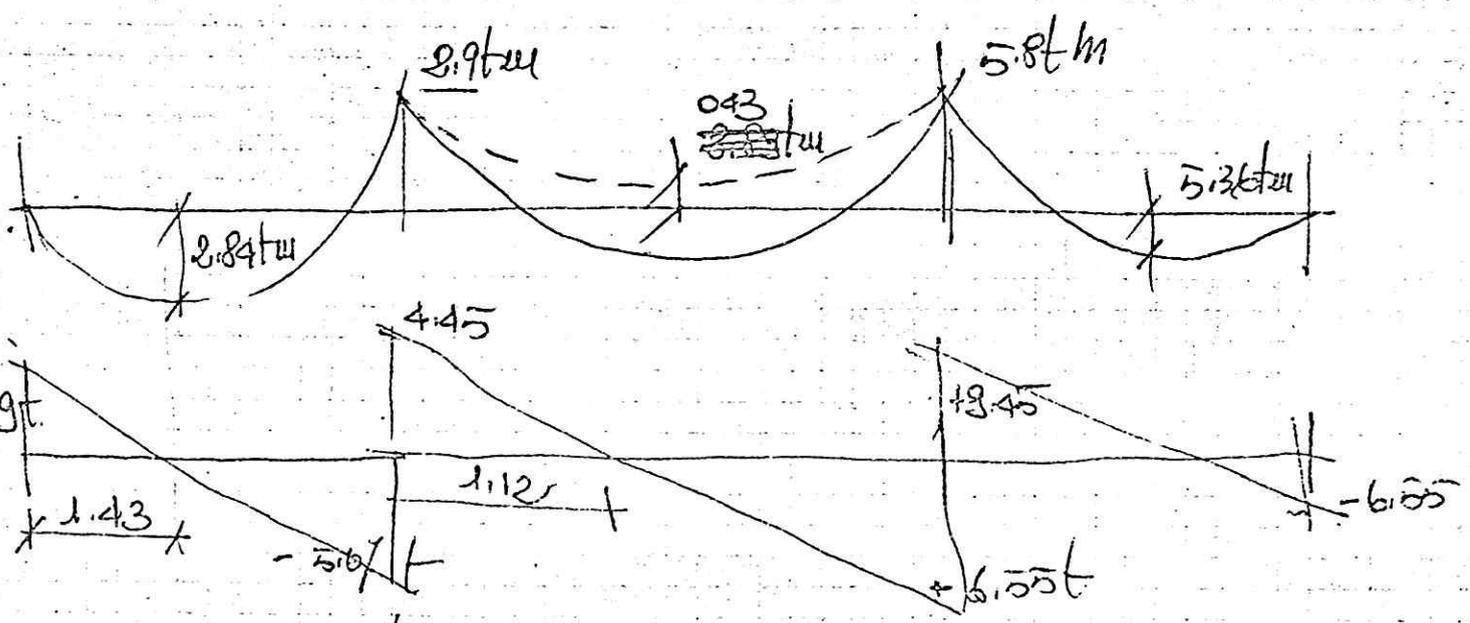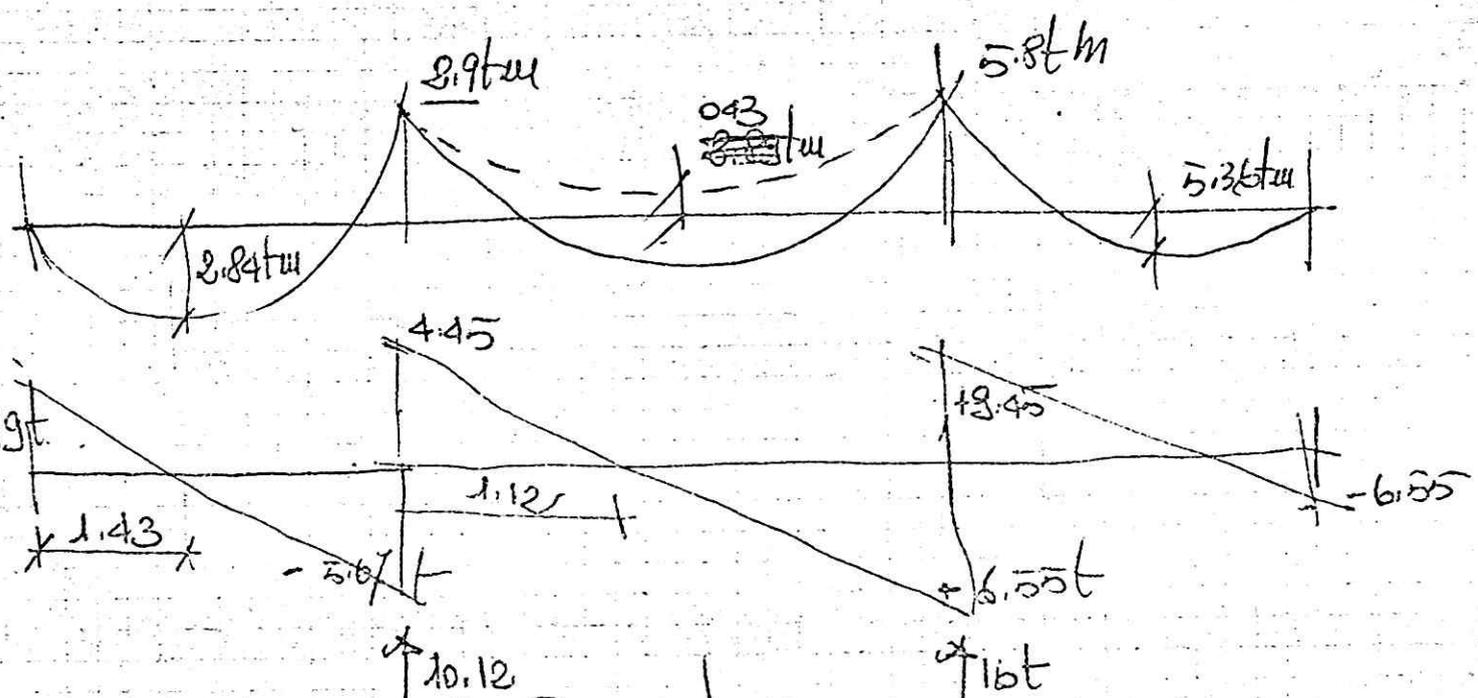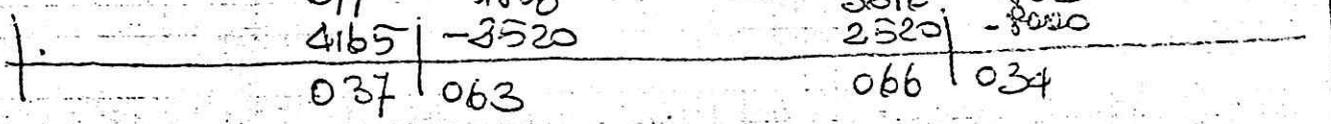
$K_{3-4} = 034$; $K_{32} = 066$

$\overline{M}_{2-1} = 4165\ t/m$

$M_{2-3} = 2520\ t/m$

$\overline{M}_{3-4} = 8000\ t/m$

2900 -825 4
       358 2
-132 -2175
-1277 1808
4165 -2520
037 | 063

5800 7.7 3
-1087 369 1
3616 1863
2520 -8000
066 | 034

2.9 t·m   043 t·m   5.8 t·m

2.84 t·m   5.36 t·m

4.45

3.99 t   +3.45

1.43   1.12   -6.55

-5.67   +6.55 t

↑10,12   ↑16 t
Progetto a flessione.

80x22   σc=66   σc=96   σc=97
σc=65   σf=2200   σf=1800   σf=2200
σf=2200   Af=7.3   Af=18.8   Af=14q.
Af=7.10 q
                        Armature adottate

Piano tipo   TRAVE 1-2-3-4

2.8 t/me   4 t/me   (V. analisi prec.)

① | ②   ③   ④ |
    3.45   ②   2.75   ③   4.00   ④

Caratt. elastiche :   Sez. cost. 80×22

$W_{2-1} = \dfrac{0.75}{3.45} = 0.217$

$W_{3-4} = \dfrac{0.75}{4} = 0.1875$

$W_{2-3} = \dfrac{1}{2.75} = 0.363$

$K_{2-1} = \dfrac{0.217}{0.217+0.363} = 0.37$; $K_{2-3} = 0.63$

$K_{3-4} = 0.34$; $K_{3.2} = 0.66$

$\overline{M}_{2-1} = 4165 \ Ym.$

$\overline{M}_{2-3} = 3520 \ Ym.$

$\overline{M}_{3-4} = 8000 \ Ym.$

        2900   5800
        =====   -825   4   ----- 3
                 358   7,17
  2 -12   -2175 2   -1087   369 3
    -1277   1808   3616   1863
    4165   -3520   2520 -8000
    0.37   0.63   0.66   0.34

2.9 tm   5.8 tm
         0.43 tm
                                    5.3 tm
2.84 tm

4.45
                              +9.45
3.99 t
                                          -6.55
  1.43   -3.67
          1.12
                        -6.55 t
  ↑10.12   ↑18 t

Progetto a flessione.

80×22 $\sigma_e = 65$ $\sigma_e = 96$ $\sigma_e = 97$
$\sigma_e = 65$ $\sigma_f = 2200$ $\sigma_f = 1800$ $\sigma_f = 2200$
$\sigma_f = 2200$ $Af = 7.3$ $Af = 18.8$ $Af = 14 \ q$
$Af = 7.10 \ q$

Armature adottate

TRAVE 5-6-7-8-8' ... (Piano tipo)

3.425 t/ml   3.425 t/ml   3.5 t/ml

⑤   ⑥   ⑦   ⑧   ⑧'

3.45   8.75   4.00   12.70

Caratteristiche elastiche :

$K_{6-5} = 037$ $W_{7-8} = 0.25 = \frac{1}{4}$ $K_{7-6} = \frac{0363}{0363+025} = 059$

$K_{6-7} = 063$ $W_{8-8} = \frac{05}{2.70} = 0185$ $K_{7-8} = 041$

$K_{8-7} = 057$

$K_{8-8'} = 043$

| 037 | 063 | 059 | 041 | 057 | 043 |

5.09	-2.158	8.158	-4.57	4.57	-2.13
-1.08	-1.847	-092	1.366	0683	-1.34
-035	098	2 1.365	-1.78	-3
4 035	-062 4	-031	-083	025
-013	035	5 070	049 5	-014	-011
	-032				
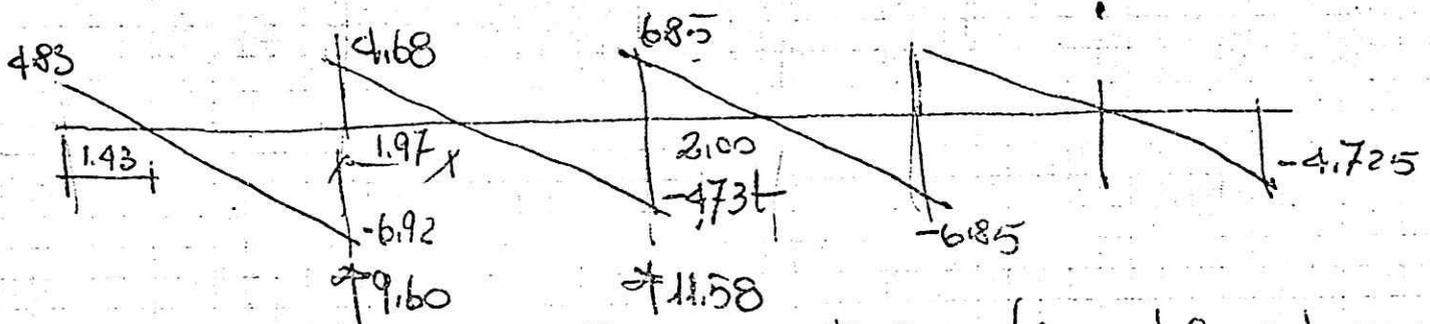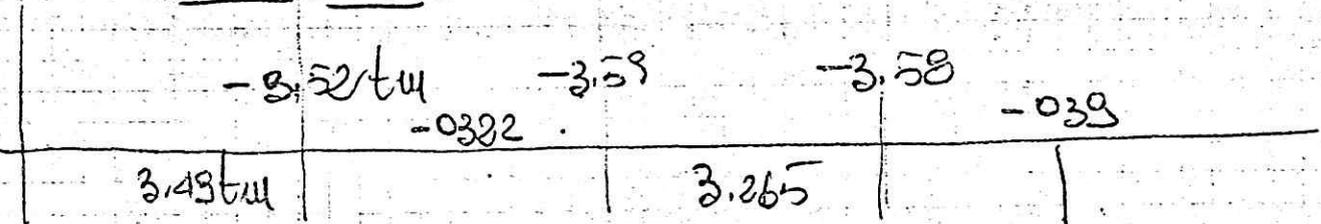
-3.52 t/m   -3.59   -3.58

-0322   -039

3.49 t/m   3.265

4.83   4.68   68.5

1.43   1.97 X   2.00

                  -6.92   -473 t   -6.85   -4.725

7.9.60   7.11.58

idem   Armatura a flessione (sez. cost. 80 x 22)

$\sigma_c = 74$ $\tau_c = 75$

$\sigma_f = 2200$ $\sigma_f = 2200$ (12)   Le armature adottate

$A_f = 3.9$ $A_f = 9.2 (15.3)$ sono maggiori

(10)   Armature adottate ( )

N.B. le medesime armature sono state adottate
no... le Tadi omologhe delle val. di angolo -

3,18 t/m   4,45 t/m   4,45 t/m

③   3.45   ⑩   3.95   ⑪   2,80   ⑫

Caratteristiche el.

$W_{10/3} = \frac{075}{3,45} = 0217$; $W_{10/11} = 0253$; $W_{11-12} = \frac{075}{2,80} = 02678$
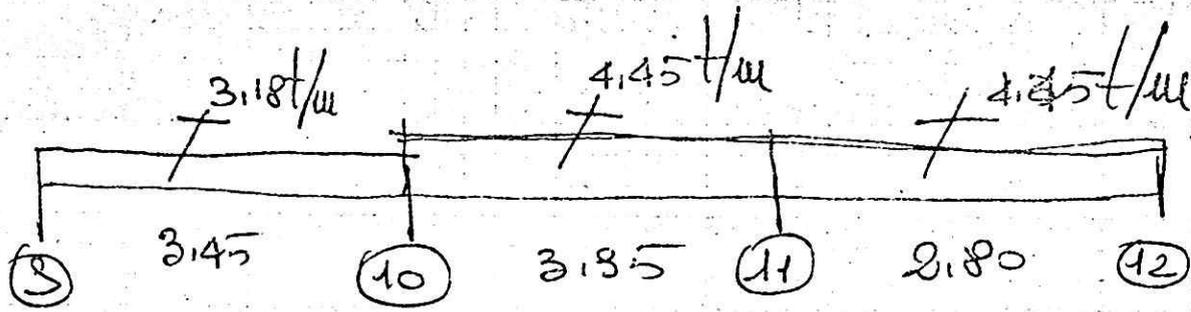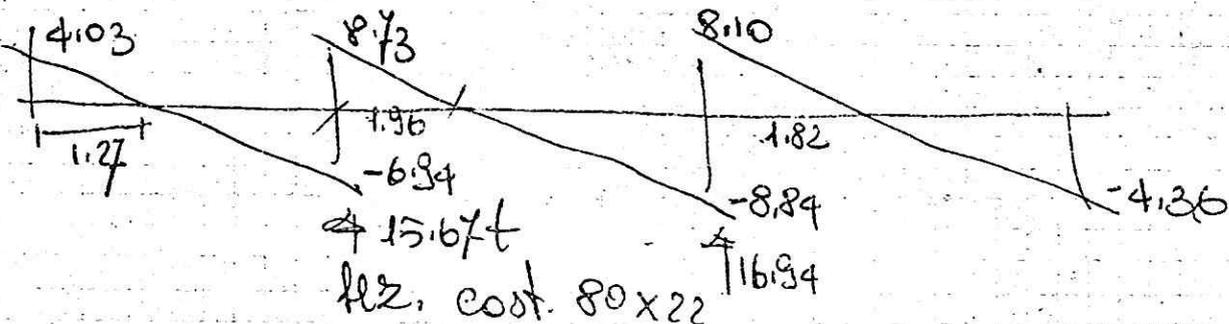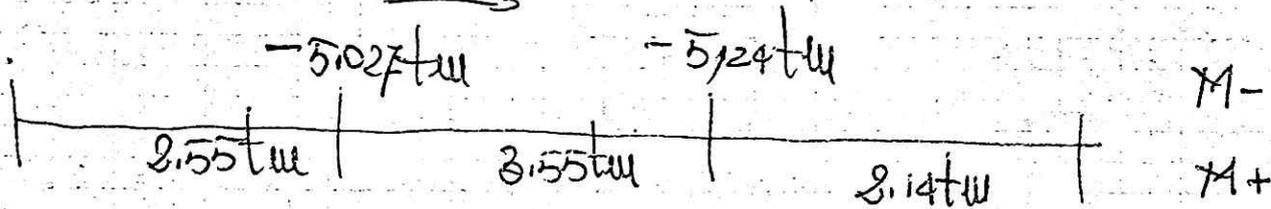
$K_{10.9} = \frac{0217}{0217+0253} = 046$ $K_{11/10} = \frac{0253}{0253+02678} = 0485$

$K_{10.11} = 054$ $K_{11-12} = 0515$

0,46	0,54	0,485	0,515
4,73	-5,79	5,79	-4,36

+0487 0573
3 -019   0415
      -022 3

0,28
2 -083 -088 2

-5,02 t/m   -5,24 t/m   M-

2,55 t/m   3,55 t/m   2,14 t/m   M+

4,03   8,73   8,10

1,27   1,96   1,82

-6,94   -8,84   -4,36

↓15,67 t   ↑16,94

flz. cost. 80×22

$\tau_c = 62$ $\tau_c = 82$ $\tau_c = 74$ $\tau_c = 85$ $\tau_c = 47$
$\sigma_f = 2200$ $\sigma_f = 2200$ $\sigma_f = 2200$ $\sigma_f = 2200$ $\sigma_f = 2200$
$Af = 64$ $Af = \frac{}{12q}$ $Af = 9q$ $Af = 12,4q$ $Af = 4,76$
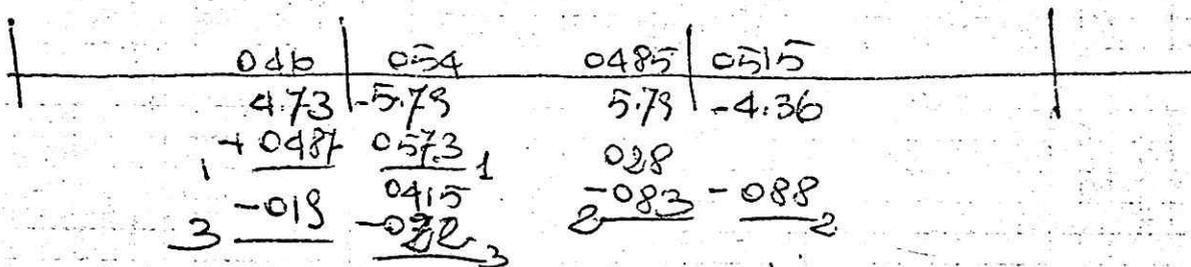
TRAVE 9-10-11-12   Piano tipo
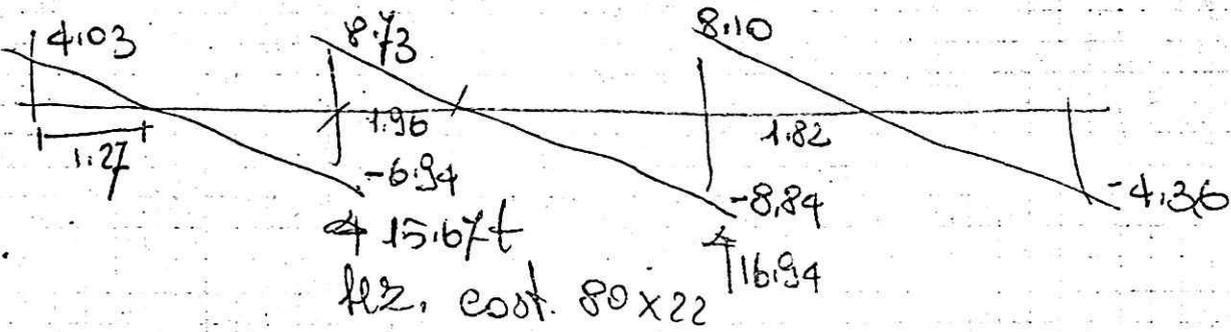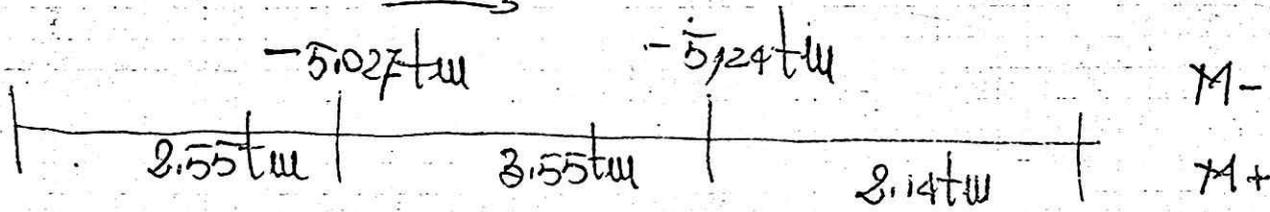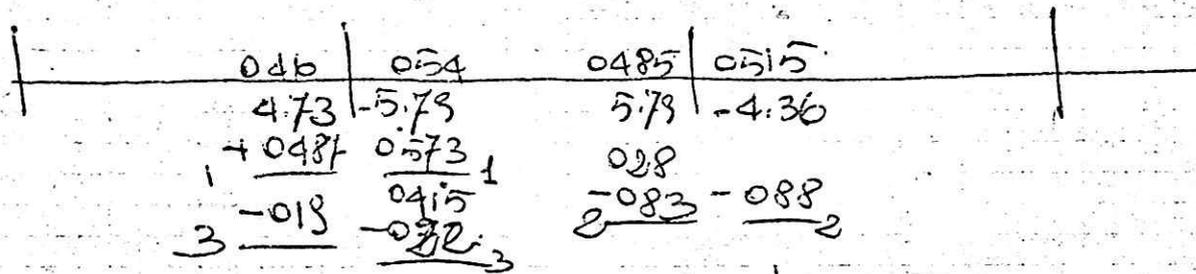
Caratteristiche el.

$W_{10/9} = \dfrac{0.75}{3.45} = 0.217$; $W_{10/11} = 0.253$; $\overline{W}_{11-12} = \dfrac{0.75}{2.80} = 0.2678$

$K_{10-9} = \dfrac{0.217}{0.217 + 0.253} = 0.46$ $K_{11/10} = \dfrac{0.253}{0.253 + 0.2678} = 0.485$

$K_{10-11} = 0.54$ $K_{11-12} = 0.515$

	0.46	0.54	0.485	0.515	
	4.73	-5.78	5.78	-4.36	

+0.487   0.573
      0.415
3 -0.18 -0.22 3

0.28
2 -0.83 -0.88 2

$-5.02\,t/m$ $-5.24\,t/m$ M-

2.55 t·m   3.55 t·m   2.14 t·m   M+

4.03   8.73   8.10
1.27   1.96   1.82
          -6.94   -8.84   -4.36

↓15.67 t

↓16.94

flz. cost. 80×22

$\sigma_c = 62$ $\sigma_c = 82$ $\sigma_c = 74$ $\sigma_c = 85$ $\sigma_c = 47$
$\sigma_f = 2200$ $\sigma_f = 2000$ $\sigma_f = 2000$ $\sigma_f = 2200$ $\sigma_f = 2200$
$A_f = 6.4$ $A_f = 12\,c_i$ $A_f = 9c_i$ $A_f = 12.4c_i$ $A_f = 4.76$

Solette a sbalzo:

a) zona con muratura.

$$M = \frac{1.50^2}{2} \times 650 + 900 \times 1.40 = 731 + 1260 = 1991 \; \text{Kgm}$$

$\sigma_c = 52 \qquad \sigma_f = 2200 \qquad Af = 5.5 \; cq/ml$

b) zona senza muratura

$$M = \frac{1.54^2}{2} \times 800 + 300 \times 1.50 = 1398 \; \text{Kgm}$$

$\sigma_c = 42 \qquad \sigma_f = 2200 \qquad Af = 3.9 \; cq/ml$

a filo di trave:

a) $$M = \frac{1.20^2}{2} \times 650 + 900 \times 1.10 = 1458 \; \text{Kgm}$$

$\sigma = 43/2200 \qquad Af = 1.58 \; cq/cm$

$1\phi 12 + 1\phi 8 /40 \qquad\qquad 4.74/120$

Oppure $1\phi 14 + 1\phi 8 /50 \qquad \boxed{1975}$

b) $$M = \frac{1.20^2}{2} \times 800 + 300 \times 1.20 = 936 \; \text{Kgm}$$

$\sigma = 36/2200 \qquad Af = 1 \; cq/40 \; cm$

$1.2/50 \; cm$

$2.9 \; cq/120$

Plinto 2,40 x 2,40   1.2.3-6-7-13-14-18-19 -5²

$P_{max} = 76 t.$

h magro di fond. : 20 cm

pp :   0,20 × 2,40 × 2,40 × 2200 = 2534
       2,40 × 2,40 × 0,70 × 2500 = 10.080
                                   ─────────
                                    12.614

$\sigma_f = \dfrac{28614}{240 \times 240} = 1.54 \, \text{k/c}$

$\sigma_{f\,def} = \dfrac{76.000}{240 \times 240} = 1.32 \, \text{k/c}$

$M_{fx} = 2,40 \times 13200 \times \dfrac{1.05^2}{2} = 17.463 \, \text{km}$

$A_f = \dfrac{1746300}{09 \times 65 \times 2200} = 13.57 \, \text{c}$

Emedia puns. $= \dfrac{76.000}{70 \times 140} = 7.75 \, \text{k/c}$

$N = 1,32 \left[240 \times 240 - (140+30)(140+40) \right] = 35640 \, \text{k}$

$A_{f\,tot} = \dfrac{35640 \times \sqrt{2}}{2200} = 22.84$

$A_{f\,lato\,30} = \dfrac{22.84}{2} \times \dfrac{30}{70} = 4.89 \, \text{c}$

$A_{f\,lato\,40} = \dfrac{22.84}{2} \times \dfrac{40}{70} = 6.52 \, \text{c}$

Plinto 240×300   1. 10-11 -

$Peso_x = 83.000$ y

    — magro: $2,40 \times 3,00 \times 0,20 \times 2200 = 3168$

    — plinto: $2,40 \times 3,00 \times 0,80 \times 2500 = \underline{14.400}$

                                              17.568

$\sigma_f = \dfrac{100.568}{240 \times 300} = 1,40$ y/cy.

        $\sigma_{fdep} = 1,10$ y/cy.

$M_1 = 2,40 \times \dfrac{130^2}{2} \times 11.600 = 23.524$ ym

        $Af = 13.84$ cy

$M_2 = 3,00 \times \dfrac{1,05^2}{2} \times 11.600 = 19.183$

        $Af = 12.92$ cy

Taccolto punz. $= \dfrac{83.000}{140 \times 80} = 7,41$ y/cy

$\ell = 1,10 \left[240 \times 300 - (160+30)(160+40) \right] = 39440$ y

$Af_p = \dfrac{39440 \times \sqrt{2}}{2200} = 25,27$ cy

$Af_{30} = \dfrac{25,27}{2} \times \dfrac{30}{70} = 5,5$ cy

$Af_{40} = 7,15$ cy

Hinto 240 × 180   4. 9'-1'

Plux = 50 t.

- mapo : 2.40 × 1.80 × 0.20 × 2200 = 1900 $\frac{\ell}{\ell}$
- Plinto : 2.40 × 1.80 × 0.60 × 2200 = 6480

$$\overline{58.380}$$

$\sigma_F = \dfrac{58.380}{240 \times 180} = 1.36 \ \frac{\ell}{c}$

$\sigma_{adp} = \dfrac{50.000}{240 \times 180} = 1.16 \ \frac{\ell}{cy}$

$M_1 = 11.600 \times 2.40 \times \dfrac{0.65^2}{2} = 5.881 \ \ell_m$

$A_{1} = 5.40 \ c$

$M_2 = 11600 \times 1.80 \times \dfrac{1.00^2}{2} = 10.440 \ \ell_m$

$A_{2} = 9.6 \ c$

Sueells. $\rho_{mu} = \dfrac{50.000}{140 \times 60} = 5.95 \ \frac{\ell}{c}$

$Q = 1.16 \ [240 \times 180 - (120 + 30)(120 + 40)] = 22.272 \ \ell$

$A_{pp} = \dfrac{22.272 \times \sqrt{2}}{2200} = 14.27 \ c$

$A_{p30} = 3.05 \ c$

$A_{p40} = 4.08 \ c$

Pernto doppio 2.70x2.40   (2x0.1 – 2x0.9)

Peso x 2 x 37.00 = 74 t

- Magro: 020x2.70x2.40 x2200 = 2850
- Pieno: 080x2.70x2.40 x2500 = 12960
                                    89.811 y

$\sigma_f = \dfrac{89811}{240x270} = 1.4$ y/q

$\sigma_{f\,dep} = 1.15$ y/q.

$M_1 = 11500 \times 2.40 \left(\dfrac{1.35-035}{2}\right)^2 = 13.800$ yu

$Af_1 = 9.29$ cy

$M_2 = 11500 \times 2.70 \times \dfrac{1.00}{2}^2 = 15.525$ y

$Af_2 = 10.45$ y/q

semedie punz $= \dfrac{74.000}{(70x2+40x2)x80} = 4.2$ y/q.

Plinto doppio (2.40×3.40)   Ex u.5

$P_{ us_x} = 44 \times 2 = 88 t$

- magro: $0.20 \times 2.40 \times 3.40 \times 2200 = 3590 \frac{h}{}$
- Plinto: $0.80 \times 2.40 \times 3.40 \times 3500 = \underline{18320}$ u

$\underline{107.910}$ 4

$\sigma_t = 1.4 \frac{h}{q}$

$\sigma_{t \, def} = 1.10 \frac{h}{q}$

$W_1 = 11.000 \times 2.4 e \left(\frac{1.70}{2} - 0.33\right)^2 =$

$A_{f1} =$

$W_2 = 11.000 \times 3.40 \times \frac{1.00}{2}^2 =$

$A_{f2} =$

Verifica punzonamento: $\frac{58.000}{(140+80) \times 80} = 5 \frac{h}{q}$

$R = 1.1 \left[240 \times 340 - (70+160)(40+160) \right] = 39.160 \frac{h}{}$

$A_{fp} = \frac{39160 \times \sqrt{2}}{2200} = 25.098 \, eq$

$A_{fp \, 70} = 8 \, eq$

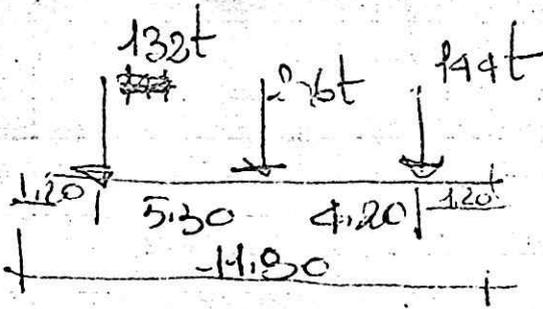$A_{fp \, 40} = 4.6 \, eq.$

Blocco di fondazione sotto i pilastri 4-8-12
$4'-8'-12'$

$P_4 = 72t$

$P_8 = 103t$

$P_{12} = 66t$

132t   206t   144t

1,20 | 5,30 | 4,20 | 1,20

11,90

$$c = \frac{11,90}{2} - \frac{132 \times 10,70 + 206 \times 5,40 + 144 \times 1,20}{132 + 206 + 144}$$

$$= 5,95 - \frac{2697,6}{482} = 35 \, cm$$
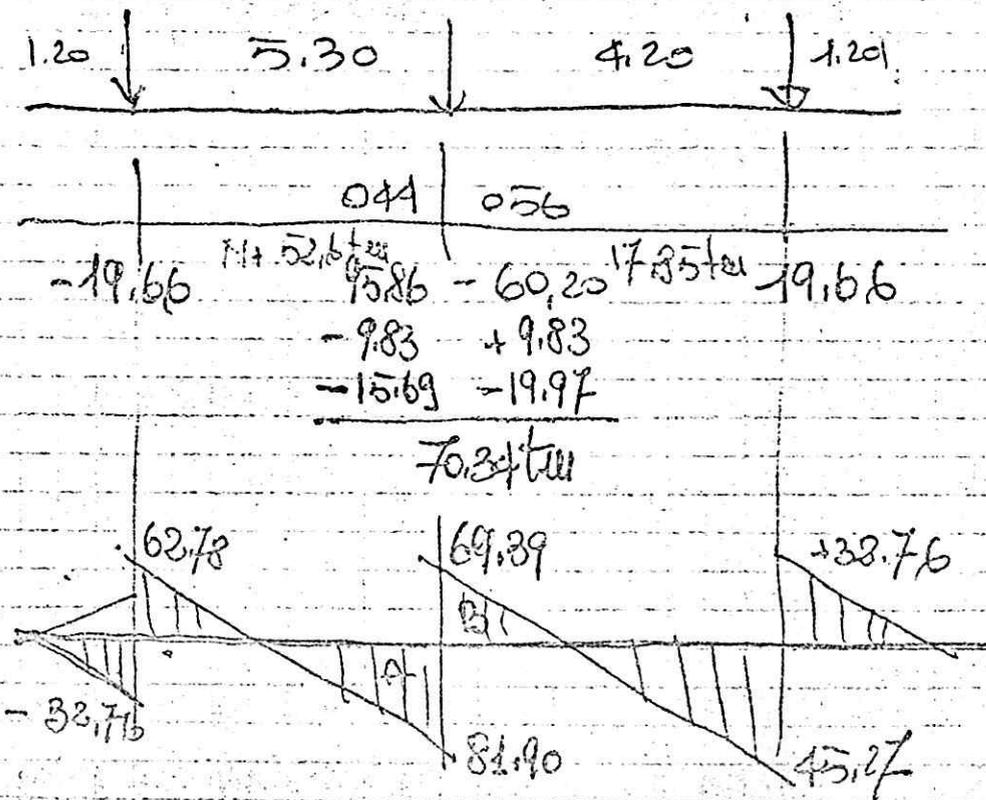
$A = 4,20 \times 11,90 = 50 \, mq$

Peso proprio $50 \times 0,40 \times 2500 + 2 \times 11,9 \times 0,50 \times 1,00 \times 2500 = 80t$.

$P_{tot} = 562t$

$$\sigma_{max} = \frac{80.000}{500.000} + \frac{482.000}{500.000}\left(1 + \frac{6 \times 0,35}{11,90}\right) =$$

$$= 0,16 + 1,14 = 1,30 \, kg/cm \longrightarrow 13.000 \, kg/mq.$$

Carico a ml sulla trave:

   $13.000 \times 2,10 = 27.300 \, t/ml.$

1,20 ↓   5,30   ↓   4,20   ↓ 1,20

| 0,44 | 0,56 |

$-19,66$ $M + 52,6$ tm $15,86 - 60,20$ $17,35$ tm $-19,66$

$-9,83$ $+9,83$

$-15,69$ $-19,97$

$70,34$ tm

$+62,78$ $+69,89$ $+38,76$

$-32,75$ $81,90$ $45,2t$

tratto A

$$\Sigma_{max} = \frac{81900}{0.9 \times 1.35 \times 50} = 13.5 \ t/q.$$

st. $\phi 10/15$ $T_{st} = 2 \times 0.8 \times 2200 \times \dfrac{0.9 \times 1.35}{15} = 28512 \ y$

$$S_{tot} = \frac{70.34 + 52.6}{0.9 \times 1.35} = 101,18 \ t.$$
max

$$A_{ffp} = \frac{(81900 - 28500)^2}{2 \times 27300} \times \frac{1}{\sqrt{2} \times 2200} \times \frac{1}{0.9 \times 1.35} = 13.85 \ cy$$

(pari a $7 \phi 16$)

$$S_{ffp} = 13.85 \times \sqrt{2} \times 2200 = 42984 \ y$$

$$S_{clatte} : 101,18 - 42,984 = 58,19 \ > 40\% \ S_{tot}$$

tratto B

$$\Sigma_{max} = \frac{69.380}{0.9 \times 1.35 \times 50} = 11,42$$

$$S_{tot} = \frac{70.34 + 7.85}{0.9 \times 1.35} = 72,58 \ t$$

$$A_{ffp} = \frac{(72,580 - 28500)^2}{2 \times 27300} \times \frac{1}{\sqrt{2} \times 2200} \times \frac{1}{0.9 \times 1.35} = 9.44 \ cy.$$

pari a $5 \phi 16$

Verifica su di una sezione $\varphi 45°$

$$T = 81.900 - 27.3 \times 1.40 = 43.68$$

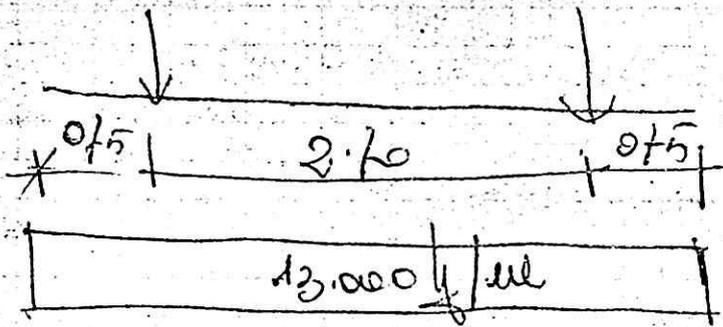$$T_{res} = \frac{140}{15} \times 2 \times 2200 + \frac{2 \times 7 \times 2200}{\sqrt{2}} = 61,44 \ t \ > 43.68.$$

— $M = 52,6 \ tm$ $\tau_c = 50$ — $\sigma_f = 2200$ $A_f = 19.3 \ cy$
                        $\dfrac{50 \times 140}{}$

— $M = 70.34 \ tm$ $\tau_c = 58$ — $\sigma_f = 2200$ $A_f = 86 \ cy \ (18 \phi 16)$

— $M = 19,66 \ tm$ $\tau_c < 30$ $A_f = 7 \ cy.$

Suola di fondazione

$\downarrow$ 0,5 | 2.70 | 0,5 $\downarrow$

13.000 y/ml

$M^{(-)} = \dfrac{0,5^2}{2} \times 13000 = 3656 \; y m/m$

$Af = 4.9 \; cq/ml$

$M^+ = \dfrac{2,70^2}{8} \times 13.000 - 3656 = 8190 \; y m/m$

$Af = 11. cq / ml$

$1 \phi 16/15 = \dfrac{100}{15} \times 2 = 13 \; cq.$