

GESTIONE CASE, LAVORATORI (legge 14-2-963)		Intervento N° 567		stazione appaltante i. a. c. p.	
QUARTIERE "S. ELIA" BRINDISI Edilizia sovvenzionata				data 18-V-1968	aggiornam.
				aggiornam.	aggiornam.
RELAZIONE				archivio	
Dr Ing. Luigi CERVELLERA	EDILIZIA			note	
Dr Ing. Ugo LONOCE	EDILIZIA				
Dr Ing. Elfo ROMANAZZI	STRUTTURE				
Dr Ing. Fausto FALIVA	IMPIANTI				
Dr Ing. Mario ZENOBI	PROGRAMMAZIONE			controllo	visto
I A C P	DIREZIONE LAVORI				

Il lotto comprende n°10 palazzine di 5 diversi tipi composte ciascuna di piano terra, tre, quattro e cinque piani abitazioni. Le strutture sono del tipo tradizionale in c.a. costituite da pilastri, travi a spessore o di calata, solai in latero-cemento, sporti in latero-cemento, scale in c.a. a sbalzo da travi a ginocchio, murature perimetrali a doppia foderà in laterizio.

I solai di calpestio e di copertura sono previsti dell' altezza di cm 25, compresa la soletta collaborante di cm 5, con interasse 50 cm, mentre per le zone ribassate dei servizi l' altezza di viene di cm 16; il calpestio piano terra è previsto con solaio in latero-cemento.

Le fondazioni sono a travi rovesce in c.a. dell' altezza di cm 100. Le fondazioni sono state proporzionate per un carico di circa 1,7 Kg/cm² sul terreno.

Si è previsto l' uso di calcestruzzo classe 180 dosato a 3 ql/mc di cemento tipo 730, ferro tondo omogeneo Aq 42.

Le sollecitazioni massime nel calcestruzzo armato sono:

- 70 Kg/cm² per le strutture sollecitate a flessione e pressoflessione
- 45 Kg/cm² per le strutture sollecitate a pressione semplice.

I calcoli sono stati eseguiti con l' ausilio del regolo calcolatore.

- Analisi generale dei carichi -

Solai in latero-cemento	$H = 20'' + 5''$	$i = 50''$
p.p.		= 160
soletta	$0,05 \times 1,00 \times 1,00 \times 2500$	= 125
sovracc. perm.		= 115
sovracc. accid.		= 200
		600 Kg/mq

Muratura

Muratura diOMPAGNO a doppia fodera di mattoni forati e tufo

fodera esterna	$80 \times 2,90$	= 230
" interna	$170 \times 2,90$	= 470
		700 Kg/ml

BALCONI

a sbalzo in latero-cemento	$H = 16'' + 4''$	
p.p.		= 140
soletta		= 100
sovracc. perm.		= 160
sovracc. accid.		= 400
		800 Kg/mq

S C A L E

gradini a sbalzo da trave a ginocchio

p.p.	$\frac{20+4}{2} \times 1,00 \times 1,00 \times 2500$	= 300
sovracc. perm.		= 100
" accid.		= 400
		800 Kg/mq

PALAZZINA TIPO 1

C/6 D/6

Solaio 25" $q = 600 \text{ Kg/mq}$ tompagno 700 Kg/ml sbalzi 800 Kg/mq

- Analisi di carico sulle travi -

Trave 1-2; 8-9;

solaio	$600 \times \frac{3,90}{2}$	= 1200
tompagno		= 700
p.p.		= 400
		2300 Kg/ml

Trave 2-3-4-5-6-7-8; 10-11-12-13-14; 15-16-17-18-19;

solaio		= 1200
sbalzo	$800 \times 1,30$	= 1050
tompagno		= 700
p.p.		= 450
		3400 Kg/ml

Trave 14-15

solaio		= 1200
sbalzo	$800 \times 0,40$	= 350
tompagno		= 700
p.p.		= 450
		2700 Kg/ml

Trave 20-21-22-23-24; 25-26-27-28-29;
30-31-32-33-34; 35-36-37-38-39;

solaio		= 1200
solaio	$600 \times \frac{5,00}{2}$	= 1500
p.p.		= 400
		3100 Kg/ml

Trave 24-25; 34-35;

solaio	=	1200
tompagno	=	700
p.p.	=	400
		2300 Kg/ml

Trave 44-45-46; 51-52-53; 54-55-56; 61-62-63;

solaio	=	1500
tompagno	=	700
p.p.	=	400
		2600 Kg/ml

Trave 46-47-48; 49-50-51; 56-57-58; 59-60-61;

solaio	=	1500
sbalzo	800 × 0,70	= 550
tompagno	=	700
p.p.	=	450
		3200 Kg/ml

Trave 48-49; 58-59;

sbalzo	=	550
tompagno	=	700
p.p.	=	350
		1600 Kg/ml

Trave 24-40-48; 25-41-49; 34-42-58; 35-43-59;

rampa	800 × 1,20	= 950
tompagno	=	700
p.p.	=	350
		2000 Kg/ml

Trave 1-20-44; 9-29-53; 10-30-54; 19-39-63;

tompagno

= 700

p.p.

= 300

1000 Kg/ml

- Analisi di carico sui pilastri -

Pilastro 1; 9

1 - 20	$1000 \times \frac{4,30}{2}$	= 2150
1 - 20	$2300 \times \frac{3,00}{2}$	= 3450
p.p.		<u>= 1400</u>
		7000 Kg

Pilastro 2; 8

1 - 2		= 3450
2 - 3	$3400 \times \frac{3,00}{2}$	= 5100
p.p.		<u>= 1450</u>
		10000 Kg

Pilastro 3; 4; 5; 6; 7; 11; 12; 13; 16; 17; 18;

3 - 2		= 5100
3 - 4	$3400 \times \frac{3,00}{2}$	= 5100
p.p.		<u>= 1300</u>
		12500 Kg

Pilastro 10; 19

10 - 11	$3400 \times \frac{3,00}{2}$	= 5100
10 - 30	$1000 \times \frac{4,30}{2}$	= 2150
p.p.		<u>= 1250</u>
		8500 Kg

Pilastro 14; 15;

$$14 - 13 \quad 3400 \times \frac{3,00}{2} = 5100$$

$$14 - 15 \quad 2700 \times \frac{3,00}{2} = 4050$$

$$p.p. \quad = \underline{1350}$$

10500 Kg

Pilastro 20; 29; 30; 39;

$$20 - 1 = 2150$$

$$20 - 44 \quad 1000 \times \frac{5,40}{2} = 2700$$

$$20 - 21 \quad 3100 \times \frac{3,00}{2} = 4650$$

$$p.p. \quad = \underline{1500}$$

11000 Kg

Pilastro 21; 22; 27; 28; 31; 32; 33; 36; 37; 38;

$$21 - 20 = 4650$$

$$21 - 22 \quad 3100 \times \frac{3,00}{2} = 4650$$

$$p.p. \quad = \underline{1200}$$

10500 Kg

Pilastro 23; 26;

$$23 - 22 \quad 3100 \times \frac{3,00}{2} = 4650$$

$$23 - 24 \quad 3100 \times \frac{1,55}{2} = 2400$$

$$p.p. \quad = \underline{1450}$$

8500 Kg

Pilastro 24; 25;

24 - 23		= 2400
24 - 25	$2300 \times \frac{2,50}{2}$	= 2900
24 - 40	$2000 \times \frac{2,00}{2}$	= 2000
p.p.		<u>= 1200</u>
		8500 Kg

Pilastro 34; 35;

34 - 30	$3100 \times \frac{3,00}{2}$	= 4650
34 - 35	$2300 \times \frac{2,50}{2}$	= 2900
34 - 42	$2000 \times \frac{2,00}{2}$	= 2000
p.p.		<u>= 1450</u>
		11000 Kg

Pilastro 40; 41; 42; 43;

40 - 24		= 2000
40 - 48	$2000 \times \frac{3,95}{2}$	= 3950
p.p.		<u>= 1550</u>
		7500 Kg

Pilastro 44; 53; 54; 63;

44 - 20		= 2700
44 - 45	$2600 \times \frac{3,00}{2}$	= 3900
p.p.		<u>= 1400</u>
		8000 Kg

Pilastro 45; 52;

45 - 44

= 3900

45 - 46

$$2600 \times \frac{2,25}{2}$$

= 2950

p.p.

= 1150

8000 Kg

Pilastro 46; 51;

46 - 45

= 2950

46 - 47

$$3200 \times \frac{3,40}{2}$$

= 3850

p.p.

= 1200

8000 Kg

Pilastro 47; 50;

47 - 46

= 3850

47 - 48

$$3200 \times \frac{1,90}{2}$$

= 3050

p.p.

= 1100

8000 Kg

Pilastro 48; 49;

48 - 47

= 3050

48 - 49

$$1600 \times \frac{2,90}{2}$$

= 2300

48 - 40

= 3950

p.p.

= 1200

10500 Kg

Pilastro 55 ; 62;

55 - 54

= 2700

55 - 56

$$2600 \times \frac{3,00}{2}$$

= 3900

p.p.

= 1400

8000 Kg

Pilastro 56; 61;

56 - 55

= 3900

56 - 57

$$3200 \times \frac{4,20}{2}$$

= 6750

p.p.

= 1350

12000 Kg

Pilastro 57; 60;

57 - 56

= 6750

57 - 58

$$3200 \times \frac{1,90}{2}$$

= 3050

p.p.

= 1200

11000 Kg

Pilastro 58; 59;

58 - 57

= 3050

58 - 59

= 2300

58 - 42

= 3950

p.p.

= 1200

10500 Kg

- Armatura travi rovesce -

- Analisi di carico sul terreno -

pilastrini	2.514.000
p.p. travi	<u>186.000</u>
	2.700.000 Kg

- Tensione sul terreno -

$$\sigma_t = \frac{2.700.000}{2.144.800} = 1,26 \text{ Kg/cm}^2$$

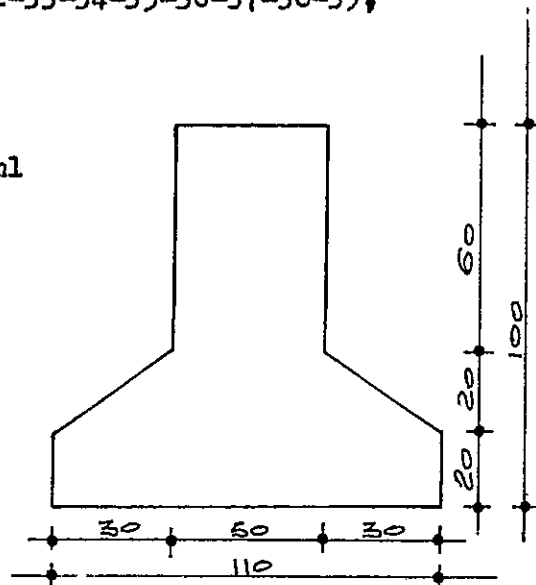
Travi 1-2-3-4-5-6-7-8-9; 10-11-12-13-14-15-16-17-18-19; 20-21-22-23-24-25-26-27-28-29; 30-31-32-33-34-35-36-37-38-39;

- Carico sulla trave -

$$\frac{2.514.000}{2.144.800} \times 100 \times 120 = 14200 \text{ Kg/ml}$$

- Caratteristiche geometriche -

vedi disegno



- Armatura a flessione

$$M_{inc} = \frac{1}{12} 14200 \times 3,40^2 = 13700 \text{ Kgm}$$

$$H = 100''$$

$$b = 50''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$\sigma_o = 33 \text{ Kg/cm}^2$$

$$A_f = 10,8 \text{ cm}^2$$

$$M_{camp} = 13700 \text{ Kgm}$$

$$H = 100''$$

$$b = 120''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$\sigma_o = 20 \text{ Kg/cm}^2$$

$$A_f = 10,5 \text{ cm}^2$$

- Armatura trasversale

$$M = \frac{1}{2} 14200 \times 0,35^2 = 900 \text{ Kgm}$$

$$H = 40''$$

$$b = 100''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$\sigma_o = 15 \text{ Kg/cm}^2$$

$$A_f = 1,2 \text{ cm}^2$$

Travi 44-45-46-47-48-49-50-51-52-53; 54-55-56-57-58-59-60-61-62-63;

$$M_{inc} = \frac{1}{12} 14200 \times \overline{4,15}^2 = 20400 \text{ Kgm} \quad H = 100'' \quad b = 50''$$

$$\sigma_F = 1400 \text{ Kg/cm}^2 \quad \sigma_C = 42 \text{ Kg/cm}^2 \quad A_F = 16,5 \text{ cm}^2$$

$$M_{camp} = 20400 \text{ Kgm} \quad H = 100'' \quad b = 120''$$

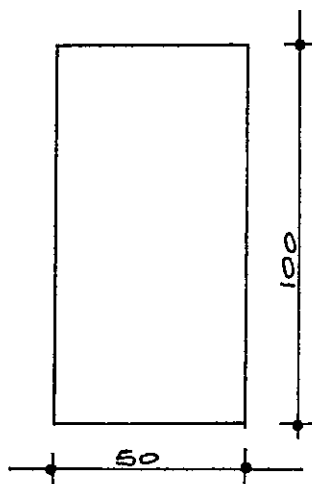
$$\sigma_F = 1400 \text{ Kg/cm}^2 \quad \sigma_C = 25 \text{ Kg/cm}^2 \quad A_F = 16 \text{ cm}^2$$

Travi 1-20-44; (4-5)-24-40-48; (5-6)-25-41-49; 9-29-53; 10-30-54;
14-34-42-58; 15-35-43-59; 19-39-63;

- Carico sulla trave

$$1,18 \times 100 \times 50 = 5900 \text{ Kg/ml}$$

- Caratteristiche geometriche -
vedi disegno



- Armatura a flessione

$$M_{camp} = M_{inc} = \frac{1}{12} 5900 \times \overline{4,95}^2 = 12000 \text{ Kgm} \quad H = 100'' \quad b = 50''$$

$$\sigma_F = 1400 \text{ Kg/cm}^2 \quad \sigma_C = 31 \text{ Kg/cm}^2 \quad A_F = 9,6 \text{ cm}^2$$

N°	P tn	A' oi cmq	A' f cmq	Armatura	sezione cm x cm	A ci cmq	σ c cmq
1-9	28	560	4,5	10 ø 12	ø 40	1369	20
2-8	40	820	6,6	10 ø 12	ø 40	1369	29
3-4-5-6-7-11- 12-13-16-17-18	50	1040	8,4	10 ø 12	ø 40	1369	36
10-19	34	700	5,6	10 ø 12	ø 40	1369	25
14-15	42	870	7,0	10 ø 12	ø 40	1369	31
20-29-30-21-28- 31-38-39	44	900	7,2	10 ø 12	ø 40	1369	32
22-27-32-33-36- 37	42	870	7,0	8 ø 12	35 x 35	1315	32
23-26	34	700	5,6	8 ø 12	35 x 35	1315	36
24-25	34	700	5,6	8 ø 12	25 x 40	1090	31
34-35	44	900	7,2	8 ø 12	25 x 40	1090	40
40-41-42-43	30	620	5,0	8 ø 12	25 x 40	1090	28
44-53-54-63-45- 52-55-62	32	660	5,3	10 ø 12	ø 40	1369	23
46-51-47-50	32	660	5,3	8 ø 12	35 x 35	1315	24
48-49	42	870	7,0	8 ø 12	25 x 40	1090	39
56-61	48	1000	8	8 ø 12	35 x 35	1315	37
57-60	44	900	7,2	8 ø 12	35 x 35	1315	34
58-59	42	870	7,0	8 ø 12	25 x 40	1090	39

SEZIONE ED ARMATURA PILASTRI PIANO PRIMO-SECONDO E TERZO

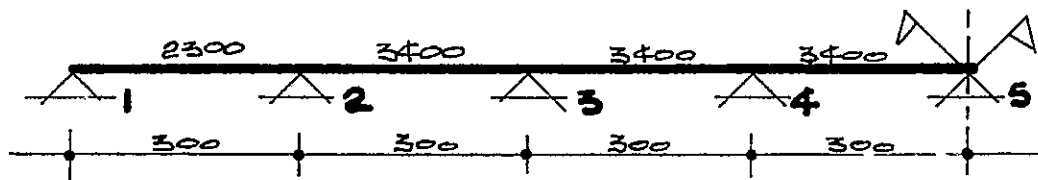
N°	sezione	armatura
1-9	30 × 30	8 Ø 12
2-8	30 × 30	8 Ø 12
3-4-5-6-7 11-12-13- 16-17-18-	30 × 30	8 Ø 12
10-19	30 × 30	8 Ø 12
14-15	30 × 30	8 Ø 12
20-29-30 21-28-31 38-39-	30 × 30	8 Ø 12
22-27-32 33-36-37	30 × 30	8 Ø 12
23-26	30 × 30	8 Ø 12

N°	sezione	armatura
24-25	25 × 40	8 Ø 12
34-35	25 × 40	8 Ø 12
40-41-42 43	25 × 40	8 Ø 12
44-53-54 63-45-52 55-62	30 × 30	8 Ø 12
46-47-51 50	30 × 30	8 Ø 12
48-49	25 × 40	8 Ø 12
56-61	30 × 30	8 Ø 12
57-60	30 × 30	8 Ø 12
58-59	25 × 40	8 Ø 12

Staffe Ø 6" / 15"

- Armatura travi a flessione -

Trave n°1-2-3-4-5-6-7-8-9

**- Armatura a flessione -**

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25 \text{ cm}$$

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

Sezione 1; 1-2;

$$M = \frac{1}{14} 2300 \times \overline{3,00}^2 = 1500 \text{ Kgm}$$

$$\sigma_o = 43 \text{ Kg/cm}^2$$

$$A_f = 5,0 \text{ cm}^2$$

Sezione 2; 3; 4; 5;

$$M = \frac{1}{12} 2300 \times \overline{3,00}^2 = 2550 \text{ Kgm}$$

$$\sigma_o = 60 \text{ Kg/cm}^2$$

$$A_f = 8,85 \text{ cm}^2$$

Sezione 2 - 3

$$M = \frac{1}{16} 2300 \times \overline{3,00}^2 = 1900 \text{ Kgm}$$

$$\sigma_o = 50 \text{ Kg/cm}^2$$

$$A_f = 6,5 \text{ cm}^2$$

Sezione 3-4; 4-5;

$$M = \frac{1}{18} 2300 \times \overline{3,00}^2 = 1700 \text{ Kgm}$$

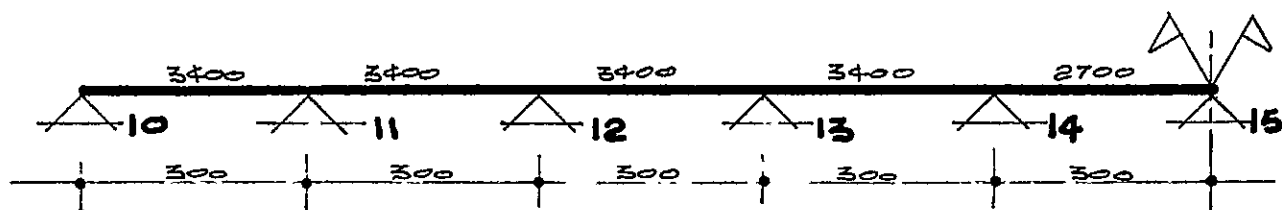
$$\sigma_o = 47 \text{ Kg/cm}^2$$

$$A_f = 5,8 \text{ cm}^2$$

Taglio massimo $T = 5100 \text{ Kg}$

$$\tau_{\max} = \frac{5100}{23 \times 0,9 \times 60} = 4,1 \text{ Kg/cm}^2$$

Trave n°10-11-12-13-14-15-16-17-18-19



- Armatura a flessione -

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25 \text{ cm}$$

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

Sezione 10; 10-11;

$$M = \frac{1}{14} 3400 \times 3,00^2 = 2200 \text{ Kgm}$$

$$\sigma_o = 55 \text{ Kg/cm}^2$$

$$A_f = 7,6 \text{ cm}^2$$

Sezione 11; 12; 13; 14;

$$M = \frac{1}{12} 3400 \times 3,00^2 = 2600 \text{ Kgm}$$

$$\sigma_o = 60 \text{ Kg/cm}^2$$

$$A_f = 8,9 \text{ cm}^2$$

Sezione 11-12

$$M = \frac{1}{16} 3400 \times 3,00^2 = 1900 \text{ Kgm}$$

$$\sigma_o = 50 \text{ Kg/cm}^2$$

$$A_f = 6,5 \text{ cm}^2$$

Sezione 12-13; 13-14;

$$M = \frac{1}{18} 3400 \times 3,00^2 = 1700 \text{ Kgm}$$

$$\sigma_o = 47 \text{ Kg/cm}^2$$

$$A_f = 5,8 \text{ cm}^2$$

Sezione 14 - 15

$$M = \frac{1}{18} 2700 \times 3,00^2 = 1350 \text{ Kgm}$$

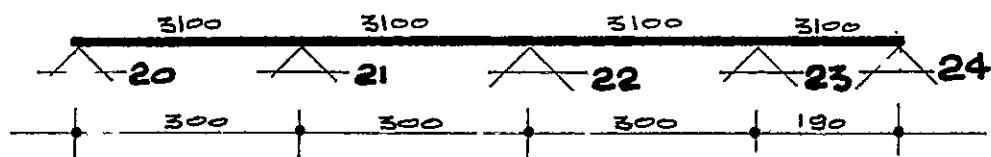
$$\sigma_o = 41 \text{ Kg/cm}^2$$

$$A_f = 4,6 \text{ cm}^2$$

Taglio massimo $T = 3400 \text{ Kg}$

$$\tau_{\max} = \frac{3400}{23 \times 0,9 \times 60} = 4,1 \text{ Kg/cm}^2$$

Trave 20-21-22-23-24, 25-26-27-28-29



- Armatura a flessione -

$$\sigma_F = 1400 \text{ Kg/cm}^2$$

$$H = 25 \text{ cm}$$

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

Sezione 20, 20-21;

$$M = \frac{1}{14} 3100 \times \overline{3,00}^2 = 2000 \text{ Kgm}$$

$$\sigma_o = 52 \text{ Kg/cm}^2$$

$$A_F = 6,9 \text{ cm}^2$$

Sezione 21, 22, 23;

$$M = \frac{1}{12} 3100 \times \overline{3,00}^2 = 2350 \text{ Kgm}$$

$$\sigma_o = 57 \text{ Kg/cm}^2$$

$$A_F = 8,1 \text{ cm}^2$$

Sezione 21-22

$$M = \frac{1}{16} 3100 \times \overline{3,00}^2 = 1750 \text{ Kgm}$$

$$\sigma_o = 47 \text{ Kg/cm}^2$$

$$A_F = 5,9 \text{ cm}^2$$

Sezione 22-23

$$M = \frac{1}{18} 3100 \times \overline{3,00}^2 = 1550 \text{ Kgm}$$

$$\sigma_o = 44 \text{ Kg/cm}^2$$

$$A_F = 5,25 \text{ cm}^2$$

Sezione 23-24

$$M = \frac{1}{18} 3100 \times \overline{1,90}^2 = 650 \text{ Kgm}$$

$$\sigma_o = 27 \text{ Kg/cm}^2$$

$$A_F = 2,2 \text{ cm}^2$$

Sezione 24

$$M = \frac{1}{12} 3100 \times \overline{1,90}^2 = 950 \text{ Kgm}$$

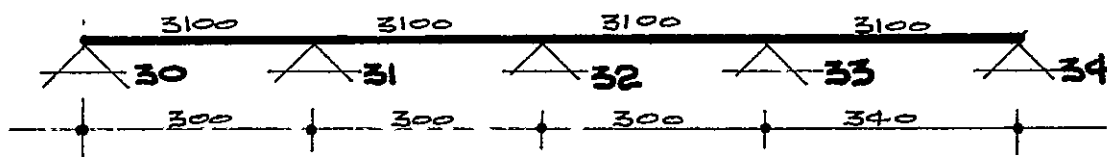
$$\sigma_o = 34 \text{ Kg/cm}^2$$

$$A_F = 3,25 \text{ cm}^2$$

$$\text{Taglio massimo } T = 4650 \text{ Kg}$$

$$\tau_{\max} = \frac{4650}{23 \times 0,9 \times 60} = 3,75 \text{ Kg/cm}^2$$

Trave 30-31-32-33-34; 35-36-37-38-39



- Armatura a flessione -

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25 \text{ cm}$$

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

Sezione 30; 30-31;

$$M = \frac{1}{14} 3100 \times \overline{3,00}^2 = 2000 \text{ Kgm}$$

$$\sigma_o = 52 \text{ Kg/cm}^2$$

$$A_f = 6,9 \text{ cm}^2$$

Sezione 31; 32;

$$M = \frac{1}{12} 3100 \times \overline{3,00}^2 = 2350 \text{ Kgm}$$

$$\sigma_o = 57 \text{ Kg/cm}^2$$

$$A_f = 8,1 \text{ cm}^2$$

Sezione 31 - 32

$$M = \frac{1}{16} 3100 \times \overline{3,00}^2 = 1750 \text{ Kgm}$$

$$\sigma_o = 47 \text{ Kg/cm}^2$$

$$A_f = 5,9 \text{ cm}^2$$

Sezione 32 - 33

$$M = \frac{1}{18} 3100 \times \overline{3,00}^2 = 1550 \text{ Kgm}$$

$$\sigma_o = 44 \text{ Kg/cm}^2$$

$$A_f = 5,25 \text{ cm}^2$$

Sezione 33; 34;

$$M = \frac{1}{12} 3100 \times \overline{3,40}^2 = 3000 \text{ Kgm}$$

$$\sigma_o = 66 \text{ Kg/cm}^2$$

$$A_f = 10,5 \text{ cm}^2$$

Sezione 33 - 34

$$M = \frac{1}{18} 3100 \times \overline{3,40}^2 = 2000 \text{ Kgm}$$

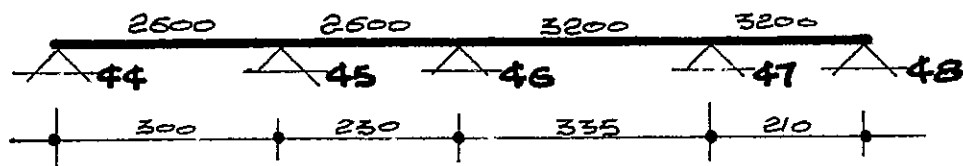
$$\sigma_o = 52 \text{ Kg/cm}^2$$

$$A_f = 6,9 \text{ cm}^2$$

Taglio massimo $T = 5300 \text{ Kg}$

$$\tau_{\max} = \frac{5300}{23 \times 0,9 \times 60} = 4,3 \text{ Kg/cm}^2$$

Trave 44-45-46-47-48; 49-50-51-52-53



- Armatura a flessione -

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25 \text{ cm}$$

$$b = 80 \text{ cm}$$

Sezione 44; 44-45;

$$M = \frac{1}{14} 2600 \times 3,00^2 = 1700 \text{ Kgm}$$

$$\sigma_c = 40 \text{ Kg/cm}^2$$

$$A_f = 5,6 \text{ cm}^2$$

Sezione 45

$$M = \frac{1}{12} 2600 \times 3,00^2 = 2000 \text{ Kgm}$$

$$\sigma_c = 43 \text{ Kg/cm}^2$$

$$A_f = 6,6 \text{ cm}^2$$

Sezione 45 - 46

$$M = \frac{1}{16} 2600 \times 2,30^2 = 850 \text{ Kgm}$$

$$\sigma_c = 27 \text{ Kg/cm}^2$$

$$A_f = 2,9 \text{ cm}^2$$

Sezione 46; 47

$$M = \frac{1}{12} 3200 \times 3,35^2 = 3000 \text{ Kgm}$$

$$\sigma_c = 55 \text{ Kg/cm}^2$$

$$A_f = 10,3 \text{ cm}^2$$

Sezione 46 - 47

$$M = \frac{1}{16} 3200 \times 3,35^2 = 2250 \text{ Kgm}$$

$$\sigma_c = 46 \text{ Kg/cm}^2$$

$$A_f = 7,6 \text{ cm}^2$$

Sezione 47-48; 48

$$M = \frac{1}{14} 3200 \times 2,10^2 = 1000 \text{ Kgm}$$

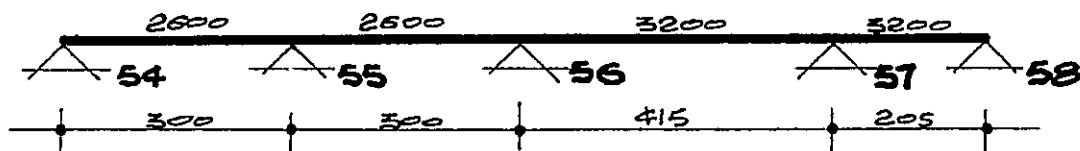
$$\sigma_c = 29 \text{ Kg/cm}^2$$

$$A_f = 3,3 \text{ cm}^2$$

$$\text{Taglio massimo } T = 5400 \text{ Kg}$$

$$\tau_{\max} = \frac{5400}{23 \times 0,9 \times 80} = 3,3 \text{ Kg/cm}^2$$

Trave 54-55-56-57-58; 59-60-61-62-63



- Armatura a flessione -

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25 \text{ cm}$$

$$b = 80 \text{ cm}$$

Sezione 54; 54-55

$$M = \frac{1}{14} 2600 \times 3,00^2 = 1700 \text{ Kgm}$$

$$\sigma_c = 40 \text{ Kg/cm}^2$$

$$A_f = 5,6 \text{ cm}^2$$

Sezione 55

$$M = \frac{1}{12} 2600 \times 3,00^2 = 2000 \text{ Kgm}$$

$$\sigma_c = 43 \text{ Kg/cm}^2$$

$$A_f = 6,6 \text{ cm}^2$$

Sezione 55 - 56

$$M = \frac{1}{16} 2600 \times 3,00^2 = 1500 \text{ Kgm}$$

$$\sigma_c = 36 \text{ Kg/cm}^2$$

$$A_f = 4,9 \text{ cm}^2$$

Sezione 56; 57

$$M = \frac{1}{12} 3200 \times 4,15^2 = 4600 \text{ Kgm}$$

$$\sigma_c = 72 \text{ Kg/cm}^2$$

$$A_f = 16,1 \text{ cm}^2$$

Sezione 56 - 57

$$M = \frac{1}{16} 3200 \times 4,15^2 = 3500 \text{ Kgm}$$

$$\sigma_c = 60 \text{ Kg/cm}^2$$

$$A_f = 11,9 \text{ cm}^2$$

Sezione 57-58; 58

$$M = \frac{1}{14} 3200 \times 2,05^2 = 1000 \text{ Kgm}$$

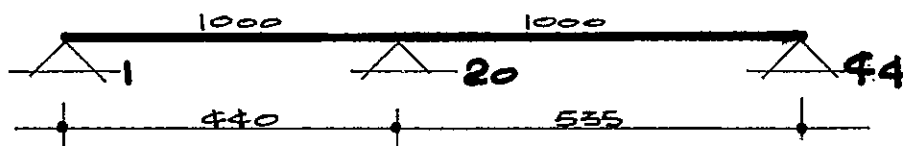
$$\sigma_c = 29 \text{ Kg/cm}^2$$

$$A_f = 3,3 \text{ cm}^2$$

$$\text{Taglio massimo } T = 6650 \text{ Kg}$$

$$\tau_{\max} = \frac{6650}{23 \times 0,9 \times 80} = 4,0 \text{ Kg/cm}^2$$

Travi 1-20-44; 9-29-53; 10-30-54; 30-39-63;
^T



- Armatura a flessione -

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25 \text{ cm}$$

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

Sezione 1; 1-20

$$M = \frac{1}{14} 1000 \times 4,40^2 = 1400 \text{ Kgm}$$

$$\sigma_c = 46 \text{ Kg/cm}^2$$

$$A_f = 4,7 \text{ cm}^2$$

Sezione 20

$$M = \frac{1}{12} 1000 \times 5,35^2 = 2400 \text{ Kgm}$$

$$\sigma_c = 64 \text{ Kg/cm}^2$$

$$A_f = 8,3 \text{ cm}^2$$

Sezione 20-44; 44

$$M = \frac{1}{14} 1000 \times 5,35^2 = 2050 \text{ Kgm}$$

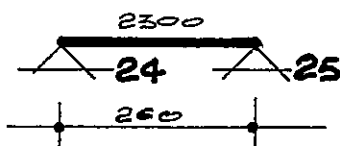
$$\sigma_c = 55 \text{ Kg/cm}^2$$

$$A_f = 6,7 \text{ cm}^2$$

Taglio Massimo $T = 2700 \text{ Kg}$

$$\tau_{\max} = \frac{2700}{23 \times 0,9 \times 50} = 2,6 \text{ Kg/cm}^2$$

Trave 24-25; 34-35;



- Armatura a flessione -

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

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

$$b = 25 \text{ cm}$$

Sezione 24; 25

$$M = \frac{1}{12} 2300 \times 2,60^2 = 1300 \text{ Kgm}$$

$$\sigma_o = 28 \text{ Kg/cm}^2$$

$$A_f = 2,0 \text{ cm}^2$$

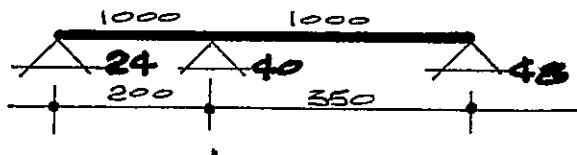
Sezione 24-25

$$M = \frac{1}{18} 2300 \times 2,60^2 = 850 \text{ Kgm}$$

$$\sigma_o = 23 \text{ Kg/cm}^2$$

$$A_f = 1,4 \text{ cm}^2$$

Trave 24-40-48; 25-41-49; 74-42-58; 35-43-59;



- Armatura a flessione -

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

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

$$b = 25 \text{ cm}$$

Sezione 24; 24-40

$$M = \frac{1}{14} 1000 \times 2,00^2 = 300 \text{ Kgm}$$

$$\sigma_o = 15 \text{ Kg/cm}^2$$

$$A_f = 1 \text{ cm}^2$$

Sezione 40

$$M = \frac{1}{12} 1000 \times \overline{3,50}^2 = 1000 \text{ Kgm}$$

$$\sigma_c = 25 \text{ Kg/cm}^2$$

$$A_f = 1,6 \text{ cm}^2$$

Sezione 40-48, 48

$$M = \frac{1}{14} 1000 \times \overline{3,50}^2 = 850 \text{ Kgm}$$

$$\sigma_c = 23 \text{ Kg/cm}^2$$

$$A_f = 1,4 \text{ cm}^2$$

- Vano scala -**- Analisi di carico**

gradino

p.p.	$\frac{20+3,5}{2} \times 1,00 \times 1,00 \times 2500$	= 300
sovracc. perm.		= 200
sovracc. accid.		= 400
		900 Kg/mq

trave a ginocchio

rampa	$900 \times 1,20$	= 1080
tompagno		= 700
p.p.	$0,25 \times 0,60 \times 1,00 \times 2500$	= 320
		2100 Kg/ml

Calcolo trave a ginocchio**- A flessione**

$$M_{inc} = \frac{1}{12} 2100 \times 3,40^2 = 2000 \text{ Kgm} \quad H = 60'' \quad b = 25''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 36 \text{ Kg/cm}^2 \quad A_f = 3,2 \text{ cm}^2$$

$$M_{camp} = \frac{1}{14} 2100 \times 3,40^2 = 1750 \text{ Kgm} \quad H = 60'' \quad b = 25 \text{ cm}^2$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 33 \text{ Kg/cm}^2 \quad A_f = 2,75 \text{ cm}^2$$

- A torsione

$$m_1 = \frac{1}{2} 900 \times 1,20^2 = 650 \text{ Kgm} \quad t_1 = 900 \times 1,20 = 1080 \text{ Kg}$$

$$m_t = 650 + 1080 \times 0,125 = 785 \text{ Kgm} \quad M_t = 785 \times \frac{3,00}{2} = 1180 \text{ Kgm}$$

$$\psi = 3 + \frac{2,6}{0,45 + \frac{60}{25}} = 3,91$$

$$\tau_t = \frac{3,91 \times 118000}{60 \times 25^2} = 12,30 \text{ Kg/cm}^2$$

- Armatura a torsione

$$F = 55 \times 20 = 1100 \text{ cm}^2$$

$$U = 2 \times (55+20) = 150 \text{ cm}$$

$$\Sigma_{f1} = \frac{118000 \times 150}{2 \times 1400 \times 1100} = 5,7 \text{ cmq}$$

$$\Sigma_{fs} = \frac{118000}{2 \times 1400 \times 1100} = 0,038 \text{ cmq/cm}$$

- Armatura gradino

$$M = \frac{1}{2} 900 \times 1,20^2 < 0,30 = 195 \text{ Kgm} \quad H = \frac{20+3}{2} = 11,5'' \quad b = 30''$$

$$\sigma_f = 1400 \text{ Kg/cmq}$$

$$\sigma_c = 50 \text{ Kg/cmq}$$

$$A_f = 1,47 \text{ cmq}$$

- Armatura pianerottoli $H = 20''$

$$q = 800 \text{ Kgm}$$

$$l = 2,60 \text{ m}$$

vincolo incastro

$$M_{inc} = \frac{1}{12} 800 \times 2,60^2 = 450 \text{ Kgm} \quad \text{per } H = 20'' \quad b = 100''$$

$$\sigma_f = 1400 \text{ Kg/cmq}$$

$$\sigma_c = 22 \text{ Kg/cmq}$$

$$A_f = 1,9 \text{ cmq/ml}$$

$$M_{camp} = \frac{1}{14} 800 \times 2,60^2 = 390 \text{ Kgm} \quad \text{per } H = 20'' \quad b = 100''$$

$$\sigma_f = 1400 \text{ Kg/cmq}$$

$$\sigma_c = 20 \text{ Kg/cmq}$$

$$A_f = 1,6 \text{ cmq/ml}$$

- SOLAIO -Solaio $H = 20'' + 5''$ **- Analisi di carico**

p.p.	= 160
soletta	= 125
sovracc. perm.	= 115
sovracc. accid.	= 200
	600 Kg/mq

$$q = 600 \times 0,50 = 300 \text{ Kg/ml}$$

$$l = 3,90 \text{ m} \quad \text{luce di calcolo } 3,90 \times 1,05 = 4,10 \text{ m}$$

$$\text{per } \sigma_f = 1400 \text{ Kg/cm}^2 \quad H = 25'' \quad b = 50''$$

$$M_{inc} = \frac{1}{12} 300 \times 4,10^2 = 420 \text{ Kgm} \quad \sigma_c = 24 \text{ Kg/cm}^2 \quad A_f = 1,40 \text{ cm}^2$$

$$M_{camp} = \frac{1}{14} 300 \times 4,10^2 = 360 \text{ Kgm} \quad \sigma_c = 22 \text{ Kg/cm}^2 \quad A_f = 1,20 \text{ cm}^2$$

$$l = 4,55 \text{ M} \quad \text{luce di calcolo } 4,55 \times 1,05 = 4,80 \text{ m}$$

$$\text{per } \sigma_f = 1400 \text{ Kg/cm}^2 \quad H = 25'' \quad b = 50''$$

$$M_{inc} = \frac{1}{12} 300 \times 4,80^2 = 580 \text{ Kgm} \quad \sigma_c = 28 \text{ Kg/cm}^2 \quad A_f = 1,92 \text{ cm}^2$$

$$M_{camp} = \frac{1}{14} 300 \times 4,80^2 = 500 \text{ Kgm} \quad \sigma_c = 26 \text{ Kg/cm}^2 \quad A_f = 1,65 \text{ cm}^2$$

Zone ribassate $H = 12'' + 4''$ **- Analisi di carico**

p.p.	= 100
soletta	= 100
sovracc. perm.	= 150
sovracc. accid.	= 200
	550 Kg/mq

$$q = 5,50 \times 0,50 = 275 \text{ Kg/ml}$$

$$l = 4,55 \times 1,05 = 4,80 \text{ m}$$

$$\text{per } \sigma_f = 1400 \text{ Kg/cm}^2 \quad H = 16'' \quad b = 50''$$

$$M_{inc} = \frac{1}{12} 275 \times 4,80^2 = 540 \text{ Kgm} \quad \sigma_c = 47 \text{ Kg/cm}^2 \quad A_f = 2,95 \text{ cm}^2$$

$$M_{camp} = \frac{1}{14} 275 \times 4,80^2 = 450 \text{ Kgm} \quad \sigma_c = 43 \text{ Kg/cm}^2 \quad A_f = 2,50 \text{ cm}^2$$

- Sporti -

- Analisi di carico

p.p.	= 140
sbalzo	= 100
sovracc. perm.	= 110
sovracc. accid.	= 400
	750 Kg/mq

$$q = 750 \times 0,50 = 375 \text{ Kg/ml} \quad l = 1,40 \text{ m}$$

$$M = \frac{1}{2} 375 \times 1,40^2 = 365 \text{ Kgm} \quad H = 20'' \quad b = 50''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 29 \text{ Kg/cm}^2 \quad A_f = 1,6 \text{ cm}^2$$

- Torrino vano scala -

Solaio

$$q = 550 \times 0,50 = 275 \text{ Kg/ml}$$

$$l = 2,80 \text{ m}$$

$$M_{inc} = \frac{1}{14} 275 \times \overline{2,80}^2 = 155 \text{ Kgm} \quad H = 20'' \quad b = 50''$$

$$\sigma_o = 18 \text{ Kg/cm}^2 \quad A_f = 0,65 \text{ cm}^2$$

$$M_{camp} = \frac{1}{10} 275 \times \overline{2,80}^2 = 215 \text{ Kgm} \quad H = 20'' \quad b = 50''$$

$$\sigma_o = 21 \text{ Kg/cm}^2 \quad A_f = 0,9 \text{ cm}^2$$

Trave 25-41-49

$$q = 550 \times \frac{2,80}{2} = 700$$

$$p.p. = \frac{300}{1000 \text{ Kg/ml}}$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad H = 50'' \quad b = 25''$$

$$M_{25} = M_{25-41} = \frac{1}{14} 1000 \times \overline{1,95}^2 = 220 \text{ Kgm} \quad \sigma_o = 15 \text{ Kg/cm}^2 \quad A_f = 1 \text{ cm}^2$$

$$M_{41} = \frac{1}{12} 1000 \times \overline{3,55}^2 = 1050 \text{ Kgm} \quad \sigma_o = 28 \text{ Kg/cm}^2 \quad A_f = 1,9 \text{ cm}^2$$

$$M_{41-49} = M_{49} = \frac{1}{14} 1000 \times \overline{3,55}^2 = \quad \sigma_o = 26 \text{ Kg/cm}^2 \quad A_f = 1,6 \text{ cm}^2$$

- Analisi di carico sulle travi al piano tipo -

trave 1-2; 6-7; 8-9; 13-14;

solaio	$600 \times \frac{5,00}{2}$	= 1500
tompagno		= 700
p.p.	$0,30 \times 0,50 \times 1,00 \times 2500$	= 400
		2600 Kg/ml

trave 2-3-4-5-6; 9-10-11-12-13;

solaio		= 1500
balcone	$800 \times 1,40$	= 1100
tompagno		= 700
p.p.		= 400
		3700 Kg/ml

trave 15-16; 17-18;

solaio	$600 \times \frac{3,75}{2}$	= 1150
tompagno		= 700
p.p.		= 350
		2200 Kg/ml

Trave 19-20-21-22; 23-24-25-26; 27-28-29-30;
31-32-33-34;

solaio		= 1500
"	$600 \times \frac{4,95}{2}$	= 1500
p.p.		= 400
		3400 Kg/ml

trave 42-43; 50-51; 1-19-39; 7-26-46; 8-27-47;
13-34-54; 15-22; 16-23; 17-30; 18-31;

tompagno	= 700
p.p.	= 300
	1000 Kg/ml

trave 39-40; 45-46; 47-48; 53-54;

solaio	= 1500
tompagno	= 700
p.p.	= 400
	2600 Kg/ml

trave 40-41-42; 43-44-45; 48-49-50; 51-52-53;

solaio	= 1500
balcone	800 × 1,40
	= 1100
tompagno	= 700
p.p.	= 400
	3700 Kg/ml

trave 22-35-42; 23-36-43; 30-37-50; 31-38-51;

rampa	= 950
tompagno	= 700
p.p.	= 350
	2000 Kg/ml

- Analisi di carico sui pilastri -

Pilastro 1; 7; 8; 14;

1 - 2	$2600 \times \frac{3,40}{2}$	= 4400
1 - 19	$1000 \times \frac{5,70}{2}$	= 2850
p.p.		<u>= 1250</u>
		8500 Kg

Pilastro 2; 6; 9; 13;

1 - 2		= 4400
2 - 3	$3700 \times \frac{3,40}{2}$	= 6300
p.p.		<u>= 1300</u>
		12000 Kg

Pilastro 3; 4; 5; 10; 11; 12;

2 - 3		= 6300
3 - 4	$3700 \times \frac{3,40}{2}$	= 6300
p.p.		<u>= 1400</u>
		14000 Kg

Pilastro 19; 34; 26; 27;

1 - 19		= 2850
19 - 39	$1000 \times \frac{5,35}{2}$	= 2700
19 - 20	$3400 \times \frac{3,60}{2}$	= 6100
p.p.		<u>= 1350</u>
		13000 Kg

Pilastro 20, 25, 28, 33,

20 - 19		= 6100
20 - 21		= 6100
p.p.		<u>= 1300</u>
		13500 Kg

Pilastro 15-16-17-18

15 - 22	$1000 \times \frac{1,60}{2}$	= 800
15 - 16	$2200 \times \frac{2,00}{2}$	= 1100
p.p.		<u>= 1100</u>
		3000 Kg

Pilastro 21-24-29-32

21 - 20		= 6100
21 - 22	$3400 \times \frac{2,20}{2}$	= 3800
p.p.		<u>= 1100</u>
		11000 Kg

Pilastro 22-23-30-31

22 - 21		= 3800
22 - 15		= 800
22 - 35	$2000 \times \frac{1,60}{2}$	= 1600
p.p.		<u>= 1300</u>
		7500 Kg

Pilastro 35-36-37-38

35 - 22		= 1600
35 - 42	$2000 \times \frac{4,20}{2}$	= 4200
p.p.		= 1200
		7000 Kg

Pilastro 39-46-47-54

39 - 19		= 2700
39 - 40	$2600 \times \frac{3,40}{2}$	= 4400
p.p.		= 1400
		8500 Kg

Pilastro 40-45-48-53

40 - 39		= 4400
40 - 41	$3700 \times \frac{3,40}{2}$	= 6300
p.p.		= 1300
		12000 Kg

Pilastro 41-44-49-52

41 - 40		= 6300
41 - 42	$3700 \times \frac{2,00}{2}$	= 3700
p.p.		= 1500
		11500 Kg

Pilastro 42-43-50-51

42 - 41		= 3700
42 - 43	$1000 \times \frac{2,70}{2}$	= 1350
42 - 35		= 4200
p.p.		= 1250
		10500 Kg

- Armatura travi rovesce -**- Analisi di carico sul terreno -**

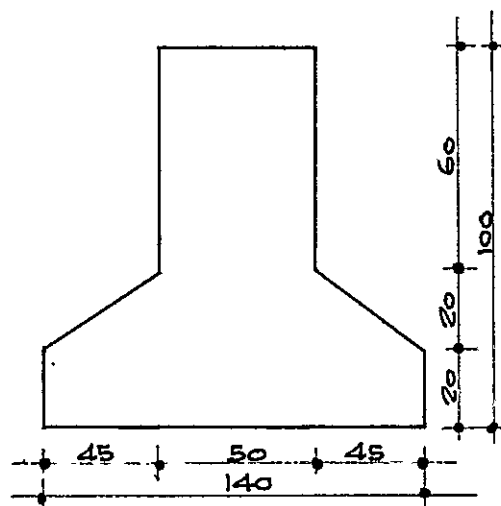
pilastrì	2.779.000
p.p. travi	<u>139.000</u>
	2.918.000 Kg

- Tensione sul terreno -

$$\sigma_t = \frac{2.918.000}{2.151.800} = 1,36 \text{ Kg/cm}^2$$

Travi 1-2-3-4-5-6-7; 8-9-10-11-12-13-14; 19-20-21-22-23-24-25-26;
27-28-29-30-31-32-33-34; 39-40-41-42-43-44-45-46-47-48-49-
50-51-52-53-54;

- Caratteristiche geometriche -
vedi disegno

**- Carico sulla trave -**

$$\frac{2.779.000}{2.151.800} \times 140 \times 100 = 18000 \text{ Kg/ml}$$

- Armatura a flessione

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad H = 100''$$

$$M_{inc} = \frac{1}{12} q l^2 = \frac{1}{12} 18000 \times 3,40^2 = 17500 \text{ Kgm}$$

$$b = 50'' \quad \sigma_o = 38 \text{ Kg/cm}^2 \quad A_f = 14,0 \text{ cm}^2$$

$$M_{camp} = \frac{1}{12} 18000 \times 3,40^2 = 17500 \text{ Kgm}$$

$$b = 140'' \quad \sigma_o = 21 \text{ Kg/cm}^2 \quad A_f = 13,5 \text{ cm}^2$$

- Armatura trasversale

$$M = \frac{1}{2} 18000 \times 0,40^2 = 1850 \text{ Kgm} \quad b = 100'' \quad H = 40''$$

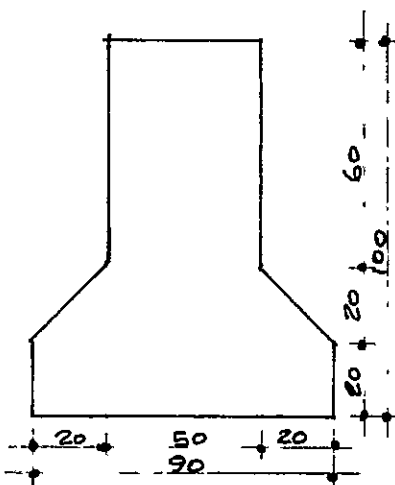
$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 21 \text{ Kg/cm}^2 \quad A_f = 5,7 \text{ cm}^2/\text{ml}$$

Staffe ϕ 12/20

Trave 1-19-39; 7-26-46; 8-27-47; 14-34-54;

- Caratteristiche geometriche -

vedi disegno



- Carico sulla trave -

$$1,29 \times 50 \times 100 = 6500 \text{ Kg}$$

$$M_{inc} = M_{camp} = \frac{1}{12} q l^2 = \frac{1}{12} 6500 \times 5,35^2 = 15500 \text{ Kgm}$$

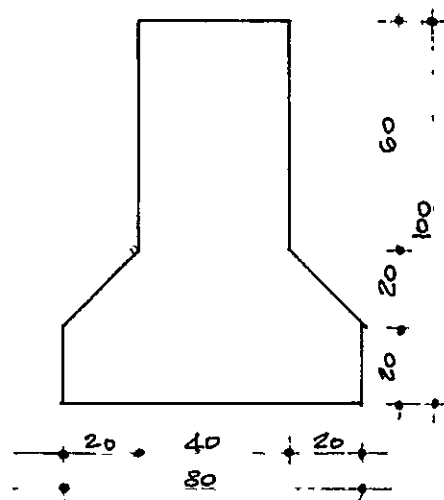
$$b = 50'' \quad H = 100'' \quad \sigma_f = 1400 \text{ Kg/cm}^2$$

$$\sigma_c = 36 \text{ Kg/cm}^2 \quad A_f = 12,5 \text{ cm}^2$$

Travi 22-35-42; 23-36-43; 30-31-50; 31-38-51;

- Caratteristiche geometriche -

vedi disegno



- Carico sulla trave

$$1,29 \times 80 \times 100 = 10500 \text{ Kg/ml}$$

- Armatura a flessione

$$M_{inc} = \frac{1}{12} q l^2 = \frac{1}{12} 10500 \times \overline{3,80}^2 = 12600 \text{ Kgm}$$

$$b = 40''$$

$$H = 100''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$\sigma_c = 36 \text{ Kg/cm}^2$$

$$A_f = 10 \text{ cm}^2$$

$$M_{camp} = 12600 \text{ Kgm}$$

$$b = 80''$$

$$H = 100''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$\sigma_c = 24 \text{ Kg/cm}^2$$

$$A_f = 9,8 \text{ cm}^2$$

Travi 22-15-(4-3); 23-16-(4-5); 30-17-(11-10); 31-18-(11-12);

- Caratteristiche geometriche -
vedi disegno

- Carico sulla trave -

$$1,29 \times 90 \times 100 = 13000 \text{ Kg/ml}$$

- Armatura a flessione

$$M_{inc} = \frac{1}{12} q l^2 = \frac{1}{12} 13000 \times \overline{4,05}^2 = 17700 \text{ Kgm}$$

$$b = 50''$$

$$H = 100''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$\sigma_c = 38 \text{ Kg/cm}^2$$

$$A_f = 14 \text{ cm}^2$$

$$M_{camp} = 17700 \text{ Kgm}$$

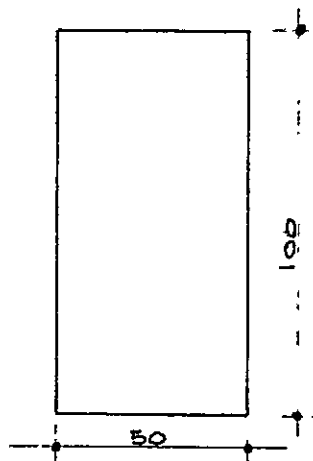
$$b = 90''$$

$$H = 100''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$\sigma_c = 27 \text{ Kg/cm}^2$$

$$A_f = 13,7 \text{ cm}^2$$



SEZIONE ED ARMATURA PILASTRI PIANO FONDAZIONE E PIANO TERRA

N°	P	A' c	Af	Armatura	sezione	A oi	σ c
	tn	cmq	cmq		cm × cm	cmq	Kg/cmq
1-7-8-14	42,5	900	7,2	8 ø 14	40 × 40	1723	25
2-6-9-13	60	1250	10,0	8 ø 14	40 × 40	1723	35
3-4-5-10-11-12	70	1450	11,6	8 ø 14	40 × 40	1723	40
19-34-26-27	65	1350	10,8	8 ø 14	40 × 40	1723	38
20-25-28-33	67,5	1400	11,2	8 ø 14	40 × 40	1723	39
15-16-17-18	15	300	2,4	12 ø 14	60 × 60 × 25	2559	6
21-24-29-32	55	1150	9,2	8 ø 14	40 × 40	1723	32
22-23-30-31	37,5	800	6,4	6 ø 14	25 × 40	1092	34
35-36-37-38	35	750	6	6 ø 14	25 × 40	1092	34
39-46-47-54	42,5	900	7,2	8 ø 14	40 × 40	1723	25
40-45-48-53	60	1250	10	8 ø 14	40 × 40	1723	35
41-44-49-52	57,5	1200	9,6	8 ø 14	40 × 40	1723	33
42-43-50-51	52,5	1100	8,8	8 ø 14	40 × 40	1723	31

Staffe ø 8" / 15"

SEZIONE ED ARMATURA PILASTRI PIANO PRIMO E SECONDO

N°	sezione	armatura
1-7-8-14	40 × 30	8 Ø 12
2-6-9-13	40 × 30	8 Ø 12
3-4-5-10 11-12	40 × 30	8 Ø 12
19-34-26 27	40 × 30	8 Ø 12
20-25-28 33	40 × 30	8 Ø 12
15-16-17 18	60 × 60 × 25	12 Ø 12
21-24-29 32	40 × 30	8 Ø 12

N°	sezione	armatura
22-23-30 31	25 × 40	6 Ø 12
35-36-37 38	25 × 40	6 Ø 12
39-46-47 54	40 × 30	8 Ø 12
40-45-48 53	40 × 30	8 Ø 12
41-44-49 52	40 × 30	8 Ø 12
42-43-50 51	40 × 30	8 Ø 12

Staffe Ø 6^{mm} /15"

SEZIONE ED ARMATURA PILASTRI PIANO TERZO E QUARTO

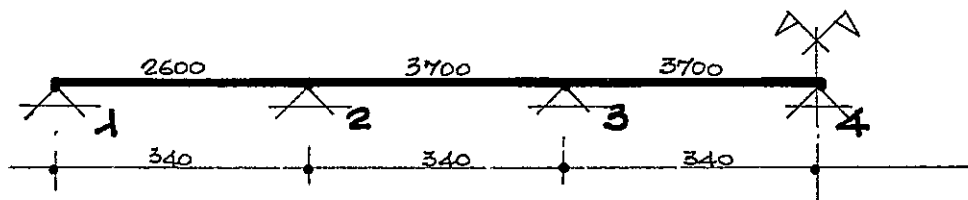
N°	sezione	armatura
1-7-8-14	30 × 30	8 ø 10
2-6-9-13	30 × 30	8 ø 10
3-4-5-10-11-12	30 × 30	8 ø 10
19-26-27-34	30 × 30	8 ø 10
20-25-28-33	30 × 30	8 ø 10
15-16-17-18	60 × 60 × 25	12 ø 10
21-24-29-32	30 × 30	8 ø 10

N°	sezione	armatura
22-23-30-31	25 × 30	6 ø 10
35-36-37-38	25 × 30	6 ø 10
39-46-47-54	30 × 30	8 ø 10
40-45-48-53	30 × 30	8 ø 10
41-44-49-52	30 × 30	8 ø 10
42-43-50-51	30 × 30	8 ø 10

Staffe ø 6" / 15"

- Armatura travi a flessione -

Trave 1-2-3-4-5-6-7; 8-9-10-11-12-13-14

**- Armatura a flessione -**

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25 \text{ cm}$$

$$b = 80 \text{ cm}$$

Sezione 1; 1-2

$$M = \frac{1}{14} 2600 \times \overline{3,40}^2 = 2150 \text{ Kgm}$$

$$\sigma_o = 45 \text{ Kg/cm}^2$$

$$A_f = 7,3 \text{ cm}^2$$

Sezione 2; 3; 4;

$$M = \frac{1}{12} 3700 \times \overline{3,40}^2 = 3600 \text{ Kgm}$$

$$\sigma_o = 62 \text{ Kg/cm}^2$$

$$A_f = 12,5 \text{ cm}^2$$

Sezione 2-3

$$M = \frac{1}{16} 3700 \times \overline{3,40}^2 = 2700 \text{ Kgm}$$

$$\sigma_o = 52 \text{ Kg/cm}^2$$

$$A_f = 9,3 \text{ cm}^2$$

Sezione 3-4

$$M = \frac{1}{18} 3700 \times \overline{3,40}^2 = 2400 \text{ Kgm}$$

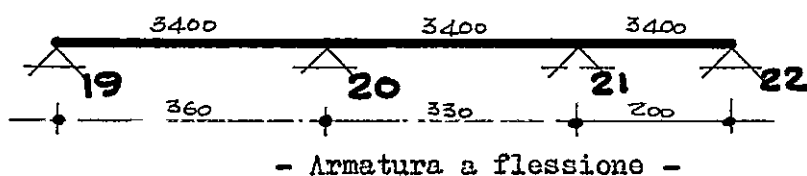
$$\sigma_o = 47 \text{ Kg/cm}^2$$

$$A_f = 8,0 \text{ cm}^2$$

$$\text{Taglio massimo } T = 6300 \text{ Kg}$$

$$\tau_{\max} = \frac{6300}{23 \times 0,9 \times 80} = 3,8 \text{ Kg/cm}^2$$

Trave 19-20-21-22; 31-32-33-34; 23-24-25-26;
27-28-29-30;



$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25 \text{ cm}$$

$$b = 80 \text{ cm}$$

Sezione 19; 19-20

$$M = \frac{1}{14} 3400 \times \overline{3,60}^2 = 3150 \text{ Kgm}$$

$$\sigma_c = 57 \text{ Kg/cm}^2$$

$$A_f = 10,8 \text{ cm}^2$$

Sezione 20

$$M = \frac{1}{12} 3400 \times \overline{3,60}^2 = 3700 \text{ Kgm}$$

$$\sigma_c = 63 \text{ Kg/cm}^2$$

$$A_f = 12,8 \text{ cm}^2$$

Sezione 20-21

$$M = \frac{1}{16} 3400 \times \overline{3,30}^2 = 2300 \text{ Kgm}$$

$$\sigma_c = 47 \text{ Kg/cm}^2$$

$$A_f = 7,8 \text{ cm}^2$$

Sezione 21

$$M = \frac{1}{12} 3400 \times \overline{3,30}^2 = 3100 \text{ Kgm}$$

$$\sigma_c = 57 \text{ Kg/cm}^2$$

$$A_f = 10,8 \text{ cm}^2$$

Sezione 21-22; 22

$$M = \frac{1}{14} 3400 \times \overline{2,00}^2 = 1000 \text{ Kgm}$$

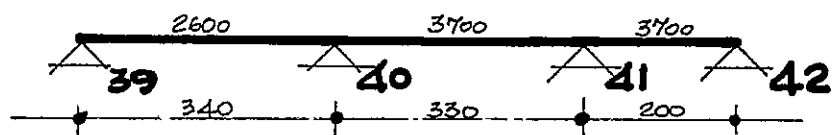
$$\sigma_c = 29 \text{ Kg/cm}^2$$

$$A_f = 3,3 \text{ cm}^2$$

Taglio massimo $T = 6150 \text{ Kg}$

$$\tau_{\max} = \frac{6150}{23 \times 0,9 \times 80} = 3,7 \text{ Kg/cm}^2$$

Trave 39-40-41-42; 43-44-45-46; 47-48-49-50;
51-52-53-54;



- Armatura a flessione -

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25 \text{ cm}$$

$$b = 80 \text{ cm}$$

Sezione 39; 39-40;

$$M = \frac{1}{14} 2600 \times \overline{3,40}^2 = 2150 \text{ Kgm}$$

$$\sigma_c = 45 \text{ Kg/cm}^2$$

$$A_f = 7,3 \text{ cm}^2$$

Sezione 40; 41

$$M = \frac{1}{12} 3700 \times \overline{3,30}^2 = 3400 \text{ Kgm}$$

$$\sigma_c = 60 \text{ Kg/cm}^2$$

$$A_f = 11,7 \text{ cm}^2$$

Sezione 40-41

$$M = \frac{1}{16} 3700 \times \overline{3,30}^2 = 2500 \text{ Kgm}$$

$$\sigma_c = 50 \text{ Kg/cm}^2$$

$$A_f = 8,6 \text{ cm}^2$$

Sezione 41-42; 42

$$M = \frac{1}{14} 3700 \times \overline{2,00}^2 = 1050 \text{ Kgm}$$

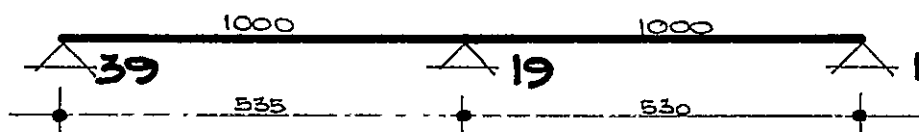
$$\sigma_c = 30 \text{ Kg/cm}^2$$

$$A_f = 3,5 \text{ cm}^2$$

Taglio massimo $T = 6100 \text{ Kg}$

$$\tau_{\max} = \frac{6100}{23 \times 0,9 \times 80} = 3,7 \text{ Kg/cm}^2$$

Travi 39-19-1; 14-34-54;



- Armatura a flessione -

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 23 \text{ cm}$$

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

Sezione 39; 39-19; 19-1; 1

$$M = \frac{1}{14} 1000 \times \overline{5,35}^2 = 2050 \text{ Kgm}$$

$$\sigma_o = 58 \text{ Kg/cm}^2$$

$$A_f = 7 \text{ cm}^2$$

Sezione 19

$$M = \frac{1}{12} 1000 \times \overline{5,35}^2 = 2400 \text{ Kgm}$$

$$\sigma_o = 64 \text{ Kg/cm}^2$$

$$A_f = 8,3 \text{ cm}^2$$

- Vano scala -**- Analisi di carico**

gradino

$$\text{p.p.} \quad \frac{20+3,5}{2} \times 1,00 \times 1,00 \times 2500 = 300$$

$$\text{sovracc. perm.} = 200$$

$$\text{sovracc. accid.} = 400$$

$$900 \text{ Kg/mq}$$

trave a ginocchio

$$\text{rampa} \quad 900 \times 1,15 = 1040$$

$$\text{tompagno} = 700$$

$$\text{p.p.} \quad 0,25 \times 0,60 \times 1,00 \times 2500 = 360$$

$$2100 \text{ Kg/ml}$$

- Calcolo travi a ginocchio

a flessione

$$M_{\text{inc}} = \frac{1}{12} 2100 \times 4,20^2 = 3100 \text{ Kgm} \quad \text{per } H = 60'' \quad b = 25''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_o = 38 \text{ Kg/cm}^2 \quad A_f = 4,15 \text{ cm}^2$$

$$M_{\text{camp}} = \frac{1}{14} 2100 \times 4,20^2 = 2650 \text{ Kgm} \quad \text{per } H = 60'' \quad b = 25''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_o = 35 \text{ Kg/cm}^2 \quad A_f = 3,60 \text{ cm}^2$$

a torsione

$$M_1 = \frac{1}{2} 900 \times 1,15^2 = 595 \text{ Kg}$$

$$t_1 = 900 \times 1,15 = 1040 \text{ Kg}$$

$$M_t = 595 + 1040 \times 0,125 = 725 \text{ Kgm}$$

$$M_t = 725 \times \frac{3,80}{2} = 1380 \text{ Kgm}$$

$$\psi = 3 + \frac{2,6}{0,45 + \frac{60}{25}} = 3,91$$

$$\tau_t = \frac{391 \times 1380}{60 \times 25^2} = 14 \text{ Kg/cm}^2$$

- Armatura a torsione $F = 1100 \text{ cmq}$ $U = 150 \text{ cmq}$

$$\varepsilon_{f1} = \frac{138000 \times 150}{2 \times 1400 \times 1100} = 6,70 \text{ cmq}$$

$$\varepsilon_{fs} = \frac{138000}{2 \times 1400 \times 1100} = 0,045 \text{ cmq/cm}$$

- Armatura gradino

$$M = \frac{1}{2} 900 \times 1,15^2 \times 0,30 = 180 \text{ Kgm} \quad H = \frac{20+3}{2} = 11,5'' \quad b = 30''$$

$$\sigma_f = 1400 \text{ Kg/cmq} \quad \sigma_o = 50 \text{ Kg/cmq} \quad A_f = 1,47 \text{ cmq}$$

- Armatura pianerottoli $H = 20''$

$$q = 800 \text{ Kg/cmq} \quad l = 2,45 \text{ m} \quad \text{vincolo incaastro}$$

$$M_{\text{inc}} = \frac{1}{12} 800 \times 2,45^2 = 420 \text{ Kgm} \quad \text{per } H = 20'' \quad b = 100''$$

$$\sigma_f = 1400 \text{ Kg/cmq} \quad \sigma_o = 21 \text{ Kg/cmq} \quad A_f = 1,8 \text{ cmq}$$

$$M_{\text{camp}} = \frac{1}{14} 800 \times 2,45^2 = 360 \text{ Kgm} \quad \text{per } H = 20'' \quad b = 100''$$

$$\sigma_f = 1400 \text{ Kg/cmq} \quad \sigma_o = 19 \text{ Kg/cmq} \quad A_f = 1,5 \text{ cmq}$$

- SOLAI -

Solaio H = 20" + 5"

- Analisi di carico

p.p.	= 160
soletta	= 125
sovracc. perm.	= 115
sovracc. accid.	= 200
	600 Kg/mq

$$q = 600 \times 0,50 = 300 \text{ Kg/ml}$$

$$l = 455 \text{ m}$$

$$\text{luce di calcolo } l = 455 \times 1,05 = 4,80 \text{ m}$$

$$\text{per } \sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25"$$

$$b = 50"$$

$$M = \frac{1}{12} 300 \times 4,80^2 = 580 \text{ Kgm}$$

$$\sigma_c = 28 \text{ Kg/cm}^2$$

$$A_f = 1,92 \text{ cm}^2$$

$$M = \frac{1}{14} 300 \times 4,80^2 = 500 \text{ Kgm}$$

$$\sigma_c = 26 \text{ Kg/cm}^2$$

$$A_f = 1,65 \text{ cm}^2$$

Zone ribassate H = 12" + 4"

- Analisi di carico

p.p.	= 100
soletta	= 100
sovracc. perm.	= 150
sovracc. accid.	= 200
	550 Kg/mq

$$q = 550 \times 0,50 \text{ Kg/ml}$$

$$l = 4,55 \times 1,05 = 4,80 \text{ m}$$

$$\text{per } \sigma_f = 1400 \text{ Kg/cm}^2 \quad H = 16'' \quad b = 50''$$

$$M_{inc} = \frac{1}{12} 275 \times 4,80^2 = 540 \text{ Kgm} \quad \sigma_c = 47 \text{ Kg/cm}^2 \quad A_f = 2,95 \text{ cm}^2$$

$$M_{camp} = \frac{1}{14} 275 \times 4,80^2 = 450 \text{ Kgm} \quad \sigma_c = 43 \text{ Kg/cm}^2 \quad A_f = 2,50 \text{ cm}^2$$

- Sporti -

- Analisi di carico

p.p.	= 140
sbalzo	= 100
sovracc. perm.	= 110
sovracc. accid.	= 400
	750 Kg/mq

$$q = 750 \times 0,50 = 375 \text{ Kg/ml} \quad l = 1,40 \text{ m}$$

$$M = \frac{1}{2} 375 \times 1,40^2 = 365 \text{ Kgm} \quad H = 20'' \quad b = 50''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 29 \text{ Kg/cm}^2 \quad A_f = 1,6 \text{ cm}^2$$

- Copertura torrino vano scala -

Solaio

$$q = 550 \times 0,50 = 275 \text{ Kg/ml}$$

$$l = 265 \times 1,05 = 2,80 \text{ m}$$

$$M_{inc} = \frac{1}{14} 275 \times \overline{2,80}^2 = 155 \text{ Kgm} \quad H = 20'' \quad b = 50''$$

$$\sigma_c \quad \sigma_c = 18 \text{ Kg/cm}^2 \quad A_F = 0,65 \text{ cm}^2$$

$$M_{camp} = \frac{1}{10} 275 \times \overline{2,80}^2 = 215 \text{ Kgm} \quad H = 20'' \quad b = 50''$$

$$\sigma_c = 21 \text{ Kg/cm}^2 \quad A_F = 0,9 \text{ cm}^2$$

Trave 22-35-46

Analisi di carico

$$q = 550 \times \frac{265}{2} = 700$$

$$p.p. \quad \frac{= 300}{1000 \text{ Kg/ml}}$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad H = 50'' \quad b = 25''$$

$$M_{22} = M_{22-35} = \frac{1}{14} 1000 \times \overline{1,71}^2 = 200 \quad \sigma_c = 15 \text{ Kg/cm}^2 \quad A_F = 1 \text{ cm}^2$$

$$M_{35} = \frac{1}{12} 1000 \times \overline{3,80}^2 = 1200 \quad \sigma_c = 27 \text{ Kg/cm}^2 \quad A_F = 1,9 \text{ cm}^2$$

$$M_{35-42} = M_{42} = \frac{1}{14} 1000 \times \overline{3,80}^2 = 1000 \quad \sigma_c = 25 \text{ Kg/cm}^2 \quad A_F = 1,6 \text{ cm}^2$$

PALAZZINA TIPO II

D/8

- Analisi di carico sulle travi -

Trave 1-2-3-4-5-6-7-8-9

solaio	$600 \times \frac{4,15}{2}$	=	1250
balcone	$800 \times 1,20$	=	950
tompagno		=	700
p.p.		=	<u>400</u>
			3300 Kg/ml

Trave 10-11

solaio	$600 \times \frac{2,40}{2}$	=	800
tompagno		=	700
p.p.		=	<u>400</u>
			1900 Kg/ml

Trave 12-13-14-15-16; 17-18-19-20-21

solaio		=	1250
"	$600 \times \frac{4,65}{2}$	=	1400
p.p.		=	<u>450</u>
			3100 Kg/ml

Trave 16-17; 1-12-24; 9-21-31; 10-(16-17); 11-(16-17);

tompagno		=	700
p.p.		=	<u>300</u>
			1000 Kg/ml

sulla 16-17 carichi concentrati $1000 \times \frac{1,50}{2} = 750 \text{ Kg}$

Trave 24-25; 26-27; 28-29; 30-31;

solaio	=	1400
tompagno	=	700
p.p.	=	<u>400</u>
		2500 Kg/ml

Trave 25-26; 29-30;

solaio	=	1400
sbalzo	800 × 1,00	= 800
tompagno	=	700
p.p.	=	<u>400</u>
		3300 Kg/ml

Trave 16-22-27; 17-23-28;

rampa	800 × 1,20	= 950
tompagno	=	700
p.p.	=	<u>350</u>
		2000 Kg/ml

- Analisi di carico sui pilastri -

Pilastro 1; 9

1 - 2	$3300 \times \frac{3,30}{2}$	= 5450
1 - 12	$1000 \times \frac{4,55}{2}$	= 2300
p.p.		<u>= 1250</u>
		9000 Kg

Pilastro 2; 8;

2 - 1		= 5450
2 - 3	$3300 \times \frac{3,00}{2}$	= 4950
p.p.		<u>= 1100</u>
		11500 Kg

Pilastro 3;- 7;

3 - 2		= 4950
3 - 4	$3300 \times \frac{3,20}{2}$	= 5300
p.p.		<u>= 1250</u>
		11500 Kg

Pilastro 4; 6;

4 - 3		= 5300
4 - 5	$3300 \times \frac{4,40}{2}$	= 7300
p.p.		<u>= 1400</u>
		14000 Kg

Pilastro 5

5 - 4		= 7300
5 - 6	$3300 \times \frac{4,40}{2}$	= 7300
P.p.		<u>= 1400</u>
		16000 Kg

Pilastro 10-11

10 - 11	$1900 \times \frac{1,90}{2}$	= 1800
10 - (16-17)	$1000 \times \frac{1,50}{2}$	= 750
P.p.		<u>= 1450</u>
		4000 Kg

Pilastro 12; 21;

12 - 1		= 2300
12 - 24	$1000 \times \frac{5,05}{2}$	= 2500
12 - 13	$3100 \times \frac{3,30}{2}$	= 5100
P.p.		<u>= 1100</u>
		11000 Kg

Pilastro 13; 20;

13 - 12		= 5100
13 - 14	$3100 \times \frac{3,15}{2}$	= 4900
P.p.		<u>= 1500</u>
		11500 Kg

Pilastro 14; 19

14 - 13		= 4900
14 - 15	$3100 \times \frac{3,20}{2}$	= 5000
p.p.		= <u>1100</u>
		11000 Kg

Pilastro 15; 18;

15 - 14		= 5000
15 - 16	$3100 \times \frac{2,75}{2}$	= 4300
p.p.		= <u>1200</u>
		10500 Kg

Pilastro 16; 17;

16 - 15		= 4300
16 - 17	$1000 \times \frac{2,60}{2}$	= 1800
16 - 22	$2000 \times \frac{2,00}{2}$	= 2000
p.p.		= <u>1400</u>
		9500 Kg

Pilastro 22; 23;

22 - 16		= 1400
22 - 27	$2000 \times \frac{3,40}{2}$	= 3400
p.p.		= <u>1200</u>
		6000 Kg

Pilastro 24; 31;

24 - 12

= 5100

24 - 25

$$2500 \times \frac{4,80}{2}$$

= 6000

p.p.

= 1400

12500 Kg

Pilastro 25; 30; 26; 29;

25 - 24

= 6000

25 - 26

$$3300 \times \frac{2,50}{2}$$

= 4150

p.p.

= 1350

12500 Kg

Pilastro 27; 28;

27 - 26

= 6000

27 - 22

= 3400

p.p.

= 1100

10500 Kg

- Armatura travi rovesce -**- Analisi di carico sul terreno -**

pilastrini	1.735.000
p.p. travi	<u>115.000</u>
	1.850.000 Kg

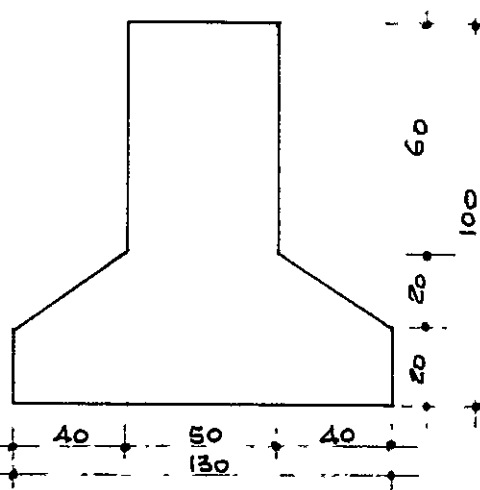
- Tensione sul terreno -

$$\sigma_t = \frac{1.850.000}{1.349.500} = 1,37 \text{ Kg/cm}^2$$

Trave 1-2-3-4-5-6-7-8-9;

- Caratteristiche geometriche -

vedi disegno

**- Carico sulla trave -**

$$\frac{1.735.000}{1.349.500} \times 1,40 \times 100 = 18000 \text{ Kg/ml}$$

- Armatura a flessione

$$M_{inc} = \frac{1}{12} q l^2 = \frac{1}{12} 18.000 \times 4,20^2 = 26500 \text{ Kgm} \quad H = 100'' \quad b = 50''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 48 \text{ Kg/cm}^2 \quad A_f = 21,2 \text{ cm}^2$$

$$M_{camp} = 26500 \text{ Kgm} \quad H = 100'' \quad b = 140'' \quad \sigma_f = 1400 \text{ Kg/cm}^2$$

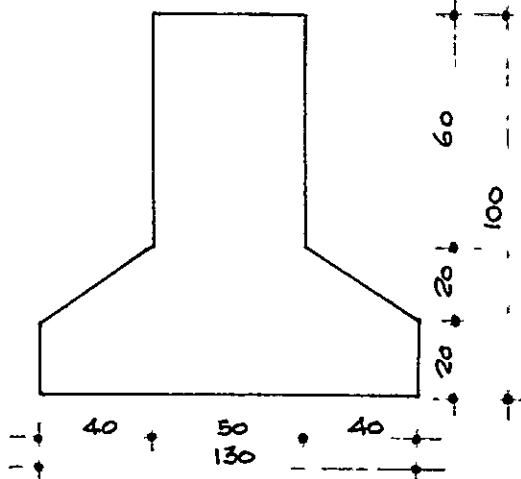
$$\sigma_c = 27 \text{ Kg/cm}^2 \quad A_f = 21 \text{ cm}^2$$

Trave 12-13-14-15-16; 17-18-19-20-21;

- carico sulla trave -

$$1,28 \times 160 \times 100 = 20500 \text{ Kg/ml}$$

- Caratteristiche geometriche -
vedi disegno



- Armatura a flessione

$$M_{inc} = \frac{1}{12} q l^2 = \frac{1}{12} 20500 \times 3,30^2 = 18600 \text{ Kgm} \quad H = 100'' \quad b = 50''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 40 \text{ Kg/cm}^2 \quad A_f = 15,1 \text{ cm}^2$$

$$M_{camp} = 18600 \text{ Kgm} \quad H = 100'' \quad b = 160'' \quad \sigma_f = 1400 \text{ Kg/cm}^2$$

$$\sigma_c = 21 \text{ Kg/cm}^2 \quad A_f = 14,8 \text{ cm}^2$$

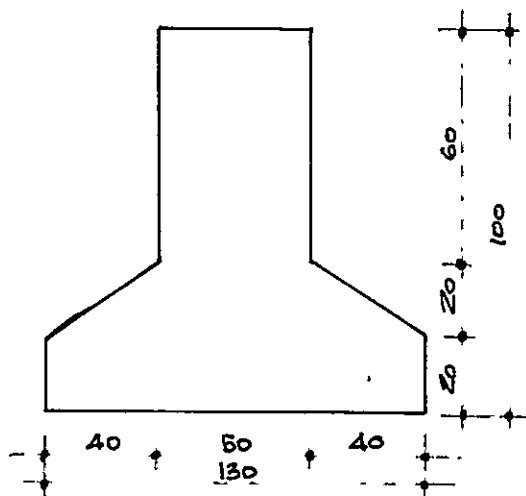
- Armatura trasversale

$$M = \frac{1}{2} 20500 \times 0,55^2 = 3100 \text{ Kgm} \quad b = 100'' \quad H = 40''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 28 \text{ Kg/cm}^2 \quad A_f = 6,5 \text{ cm}^2/\text{ml}$$

trave 24-25-26-27-28-29-30-31

- Caratteristiche geometriche -
vedi disegno



- Carico sulla trave -

$$1,28 \times 140 \times 100 = 18000 \text{ Kg/ml}$$

- Armatura a flessione

$$M_{inc} = \frac{1}{12} 18000 \times 4,80^2 = 34500 \text{ Kgm} \quad H = 100'' \quad b = 50''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 57 \text{ Kg/cm}^2 \quad A_f = 28,5 \text{ cm}^2$$

$$M_{camp} = 34500 \text{ Kgm}$$

$$H = 100''$$

$$b = 140''$$

$$\sigma_F = 1400 \text{ Kg/cm}^2$$

$$\sigma_O = 31 \text{ Kg/cm}^2$$

$$A_F = 27,2 \text{ cm}^2$$

Trave 27-22-16-(4-5); (5-6)-17-23-28;

- Caratteristiche geometriche -
vedi disegno

- Carico sulla trave -

$$1,28 \times 100 \times 90 = 11500 \text{ Kg/ml}$$

- Armatura a flessione -

$$M_{ino} = \frac{1}{12} 11500 \times 3,40^2 = 11000 \text{ Kgm}$$

$$H = 100''$$

$$b = 40''$$

$$\sigma_F = 1400 \text{ Kg/cm}^2$$

$$\sigma_O = 33 \text{ Kg/cm}^2$$

$$A_F = 8,9 \text{ cm}^2$$

$$M_{camp} = 11000 \text{ Kgm}$$

$$H = 100''$$

$$b = 90''$$

$$\sigma_F = 1400 \text{ Kg/cm}^2$$

$$\sigma_O = 21 \text{ Kg/cm}^2$$

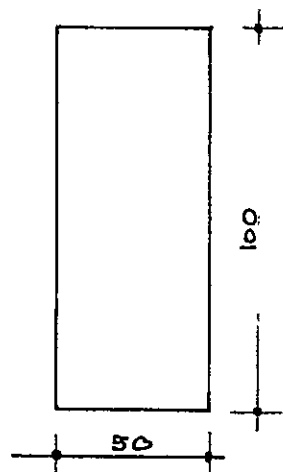
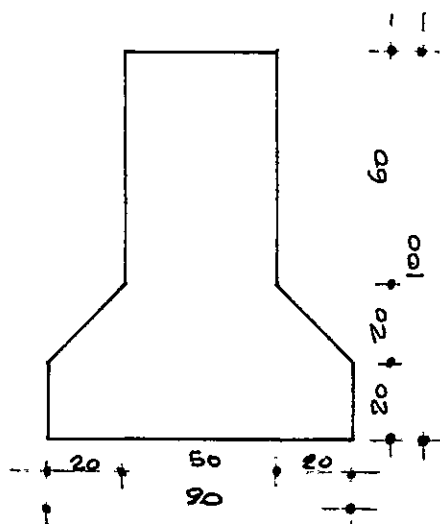
$$A_F = 8,5 \text{ cm}^2$$

Trave 1-12-24; 10-11; 9-21-31;

- Caratteristiche geometriche -
vedi disegno

- Carico sulla trave

$$1,28 \times 100 \times 50 = 6400 \text{ Kg/ml}$$



- Armatura a flessione -

$$M_{inc} = M_{camp} = \frac{1}{12} 6400 \times 4,65^2 = 11500 \text{ Kgm} \quad H = 100'' \quad b = 50''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$\sigma_o = 30 \text{ Kg/cm}^2$$

$$A_f = 9 \text{ cm}^2$$

SEZIONE ED ARMATURA PILASTRI PIANO FONDAZIONE E PIANO TERRA

N°	P	A' c	Af	Armatura	sezione	A ci	σ c
	tn	cmq	cmq		cm × cm	cmq	cmq
1-9	45	950	7,6	8 ø 14	40 × 40	1723	26
2-8	57,5	1200	9,6	8 ø 14	40 × 40	1723	33
3-7	57,5	1200	9,6	8 ø 14	40 × 40	1723	33
4-6	70	1450	11,6	8 ø 14	40 × 40	1723	40
5	80	1650	13,2	10 ø 14	40 × 40	1754	45
10-11	20	400	3,2	6 ø 14	25 × 40	1092	18
12-21	55	1150	9,2	8 ø 14	40 × 40	1723	32
13-20	57,5	1200	9,6	8 ø 14	40 × 40	1723	33
14-19	55	1150	9,2	8 ø 14	40 × 40	1723	32
15-18	52,5	1100	8,8	8 ø 14	40 × 40	1723	30
16-17	47,5	1000	8,0	8 ø 14	25 × 40	1092	43
22-23	30	650	5,2	6 ø 14	25 × 40	1092	28
24-31	62,5	1300	10,4	8 ø 14	40 × 40	1723	36
25-30-26-29	62,5	1300	10,4	8 ø 14	40 × 40	1723	36
27-28	52,5	1100	8,8	8 ø 14	40 × 40	1723	30

Staffe ø 8" / 15"

SEZIONE ED ARMATURA PILASTRI PIANO PRIMO E SECONDO

N°	sezione	armatura
1-9	30 × 40	8 ø 12
2-8	30 × 40	8 ø 12
3-7	30 × 40	8 ø 12
4-6	30 × 40	8 ø 12
5	40 × 40	10 ø 12
10-11	25 × 40	6 ø 12
12-21	30 × 40	8 ø 12

N°	sezione	armatura
15-20	30 × 40	8 ø 12
14-19	30 × 40	8 ø 12
15-18	30 × 40	8 ø 12
16-17	25 × 40	8 ø 12
22-23	25 × 40	6 ø 12
24-31	30 × 40	8 ø 12
25-26- 29-30	30 × 40	8 ø 12
27-28	30 × 40	8 ø 12

Staffe ø 6" /15"

SEZIONE ED ARMATURA PILASTRI PIANO TERZO E QUARTO

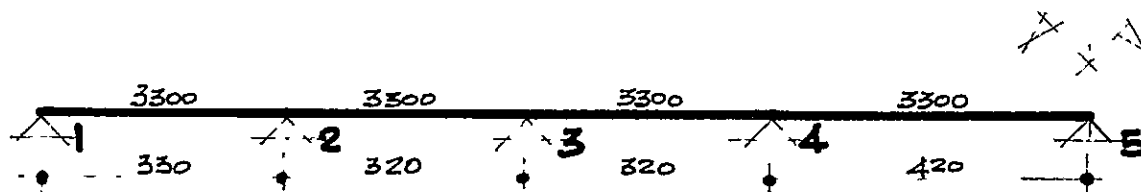
N°	sezione	armatura
1-9	30 × 30	8 ø 12
2-8	30 × 30	8 ø 12
3-7	30 × 30	8 ø 12
4-6	30 × 30	8 ø 12
5	30 × 30	8 ø 12
10-11	25 × 40	6 ø 12
12-21	30 × 30	8 ø 12

N°	sezione	armatura
13-20	30 × 30	8 ø 12
14-19	30 × 30	8 ø 12
15-18	30 × 30	8 ø 12
16-17	25 × 40	6 ø 12
22-23	25 × 40	6 ø 12
24-31	30 × 30	8 ø 12
25-26 29-30	30 × 30	8 ø 12
27-28	30 × 30	8 ø 12

Staffe ø 6" / 15"

- Armatura travi a flessione -

Trave n°1-2-3-4-5-6-7-8-9

**- Armatura a flessione -**

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25 \text{ cm}$$

$$b = 90 \text{ cm}$$

Sezione 1; 1-2; 9-8; 2

$$M = \frac{1}{14} 3300 \times 3,30^2 = 2600 \text{ Kgm}$$

$$\sigma_c = 47 \text{ Kg/cm}^2$$

$$A_f = 8,7 \text{ cm}^2$$

Sezione 2; 8;

$$M = \frac{1}{12} 3300 \times 3,30^2 = 3000 \text{ Kgm}$$

$$\sigma_c = 52 \text{ Kg/cm}^2$$

$$A_f = 10,3 \text{ cm}^2$$

Sezione 2-3; 8-7;

$$M = \frac{1}{16} 3300 \times 3,20^2 = 2100 \text{ Kgm}$$

$$\sigma_c = 42 \text{ Kg/cm}^2$$

$$A_f = 7,15 \text{ cm}^2$$

Sezione 3; 7;

$$M = \frac{1}{12} 3300 \times 3,20^2 = 2850 \text{ Kgm}$$

$$\sigma_c = 50 \text{ Kg/cm}^2$$

$$A_f = 9,7 \text{ cm}^2$$

Sezione 3-4; 7-6;

$$M = \frac{1}{18} 3300 \times 3,20^2 = 1900 \text{ Kgm}$$

$$\sigma_c = 39 \text{ Kg/cm}^2$$

$$A_f = 6,3 \text{ cm}^2$$

Sezione 4; 5; 6;

$$M = \frac{1}{12} 3300 \times 4,20^2 = 4850 \text{ Kgm}$$

$$\sigma_c = 69 \text{ Kg/cm}^2$$

$$A_f = 14,7 \text{ cm}^2$$

Sezione 4-5; 5-6;

$$M = \frac{1}{18} 3300 \times 4,20^2 = 3250 \text{ Kgm}$$

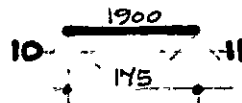
$$\sigma_c = 54 \text{ Kg/cm}^2$$

$$A_f = 11,2 \text{ cm}^2$$

Taglio massimo $T = 6950 \text{ Kg}$

$$\tau_{\max} = \frac{6950}{90 \times 0,9 \times 23} = 3,75 \text{ Kg/cm}^2$$

Trave n°10-11;



- Armatura a flessione -

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

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

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

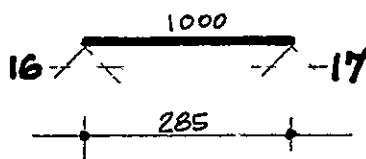
Sezione 10; 11; 10-11;

$$M = \frac{1}{12} 1900 \times 1,75^2 = 500 \text{ Kgm}$$

$$\sigma_c = 19 \text{ Kg/cm}^2$$

$$A_f = 0,8 \text{ cm}^2$$

Trave 16 - 17



- Armatura a flessione -

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

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

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

Sezione 16, 17

$$M = \frac{1}{12} 1000 \times 2,85^2 = 680 \text{ Kgm}$$

$$\sigma_c = 22 \text{ Kg/cm}^2$$

$$A_f = 1,05 \text{ cm}^2$$

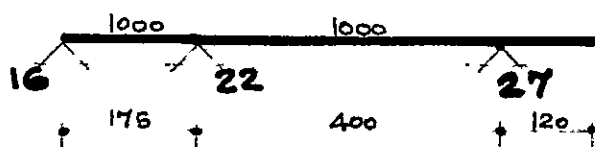
Sezione 16 - 17

$$M = \frac{1}{18} 1000 \times 2,85^2 = 450 \text{ Kgm}$$

$$\sigma_c = 18 \text{ Kg/cm}^2$$

$$A_f = 0,7 \text{ cm}^2$$

Trave 16-22-27-3; 17-23-28-S;



- Armatura a flessione -

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

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

$$b = 25 \text{ cm}$$

Sezione 16, 17; 16-22; 17-23;

$$M = \frac{1}{14} 1000 \times 1,75^2 = 450 \text{ Kgm}$$

$$\sigma_c = 18 \text{ Kg/cm}^2$$

$$A_f = 0,7 \text{ cm}^2$$

Sezione 22; 23; 27; 28;

$$M = \frac{1}{12} 1000 \times 4,00^2 = 1300 \text{ Kgm}$$

$$\sigma_c = 29 \text{ Kg/cm}^2$$

$$A_f = 2,12 \text{ cm}^2$$

Sezione 22-27; 23-28;

$$M = \frac{1}{16} 1000 \times 4,00^2 = 1000 \text{ Kgm}$$

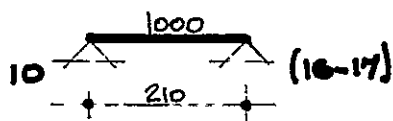
$$\sigma_c = 25 \text{ Kg/cm}^2$$

$$A_f = 1,6 \text{ cm}^2$$

Taglio massimo $T = 2000 \text{ Kg}$

$$\tau_{max} = \frac{2000}{25 \times 0,9 \times 48} = 2,0 \text{ Kg/cm}^2$$

Trave 10-(16-17) $\approx$ 11-(16-17)



- Armatura a flessione -

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

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

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

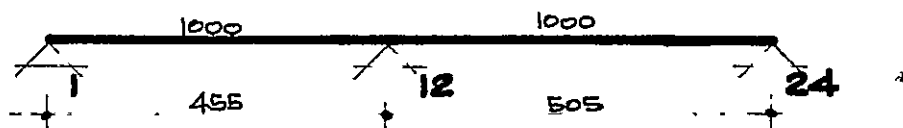
Sezione 10; 10-(16-17); (16-17);

$$M = \frac{1}{12} 1000 \times 2,20^2 = 360 \text{ Kgm}$$

$$\sigma_o = < 15 \text{ Kg/cm}^2$$

$$A_f = < 1 \text{ cm}^2$$

Trave 1-12-24 $\approx$ 9-21-31



- Armatura a flessione -

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25 \text{ cm}$$

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

Sezione 1; 1-12;

$$M = \frac{1}{14} 1000 \times 4,55^2 = 1400 \text{ Kgm}$$

$$\sigma_o = 47 \text{ Kg/cm}^2$$

$$A_f = 4,85 \text{ cm}^2$$

Sezione 12

$$M = \frac{1}{12} 1000 \times 5,05^2 = 2150 \text{ Kgm}$$

$$\sigma_o = 60 \text{ Kg/cm}^2$$

$$A_f = 7,4 \text{ cm}^2$$

Sezione 12-24; 24;

$$M = \frac{1}{14} 1000 \times \overline{5,05}^2 = 1800 \text{ Kgm}$$

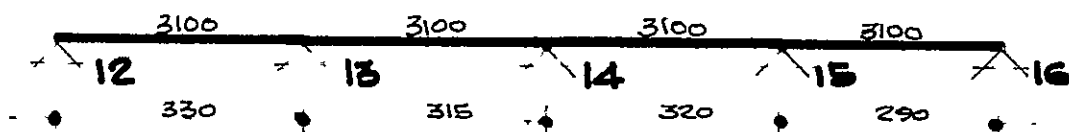
$$\sigma_o = 55 \text{ Kg/cm}^2$$

$$A_F = 6,35 \text{ cm}^2$$

$$\text{Taglio massimo } T = 2500 \text{ Kg}$$

$$\tau_{\max} = \frac{2500}{50 \times 0,9 \times 23} = 2,5 \text{ Kg/cm}^2$$

Travi 12-13-14-15-16 = 17-18-19-20-21



- Armatura a flessione -

$$\sigma_F = 1400 \text{ Kg/cm}^2$$

$$H = 25 \text{ cm}$$

$$b = 80 \text{ cm}$$

Sezione 12; 12-13;

$$M = \frac{1}{14} 3100 \times \overline{3,30}^2 = 2400 \text{ Kgm}$$

$$\sigma_o = 48 \text{ Kg/cm}^2$$

$$A_F = 8,1 \text{ cm}^2$$

Sezione 13

$$M = \frac{1}{12} 3100 \times \overline{3,30}^2 = 2800 \text{ Kgm}$$

$$\sigma_o = 53 \text{ Kg/cm}^2$$

$$A_F = 9,6 \text{ cm}^2$$

Sezione 13 - 14

$$M = \frac{1}{16} 3100 \times \overline{3,15}^2 = 1950 \text{ Kgm}$$

$$\sigma_o = 43 \text{ Kg/cm}^2$$

$$A_F = 6,6 \text{ cm}^2$$

Sezione 14; 15;

$$M = \frac{1}{12} 3100 \times \overline{3,15}^2 = 2650 \text{ Kgm}$$

$$\sigma_o = 51 \text{ Kg/cm}^2$$

$$A_F = 9,0 \text{ cm}^2$$

Sezione 14-15

$$M = \frac{1}{16} 3100 \times 3,15^2 = 2000 \text{ Kgm}$$

$$\sigma_o = 44 \text{ Kg/cm}^2$$

$$A_f = 6,9 \text{ cm}^2$$

Sezione 15-16; 16

$$M = \frac{1}{14} 3100 \times 2,90^2 = 1850 \text{ Kgm}$$

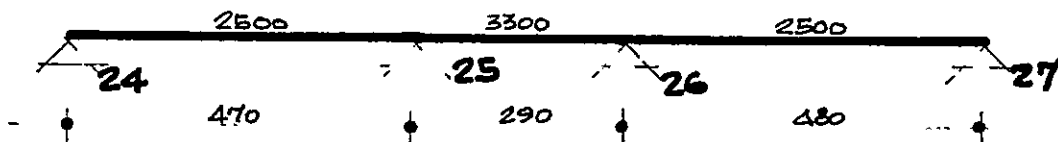
$$\sigma_o = 41 \text{ Kg/cm}^2$$

$$A_f = 6,2 \text{ cm}^2$$

Taglio massimo T = 5100 Kg

$$\tau_{\max} = \frac{5100}{80 \times 0,79 \times 23} = 3,1 \text{ Kg/cm}^2$$

Trave 24-25-26-27; 28-29-30-31



- Armatura a flessione -

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25 \text{ cm}$$

$$b = 90 \text{ cm}$$

Sezione 24; 24-25;

$$M = \frac{1}{14} 2500 \times 4,70^2 = 4000 \text{ Kgm}$$

$$\sigma_o = 61 \text{ Kg/cm}^2$$

$$A_f = 13,7 \text{ cm}^2$$

Sezione 25

$$M = \frac{1}{12} 2500 \times 4,70^2 = 4600 \text{ Kgm}$$

$$\sigma_o = 67 \text{ Kg/cm}^2$$

$$A_f = 16 \text{ cm}^2$$

Sezione 25 - 26

$$M = \frac{1}{14} 3300 \times 2,90^2 = 2000 \text{ Kgm}$$

$$\sigma_o = 40 \text{ Kg/cm}^2$$

$$A_f = 6,65 \text{ cm}^2$$

Sezione 26

$$M = \frac{1}{12} 3300 \times 4,80^2 = 4800 \text{ Kgm}$$

$$\sigma_o = 69 \text{ Kg/cm}^2$$

$$A_f = 16,8 \text{ cm}^2$$

Sezione 26-27; 27

$$M = \frac{1}{14} 3300 \times 4,80^2 = 4200 \text{ Kgm}$$

$$\sigma_o = 63 \text{ Kg/cm}^2$$

$$A_f = 14,5 \text{ cm}^2$$

$$\text{Taglio massimo } T = 6000 \text{ Kg}$$

$$\tau_{\max} = \frac{6000}{90 \times 0,9 \times 23} = 3,2 \text{ Kg/cm}^2$$

- Vano scala -**- Analisi di carico**

gradino

p.p.	$\frac{20+3,5}{2} \times 1,00 \times 1,00 \times 2500$	= 300
sovracc. perm.		= 200
sovracc. accid.		= 400
		900 Kg/mq

trave a ginocchio

rampa	$900 \times 1,20$	= 1080
tompagno		= 700
p.p.	$0,25 \times 0,60 \times 1,00 \times 2500$	= 320
		2100 Kg/ml

Calcolo trave a ginocchio

- A flessione

$$M_{inc} = \frac{1}{12} 2100 \times 3,40^2 = 2000 \text{ Kgm} \quad H = 60'' \quad b = 25''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 36 \text{ Kg/cm}^2 \quad A_f = 3,2 \text{ cm}^2$$

$$M_{camp} = \frac{1}{14} 2100 \times 3,40^2 = 1750 \text{ Kgm} \quad H = 60'' \quad b = 25 \text{ cm}^2$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 33 \text{ Kg/cm}^2 \quad A_f = 2,75 \text{ cm}^2$$

- A torsione

$$m_i = \frac{1}{2} 900 \times 1,20^2 = 650 \text{ Kgm} \quad t_i = 900 \times 1,20 = 1080 \text{ Kg}$$

$$m_t = 650 + 1080 \times 0,125 = 785 \text{ Kgm} \quad M_t = 785 \times \frac{3,00}{2} = 1180 \text{ Kgm}$$

$$\psi = 3 + \frac{2,6}{0,45 + \frac{60}{25}} = 3,91$$

$$\tau_t = \frac{3,91 \times 118000}{60 \times 25^2} = 12,30 \text{ Kg/cm}^2$$

- Armatura a torsione

$$F = 55 \times 20 = 1100 \text{ cm}^2$$

$$U = 2 \times (55+20) = 150 \text{ cm}$$

$$\Sigma_{fl} = \frac{118000 \times 150}{2 \times 1400 \times 1100} = 5,7 \text{ cmq}$$

$$\Sigma_{fs} = \frac{118000}{2 \times 1400 \times 1100} = 0,038 \text{ cmq/cm}$$

- Armatura gradino

$$M = \frac{1}{2} 900 \times \overline{1,20}^2 < 0,30 = 195 \text{ Kgm} \quad H = \frac{20+3}{2} = 11,5'' \quad b = 30''$$

$$\sigma_f = 1400 \text{ Kg/cmq}$$

$$\sigma_c = 50 \text{ Kg/cmq}$$

$$A_f = 1,47 \text{ cmq}$$

- Armatura pianerottoli $H = 20''$

$$q = 800 \text{ Kgm}$$

$$l = 2,60 \text{ m}$$

vincolo incastro

$$M_{inc} = \frac{1}{12} 800 \times \overline{2,60}^2 = 450 \text{ Kgm} \quad \text{per } H = 20'' \quad b = 100''$$

$$\sigma_f = 1400 \text{ Kg/cmq}$$

$$\sigma_c = 22 \text{ Kg/cmq}$$

$$A_f = 1,9 \text{ cmq/ml}$$

$$M_{camp} = \frac{1}{14} 800 \times \overline{2,60}^2 = 390 \text{ Kgm} \quad \text{per } H = 20'' \quad b = 100''$$

$$\sigma_f = 1400 \text{ Kg/cmq}$$

$$\sigma_c = 20 \text{ Kg/cmq}$$

$$A_f = 1,6 \text{ cmq/ml}$$

- SOLAI -

Solaio $H = 20'' + 5''$ $i = 50''$

- Analisi di carico

p.p.		= 160
soletta	$0,05 \times 1,00 \times 1,00 \times 2500$	= 125
sovracc. perm.		= 115
sovracc. accid.		= 200
		600 Kg/mq

$$q = 600 \times 0,50 = 300 \text{ Kg/ml}$$

$$l = 3,45 \text{ m}$$

$$\text{luce di calcolo } l = 3,45 \times 1,05 = 3,60 \text{ m}$$

$$\text{per } \sigma_f = 1400 \text{ Kg/cm}^2 \quad H = 25'' \quad b = 50''$$

$$M_{inc} = \frac{1}{12} 300 \times 3,60^2 = 330 \text{ Kgm} \quad \sigma_c = 21 \text{ Kg/cm}^2 \quad A_f = 1,1 \text{ cm}^2$$

$$M_{camp} = \frac{1}{14} 300 \times 3,60^2 = 280 \text{ Kgm} \quad \sigma_c = 19 \text{ Kg/cm}^2 \quad A_f = 0,95 \text{ cm}^2$$

$$\text{luce di calcolo } l = 3,95 \times 1,05 = 4,15 \text{ m}$$

$$\text{per } \sigma_f = 1400 \text{ Kg/cm}^2 \quad H = 25'' \quad b = 50''$$

$$M_{inc} = \frac{1}{12} 300 \times 4,15^2 = 430 \text{ Kgm} \quad \sigma_c = 23 \text{ Kg/cm}^2 \quad A_f = 1,37 \text{ cm}^2$$

$$M_{camp} = \frac{1}{14} 300 \times 4,15^2 = 370 \text{ Kgm} \quad \sigma_c = 21 \text{ Kg/cm}^2 \quad A_f = 1,1 \text{ cm}^2$$

$$\text{luce di calcolo } l = 2,05 \times 1,05 = 2,15 \text{ m}$$

$$\text{per } \sigma_f = 1400 \text{ Kg/cm}^2 \quad H = 25'' \quad b = 50''$$

$$M_{inc} = \frac{1}{12} 300 \times 2,15^2 = 120 \text{ Kgm} \quad \sigma_c = < 15 \text{ Kg/cm}^2 \quad A_f \approx 0,5 \text{ cm}^2$$

$$M_{camp} = \frac{1}{14} 300 \times 2,15^2 = 100 \text{ Kgm} \quad \sigma_c = < 15 \text{ Kg/cm}^2 \quad A_f \approx 0,5 \text{ cm}^2$$

Zone ribassate $H = 12'' + 4''$

- Analisi di carico

P.P.		= 100
soletta	$0,04 \times 1,00 \times 1,00 \times 2500$	= 100
sovracc. perm.		= 150
sovracc. accid.		= 200
		550 Kg/mq

$l = 3,95 \text{ m}$

luce di calcolo $l = 3,95 \times 1,05 = 3,95 \text{ m}$

per $\sigma_f = 1400 \text{ Kg/cm}^2$

$H = 16''$

$b = 50''$

$$M_{inc} = \frac{1}{12} 275 \times 3,95^2 = 360 \text{ Kgm}$$

$$\sigma_c = 37 \text{ Kg/cm}^2$$

$$A_f = 1,95 \text{ cm}^2$$

$$M_{camp} = \frac{1}{14} 275 \times 3,95^2 = 310 \text{ Kgm}$$

$$\sigma_c = 34 \text{ Kg/cm}^2$$

$$A_f = 1,7 \text{ cm}^2$$

- SPORTI -

- Analisi di carico

P.P.		= 140
soletta	$0,04 \times 1,00 \times 1,00 \times 2500$	= 100
sovracc. perm.		= 110
sovracc. accid.		= 400
		750 Kg/mq

$$q = 750 \times 0,50 = 375 \text{ kg/ml}$$

$$l = 1,25 \text{ m}$$

per $\sigma_f = 1400 \text{ Kg/cm}^2$

$H = 20''$

$b = 50''$

$$M = \frac{1}{2} 375 \times 1,25^2 = 295 \text{ Kgm}$$

$$\sigma_c = 25 \text{ Kg/cm}^2$$

$$A_f = 1,25 \text{ cm}^2$$

per $\sigma_f = 1400 \text{ Kg/cm}^2$

$H = 20''$

$b = 50''$

$$M = \frac{1}{2} 375 \times 1,00^2 = 190 \text{ Kgm}$$

$$\sigma_c = 20 \text{ Kg/cm}^2$$

$$A_f = 0,8 \text{ cm}^2$$

- Torrino vano scala -

Solaio

$$q = 550 \times 0,50 = 275 \text{ Kg/ml}$$

$$l = 2,80 \text{ m}$$

$$M_{inc} = \frac{1}{14} 275 \times 2,80^2 = 155 \text{ Kgm} \quad H = 20'' \quad b = 50''$$

$$\sigma_c = 18 \text{ Kg/cm}^2 \quad A_f = 0,65 \text{ cm}^2$$

$$M_{camp} = \frac{1}{10} 275 \times 2,80^2 = 215 \text{ Kgm} \quad H = 20'' \quad b = 50''$$

$$\sigma_c = 21 \text{ Kg/cm}^2 \quad A_f = 0,7 \text{ cm}^2$$

Travi 10-16-22

$$q = 550 \times \frac{2,80}{2} = 700$$

$$p.p. = \frac{300}{1000 \text{ Kg/ml}}$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad H = 50'' \quad b = 25''$$

$$M_{25} = M_{25-41} = \frac{1}{14} 1000 \times 1,95^2 = 220 \text{ Kgm} \quad \sigma_c = 15 \text{ Kg/cm}^2 \quad A_f = 1 \text{ cm}^2$$

$$M_{41} = \frac{1}{12} 1000 \times 3,55^2 = 1050 \text{ Kgm} \quad \sigma_c = 28 \text{ Kg/cm}^2 \quad A_f = 1,9 \text{ cm}^2$$

$$M_{41-49} = M_{49} = \frac{1}{14} 1000 \times 3,55^2 = \quad \sigma_c = 26 \text{ Kg/cm}^2 \quad A_f = 1,6 \text{ cm}^2$$

Pilastri 5; 14;

5 - 4

= 4600

5 - 6

$$3300 \times \frac{2,80}{2}$$

= 4600

p.p.

= 1300

10500 Kg

Pilastro 19; 20; 21; 22;

19 - 20

$$1700 \times \frac{2,00}{2}$$

= 1700

19 - (23-24)

$$1000 \times \frac{1,50}{2}$$

= 750

p.p.

= 1050

3500 Kg

Pilastri 23; 24; 25; 26;

23 - 24

$$1000 \times \frac{2,70}{2} + 750$$

= 2000

23 - 39

$$2000 \times \frac{20,00}{2} + 3000$$

= 5000

p.p.

= 1500

8500 Kg

Pilastro 27; 32; 33; 38;

27 - 1

= 2250

27 - 43

$$1000 \times \frac{3,90}{2}$$

= 1950

27 - 28

$$3000 \times \frac{3,40}{2}$$

= 5100

p.p.

= 1200

10500 Kg

Pilastro 44; 51; 54; 61;

44 - 43

= 4600

44 - 45

$$2900 \times \frac{2,80}{2}$$

= 4050

p.p.

= 1350

10000 Kg

Pilastro 45; 50; 55; 60;

45 - 44

= 4050

45 - 46

$$2900 \times \frac{2,00}{2}$$

= 2900

p.p.

= 1550

8500 Kg

Pilastro 46; 49; 56; 59;

46 - 45

= 2900

46 - 47

$$2900 \times \frac{2,10}{2}$$

= 3000

p.p.

= 1100

7000 Kg

Pilastro 47; 48; 57; 58;

47 - 46

= 3000

47 - 39

= 3000

sbalzi

$$2000 \times 0,70$$

= 1400

p.p.

= 1100

9500 Kg

- Armatura travi rovesce -

- Analisi di carico sul terreno -

pilastrini	2.935.000
p.p. travi	<u>165.000</u>
	3.100.000 Kg

- Tensione sul terreno -

$$\sigma_t = \frac{3.100.000}{2.309.600} = 1,34 \text{ Kg/cm}^2$$

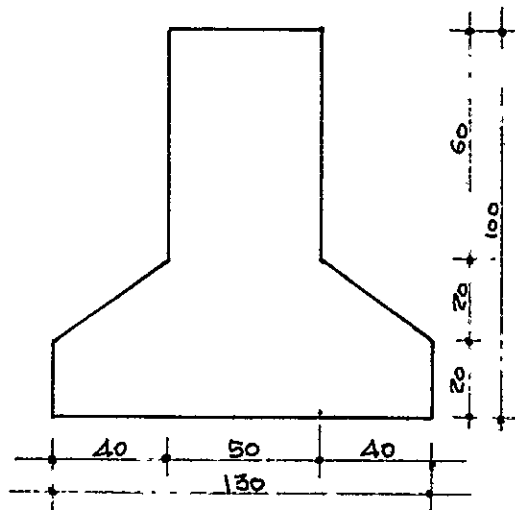
Trave 1-2-3-4-5-6-7-8-9; 10-11-12-13-14-15-16-17-18; 27-26-25-24-23;
 24-25-26-27-28-29-30-31-32; 33-32-31-30-29-28-27-26-25; 34-35-
 36-37-38; 43-44-45-46-47-48-49-50-51-52; 53-54-55-56-57-58-59-
 60-61-62;

- Carico sulla trave -

$$\frac{2.935.000}{2.309.600} \times 100 \times 130 = 16500 \text{ Kg/ml}$$

- Caratteristiche geometriche -

vedi disegno



- Armatura a flessione

$$M_{inc} = \frac{1}{12} 16500 \times 3,80^2 = 19800 \text{ Kgm} \quad H = 100'' \quad b = 50''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_o = 41 \text{ Kg/cm}^2 \quad A_f = 16 \text{ cm}^2$$

$$M_{camp} = 19800 \text{ Kgm} \quad H = 100'' \quad b = 130''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_o = 24 \text{ Kg/cm}^2 \quad A_f = 15,6 \text{ cm}^2$$

- Armatura trasversale

$$M = \frac{1}{2} 16500 \times 0,40^2 = 1300 \text{ Kgm} \quad H = 40'' \quad b = 100''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 17 \text{ Kg/cm}^2 \quad A_f = 2,5 \text{ cm}^2$$

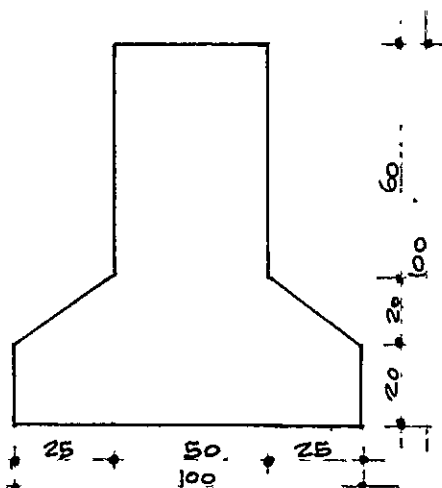
Travi 17-39-23-(4-5); 48-40-24-(5-6); 57-41-25-(13-14);
58-42-26-(14-15);

- Carico sulla trave -

$$1,27 \times 100 \times 90 = 11400 \text{ Kgm}$$

- Caratteristiche geometriche -

vedi disegno



- Armatura a flessione

$$M_{inc} = \frac{1}{12} 11400 \times 4,00^2 = 15200 \text{ Kgm} \quad H = 100'' \quad b = 40''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 40 \text{ Kg/cm}^2 \quad A_f = 12 \text{ cm}^2$$

$$M_{camp} = 15200 \text{ Kgm} \quad H = 100'' \quad b = 90''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 25 \text{ Kg/cm}^2 \quad A_f = 11,7 \text{ cm}^2$$

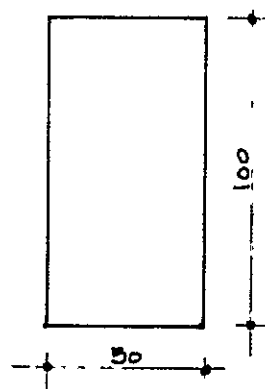
Travi 1-27-43; 9-32-52; 10-33-53; 18-38-62; 19-20; 21-22;

- Carico sulla trave -

$$1,27 \times 0,50 \times 100 = 6300 \text{ Kgm}$$

- Caratteristiche geometriche -

vedi disegno



- Armatura a flessione

$$M_{inc} = M_{camp} = \frac{1}{12} 6300 \times \overline{4,50}^2 = 10600 \text{ Kgm} \quad H = 100'' \quad b = 50''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$\sigma_o = 29 \text{ Kg/cm}^2$$

$$A_f = 8,5 \text{ cm}^2$$

SEZIONE ED ARMATURA PILASTRI PIANO FONDAZIONI E PIANO TERRA

N°	P	A' o	Af	Armatura	sezione	A ci	σ o
	tn	cmq	cmq		cm × cm	cmq	cmq
1-18	50	1030	8,3	10 ø 14	ø 50	2114	24
2-8-11-17	62,5	1300	10,4	10 ø 14	ø 50	2114	30
3-7-12-16	52,5	1080	8,7	10 ø 14	ø 50	2114	25
4-6-13-15	52,5	1080	8,7	10 ø 14	ø 50	2114	25
5-14	52,5	1080	8,7	10 ø 14	ø 50	2114	25
9-10	50	1030	8,3	10 ø 14	ø 50	2114	24
19-20-21-22	17,5	360	2,9	8 ø 14	25 × 40	1123	16
23-24-25-26	42,5	880	7	8 ø 14	25 × 40	1123	38
27-38	52,5	1080	8,7	10 ø 14	ø 50	2114	25
28-31-34-37	55	1130	9,1	8 ø 14	35 × 35	1353	41
29-30-35-36	60	1250	10,0	8 ø 14	35 × 35	1353	44
32-33	52,5	1080	8,7	10 ø 14	ø 50	2114	25
39-40-41-42	47,5	1000	8	8 ø 14	25 × 40	1123	42
43-62	40	830	6,7	10 ø 14	ø 50	2114	19
44-51-54-61	50	1030	8,3	10 ø 14	ø 50	2114	23
45-50-55-60	42,5	880	7	10 ø 14	ø 50	2114	20

46-49-56-59	35	720	5,9	8ø 14	35 × 35	1353	26
47-48-57-58	47,5	1000	8	8 ø 14	35 × 35	1353	35
52-53	40	830	6,7	10 ø 14	ø 50	2114	19

Staffe ø 8" /15"

SEZIONE ED ARMATURA PILASTRI PIANO PRIMO E SECONDO

N°	sezione	armatura
1-18	ø 40	10 ø 12
2-8-11- 17	35 × 35	8 ø 12
3-7-12- 16	35 × 35	8 ø 12
4-6-13- 15	35 × 35	8 ø 12
5-14	35 × 35	8 ø 12
9-10	35 × 35	8 ø 12
13-20 21-22	25 × 40	8 ø 12
23-24 25-26	25 × 40	8 ø 12
27-38	ø 40	10 ø 12

N°	sezione	armatura
28-31 34-37	35 × 35	8 ø 12
29-30 35-36	35 × 35	8 ø 12
32-33	35 × 35	8 ø 12
39-40 41-42	25 × 40	8 ø 12
43-62	ø 40	10 ø 12
44-51 54-61	35 × 35	8 ø 12
45-50 55-60	ø 40	10 ø 12
46-49 56-59	35 × 35	8 ø 12
47-48 57-58	35 × 35	8 ø 12
52-53	35 × 35	8 ø 12

Staffe ø 6" / 15"

SEZIONE ED ARMATURA PILASTRI PIANO TERZO E QUARTO

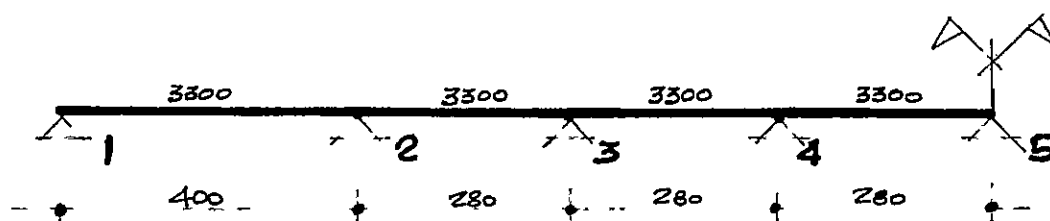
N°	sezione	armatura
1-18	Ø 30	8 Ø 12
2-8-11-17	30 × 30	8 Ø 12
3-7-12-16	30 × 30	8 Ø 12
4-6-13-15	30 × 30	8 Ø 12
5-14	30 × 30	8 Ø 12
9-10	30 × 30	8 Ø 12
19-20 21-22	25 × 40	8 Ø 12
23-24 25-26	25 × 40	8 Ø 12
27-38	Ø 30	8 Ø 12

N°	sezione	armatura
28-31 34-37	30 × 30	8 Ø 12
29-30 35-36	30 × 30	8 Ø 12
32-33	30 × 30	8 Ø 12
39-40 41-42	25 × 40	8 Ø 12
43-62	Ø 30	8 Ø 12
44-51 54-61	30 × 30	8 Ø 12
45-50 55-60	Ø 30	8 Ø 12
46-49 56-59	30 × 30	8 Ø 12
47-48 57-58	30 × 30	8 Ø 12
52-53	30 × 30	8 Ø 12

Staffe Ø 6" / 15"

- Armatura travi a flessione -

Trave 1-2-3-4-5-6-7-8-9,10-11-12+13-14-15-16-17-18

**- Armatura a flessione -**

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25 \text{ cm}$$

$$b = 80 \text{ cm}$$

Sezione 1; 1-2;

$$M = \frac{1}{14} 3300 \times \overline{4,00}^2 = 3800 \text{ Kgm}$$

$$\sigma_o = 64 \text{ Kg/cm}^2$$

$$A_f = 13,2 \text{ cm}^2$$

Sezione 2

$$M = \frac{1}{12} 3300 \times \overline{4,00}^2 = 4400 \text{ Kgm}$$

$$\sigma_o = 70 \text{ Kg/cm}^2$$

$$A_f = 15,3 \text{ cm}^2$$

Sezione 2-3

$$M = \frac{1}{16} 3300 \times \overline{2,80}^2 = 1600 \text{ Kgm}$$

$$\sigma_o = 38 \text{ Kg/cm}^2$$

$$A_f = 5,5 \text{ cm}^2$$

Sezione 3; 4; 5;

$$M = \frac{1}{12} 3300 \times \overline{2,80}^2 = 2200 \text{ Kgm}$$

$$\sigma_o = 46 \text{ Kg/cm}^2$$

$$A_f = 7,5 \text{ cm}^2$$

Sezione 3-4; 4-5;

$$M = \frac{1}{18} 3300 \times \overline{2,80}^2 = 1450 \text{ Kgm}$$

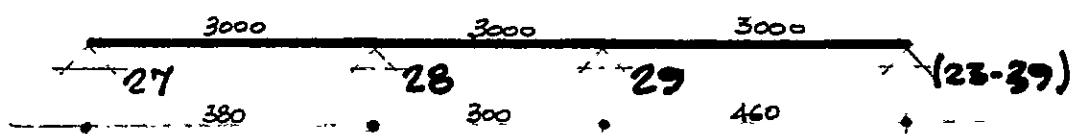
$$\sigma_o = 36 \text{ Kg/cm}^2$$

$$A_f = 4,9 \text{ cm}^2$$

$$\text{Taglio massimo } T = 6600 \text{ Kg}$$

$$\tau_{\max} = \frac{6600}{23 \times 0,9 \times 80} = 4,0 \text{ Kg/cm}^2$$

Trave 27-28-29-(23-39); (24-40)-30-31-32; 33-34-35-(25-41);
(26-42)-36-37-38;



- Armatura a flessione -

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25 \text{ cm}$$

$$b = 80 \text{ cm}$$

Sezione 27; 27-28;

$$M = \frac{1}{14} 3000 \times 3,80^2 = 3100 \text{ Kgm}$$

$$\sigma_o = 56 \text{ Kg/cm}^2$$

$$A_f = 10,6 \text{ cm}^2$$

Sezione 28

$$M = \frac{1}{12} 3000 \times 3,80^2 = 3600 \text{ Kgm}$$

$$\sigma_o = 62 \text{ Kg/cm}^2$$

$$A_f = 12,5 \text{ cm}^2$$

Sezione 28-29

$$M = \frac{1}{16} 3000 \times 3,00^2 = 1700 \text{ Kgm}$$

$$\sigma_o = 39 \text{ Kg/cm}^2$$

$$A_f = 5,6 \text{ cm}^2$$

Sezione 29

$$M = \frac{1}{12} 3000 \times 4,00^2 = 4000 \text{ Kgm}$$

$$\sigma_o = 66 \text{ Kg/cm}^2$$

$$A_f = 13,9 \text{ cm}^2$$

Sezione 29-(23-39); (23-39);

$$M = \frac{1}{14} 3000 \times 4,00^2 = 3450 \text{ Kgm}$$

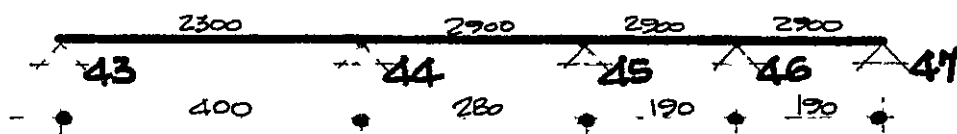
$$\sigma_o = 60 \text{ Kg/cm}^2$$

$$A_f = 11,9 \text{ cm}^2$$

Taglio massimo $T = 6000 \text{ Kg}$

$$\tau_{\max} = \frac{6000}{23 \times 0,9 \times 80} = 3,6 \text{ Kg/cm}^2$$

Travi 43-44-45-46-47; 48-49-50-51-52;
53-54-55-56-57; 58-59-60-61-62;



- Armatura a flessione -

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25 \text{ cm}$$

$$b = 80 \text{ cm}$$

Sezione 43; 43-44;

$$M = \frac{1}{14} 2300 \times 4,00^2 = 2650 \text{ Kgm}$$

$$\sigma_o = 51 \text{ Kg/cm}^2$$

$$A_f = 9 \text{ cm}^2$$

Sezione 44

$$M = \frac{1}{12} 2300 \times 4,00^2 = 3050 \text{ Kgm}$$

$$\sigma_o = 56 \text{ Kg/cm}^2$$

$$A_f = 10,5 \text{ cm}^2$$

Sezione 44-45

$$M = \frac{1}{16} 2900 \times 2,80^2 = 1400 \text{ Kgm}$$

$$\sigma_o = 36 \text{ Kg/cm}^2$$

$$A_f = 4,8 \text{ cm}^2$$

Sezione 45

$$M = \frac{1}{12} 2900 \times 2,80^2 = 1900 \text{ Kgm}$$

$$\sigma_o = 42 \text{ Kg/cm}^2$$

$$A_f = 6,4 \text{ cm}^2$$

Sezione 45-46

$$M = \frac{1}{16} 2900 \times 1,90^2 = 650 \text{ Kgm}$$

$$\sigma_o = 22 \text{ Kg/cm}^2$$

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

Sezione 46

$$M = \frac{1}{12} 2900 \times 1,90^2 = 900 \text{ Kgm}$$

$$\sigma_o = 28 \text{ Kg/cm}^2$$

$$A_f = 3 \text{ cm}^2$$

Sezione 46-47; 47;

$$M = \frac{1}{14} 2900 \times 1,90^2 = 750 \text{ Kgm}$$

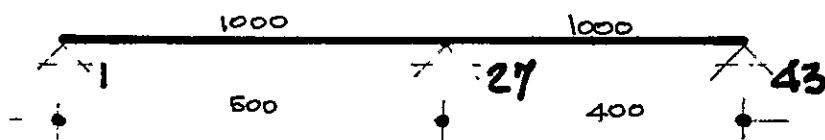
$$\sigma_o = 25 \text{ Kg/cm}^2$$

$$A_f = 2,5 \text{ cm}^2$$

Taglio massimo $T = 4600 \text{ Kg}$

$$\tau_{\max} = \frac{4600}{23 \times 0,9 \times 80} = 2,8 \text{ Kg/cm}^2$$

Trave n°1-27-43; 9-32-52; 10-33-53; 18-38-62;



- Armatura a flessione -

$$\sigma_F = 1400 \text{ Kg/cm}^2$$

$$H = 25 \text{ cm}$$

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

Sezione 1; 1-27;

$$M = \frac{1}{14} 1000 \times 5,00^2 = 1900 \text{ Kgm}$$

$$\sigma_c = 53 \text{ Kg/cm}^2$$

$$A_F = 6,25 \text{ cm}^2$$

Sezione 27

$$M = \frac{1}{12} 1000 \times 5,00^2 = 2100 \text{ Kgm}$$

$$\sigma_c = 59 \text{ Kg/cm}^2$$

$$A_F = 7,2 \text{ cm}^2$$

Sezione 27-43; 43;

$$M = \frac{1}{14} 1000 \times 4,00^2 = 1150 \text{ Kgm}$$

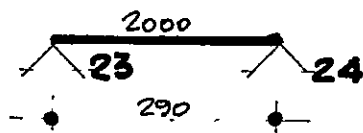
$$\sigma_c = 41 \text{ Kg/cm}^2$$

$$A_F = 3,85 \text{ cm}^2$$

Taglio massimo $T = 2500 \text{ Kg}$

$$\tau_{\max} = \frac{2500}{23 \times 0,9 \times 50} = 2,4 \text{ Kg/cm}^2$$

Trave 23-24; 25-26;



- Armatura a flessione -

$$\sigma_F = 1400 \text{ Kg/cm}^2$$

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

$$b = 25 \text{ cm}$$

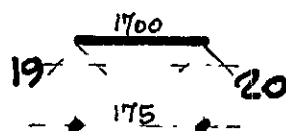
Sezione 23; 23-24; 24

$$M = \frac{1}{12} 2000 \times 2,90^2 = 1400 \text{ Kgm}$$

$$\sigma_c = 30 \text{ Kg/cm}^2$$

$$A_f = 2,3 \text{ cm}^2$$

Trave 19-20; 21-22;



- Armatura a flessione -

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

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

$$b = 25 \text{ cm}$$

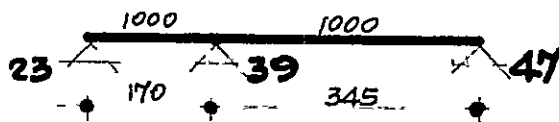
Sezione 19; 19-20; 20

$$M = \frac{1}{12} 1700 \times 1,75^2 = 450 \text{ Kgm}$$

$$\sigma_c = < 15 \text{ Kg/cm}^2$$

$$A_f = 0,7 \text{ cm}^2$$

Trave 23-39-47; 24-40-48; 25-41-57; 26-42-57;



- Armatura a flessione -

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

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

$$b = 25 \text{ cm}$$

Sezione 23, 23-39,

$$M = \frac{1}{14} 1000 \times \overline{1,70}^2 = 200 \text{ Kgm}$$

$$\sigma_c = < 15 \text{ Kg/cm}^2 \quad A_F = 0,5 \text{ cm}^2$$

Sezione 39, 47

$$M = \frac{1}{12} 1000 \times \overline{3,45}^2 = 1000 \text{ Kgm}$$

$$\sigma_c = 25 \text{ Kg/cm}^2 \quad A_F = 1,6 \text{ cm}^2$$

Sezione 39-47

$$M = \frac{1}{14} 1000 \times \overline{3,45}^2 = 850 \text{ Kgm}$$

$$\sigma_c = 22 \text{ Kg/cm}^2 \quad A_F = 1,3 \text{ cm}^2$$

$$\text{Taglio massimo } T = 1700 \text{ Kg}$$

$$\tau_{\max} = \frac{1700}{25 \times 0,9 \times 48} = 1,6 \text{ Kg/cm}^2$$

- Vano scala -**- Analisi di carico**

gradino

$$\begin{array}{rcl}
 \text{p.p.} & \frac{20+3,5}{2} \times 1,00 \times 1,00 \times 2500 & = 300 \\
 \text{sovracc. perm.} & & = 200 \\
 \text{sovracc. accid.} & & = 400 \\
 & & \hline
 & & 900 \text{ Kg/ml}
 \end{array}$$

trave a ginocchio

$$\begin{array}{rcl}
 \text{rampa} & 900 \times 1,20 & = 1080 \\
 \text{tompagno} & & = 700 \\
 \text{p.p.} & 0,25 \times 0,60 \times 1,00 \times 2500 & = 320 \\
 & & \hline
 & & 2100 \text{ Kg/ml}
 \end{array}$$

Calcolo trave a ginocchio

- A flessione

$$M_{inc} = \frac{1}{12} 2100 \times 3,40^2 = 2000 \text{ Kgm} \quad H = 60" \quad b = 25"$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 36 \text{ Kg/cm}^2 \quad i_c = 3,2 \text{ cm}^2$$

$$M_{camp} = \frac{1}{14} 2100 \times 3,40^2 = 1750 \text{ Kgm} \quad H = 60" \quad b = 25 \text{ cm}^2$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 33 \text{ Kg/cm}^2 \quad i_c = 3,2 \text{ cm}^2$$

- A torsione

$$m_i = \frac{1}{2} 900 \times 1,20^2 = 650 \text{ Kgm} \quad t_i = 900 \times 1,20 = 1080 \text{ Kg}$$

$$m_t = 650 + 1080 \times 0,125 = 785 \text{ Kgm} \quad M_t = 785 \times \frac{3,00}{2} = 1180 \text{ Kgm}$$

$$\psi = 3 + \frac{2,6}{0,45 + \frac{60}{25}} = 3,91$$

$$\tau_t = \frac{3,91 \times 118000}{60 \times 25^2} = 12,30 \text{ Kg/cm}^2$$

- Armatura a torsione

$$F = 55 \times 20 = 1100 \text{ cm}^2$$

$$U = 2 \times (55+20) = 150 \text{ cm}$$

$$\Sigma_{f1} = \frac{118000 \times 150}{2 \times 1400 \times 1100} = 5,7 \text{ cmq}$$

$$\Sigma_{fs} = \frac{118000}{2 \times 1400 \times 1100} = 0,038 \text{ cmq/cm}$$

- Armatura gradino

$$M = \frac{1}{2} 900 \times 1,20^2 < 0,30 = 195 \text{ Kgm} \quad H = \frac{20+3}{2} = 11,5'' \quad b = 30''$$

$$\sigma_f = 1400 \text{ Kg/cmq}$$

$$\sigma_c = 50 \text{ Kg/cmq}$$

$$A_f = 1,47 \text{ cmq}$$

- Armatura pianerottoli $H = 20''$

$$q = 800 \text{ Kgm}$$

$$l = 2,60 \text{ m}$$

vincolo incastro

$$M_{ino} = \frac{1}{12} 800 \times 2,60^2 = 450 \text{ Kgm} \quad \text{per } H = 20'' \quad b = 100''$$

$$\sigma_f = 1400 \text{ Kg/cmq}$$

$$\sigma_c = 22 \text{ Kg/cmq}$$

$$A_f = 1,9 \text{ cmq/ml}$$

$$M_{camp} = \frac{1}{14} 800 \times 2,60^2 = 390 \text{ Kgm} \quad \text{per } H = 20'' \quad b = 100''$$

$$\sigma_f = 1400 \text{ Kg/cmq}$$

$$\sigma_c = 20 \text{ Kg/cmq}$$

$$A_f = 1,6 \text{ cmq/ml}$$

- SOLAI -Solaio $H = 20'' + 5''$ $i = 50''$ **- Analisi di carico**

p.p.	= 160
soletta	= 125
sovracc. perm.	= 115
sovracc. accid.	= 200
	600 Kg/mq

$$q = 600 \times 0,50 = 300 \text{ Kg/ml}$$

$$l = 4,00 \text{ m}$$

$$\text{luce di calcolo } l = 4,00 \times 1,05 = 4,20 \text{ m}$$

$$\text{per } \sigma_F = 1400 \text{ Kg/cm}^2$$

$$H = 25''$$

$$b = 50''$$

$$M_{inc} = \frac{1}{12} 300 \times 4,00^2 = 400 \text{ Kgm}$$

$$\sigma_c = 23 \text{ Kg/cm}^2 \quad A_F = 1,35 \text{ cm}^2$$

$$M_{camp} = \frac{1}{14} 300 \times 4,00^2 = 340 \text{ Kgm}$$

$$\sigma_c = 21 \text{ Kg/cm}^2 \quad A_F = 1,15 \text{ cm}^2$$

$$l = 3,50 \text{ m}$$

$$\text{luce di calcolo } l = 3,50 \times 1,05 = 3,60 \text{ m}$$

$$\text{per } \sigma_F = 1400 \text{ Kg/cm}^2$$

$$H = 25''$$

$$b = 50''$$

$$M_{inc} = \frac{1}{12} 300 \times 3,60^2 = 330 \text{ Kgm}$$

$$\sigma_c = 21 \text{ Kg/cm}^2 \quad A_F = 1,1 \text{ cm}^2$$

$$M_{camp} = \frac{1}{14} 300 \times 3,60^2 = 280 \text{ Kgm}$$

$$\sigma_c = 19 \text{ Kg/cm}^2 \quad A_F = 0,95 \text{ cm}^2$$

Zone ribassate $H = 12'' + 4''$ **- Analisi di carico**

p.p.	= 100
soletta	= 100
sovracc. perm.	= 150
sovracc. accid.	= 500
	550 Kg/mq

$$q = 550 \times 0,50 = 275 \text{ Kg/ml}$$

$$\text{per } \sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 16''$$

$$b = 50''$$

$$M_{inc} = \frac{1}{12} 275 \times \overline{3,60}^2 = 300 \text{ Kgm}$$

$$\sigma_c = 34 \text{ Kg/cm}^2 \quad A_f = 1,65 \text{ cm}^2$$

$$M_{camp} = \frac{1}{14} 275 \times \overline{3,60}^2 = 260 \text{ Kgm}$$

$$\sigma_c = 31 \text{ Kg/cm}^2 \quad A_f = 1,40 \text{ cm}^2$$

- SPORTI -

- Analisi di carico $H = 16'' + 4''$

p.p.	= 140
soletta	= 100
sovracc. perm.	= 110
sovracc. accid.	= 400
	750 Kg/mq

$$H = 20'' + 5''$$

p.p.	= 160
soletta	= 125
sovracc. perm.	= 115
sovracc. accid.	= 400
	800 Kg/mq

$$q = 750 \times 0,50 = 375 \text{ Kgm}$$

$$l = 1,40 \text{ m}$$

$$M = \frac{1}{2} 375 \times \overline{1,40}^2 = 365 \text{ Kgm}$$

$$H = 20''$$

$$b = 50''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$\sigma_c = 29 \text{ Kg/cm}^2$$

$$A_f = 1,6 \text{ cm}^2$$

$$q = 800 \times 0,50 = 400 \text{ Kgm}$$

$$l = 1,20 \text{ m}$$

$$M = \frac{1}{2} 400 \times \overline{1,20}^2 = 290 \text{ Kgm}$$

$$H = 25''$$

$$b = 50''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$\sigma_c = 19 \text{ Kg/cm}^2$$

$$A_f = 0,95 \text{ cm}^2$$

- Torrino vano scala -

Solaio

$$q = 550 \times 0,50 = 275 \text{ Kg/ml}$$

$$l = 2,80 \text{ m}$$

$$M_{inc} = \frac{1}{14} 275 \times 2,80^2 = 155 \text{ Kgm} \quad H = 20'' \quad b = 50''$$

$$\sigma_c = 18 \text{ Kg/cm}^2 \quad A_f = 0,65 \text{ cm}^2$$

$$M_{camp} = \frac{1}{10} 275 \times 2,80^2 = 215 \text{ Kgm} \quad H = 20'' \quad b = 50''$$

$$\sigma_c = 21 \text{ Kg/cm}^2 \quad A_f = 0,7 \text{ cm}^2$$

Trave 19-23-39

$$q = 550 \times \frac{0,80}{2} = 700$$

$$p.p. = \frac{300}{1000 \text{ Kg/ml}}$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad H = 50'' \quad b = 25''$$

$$M_{25} = M_{25-41} = \frac{1}{14} 1000 \times 1,95^2 = 220 \text{ Kgm} \quad \sigma_c = 15 \text{ Kg/cm}^2 \quad A_f = 1 \text{ cm}^2$$

$$M_{41} = \frac{1}{12} 1000 \times 3,55^2 = 1050 \text{ Kgm} \quad \sigma_c = 28 \text{ Kg/cm}^2 \quad A_f = 1,9 \text{ cm}^2$$

$$M_{41-49} = M_{41} = \frac{1}{14} 1000 \times 3,55^2 = \quad \sigma_c = 26 \text{ Kg/cm}^2 \quad A_f = 1,6 \text{ cm}^2$$

- Analisi di carico sulle travi -

trave 1-2; 6-7; 9-10; 14-15; 17-18; 23-24;

solaio	$600 \times \frac{4,05}{2}$	= 1200
tompagno		= 700
p.p.		= 400
		2300 Kg/ml

trave 2-3-4-5-6; 8-9; 10-11-12-13-14; 15-16;
18-19-20-21-22-23;

solaio		= 1200
balcone	$800 \times 1,40$	= 1100
tompagno		= 700
p.p.		= 400
		3400 Kg/ml

trave 25-26-27-28; 29-30-31-32; 33-34-35-36-37;
38-39-40-41-42; 43-44-45-46; 47-48-49-50;

solaio		= 1200
"	$600 \times \frac{4,90}{2}$	= 1500
p.p.		= 400
		3100 Kg/ml

trave 28-29; 37-38; 46-47;

solaio		= 1200
tompagno		= 700
p.p.		= 400
		2300 Kg/ml

trave 57-58-59; 60-61-62; 63-64-65-66; 67-68-69-70;
71-72-73-74; 75-76-77-78;

solaio		= 1500
balcone	800 × 1,40	= 1100
tompagno		= 700
p.p.		= 400
		3700 Kg/ml

trave 51-59-S; 52-60-S; 53-66-S; 54-67-S; 55-74-S;
56-75-S;

rampa	800 × 1,20	= 950
tompagno		= 700
p.p.		= 350
		2000 Kg/ml

trave 1-25-57; 28-51; 29-52; 7-32-62; 8-33-63; 37-53;
38-54; 16-42-70; 17-43-71; 46-55; 47-56; 24-50-78;

tompagno		= 700
p.p.		= 300
		1000 Kg/ml

- Analisi di carico sui pilastri -

Pilastro 1; 7; 17; 24;

1 - 2	$2300 \times \frac{3,40}{2}$	= 3900
1 - 25	$1000 \times \frac{4,15}{2}$	= 2100
p.p.		= 1500
		7500 Kg

Pilastro 2; 6; 9; 10; 14; 15; 18; 23;

2 - 1		= 3900
2 - 3	$3400 \times \frac{3,40}{2}$	= 5800
p.p.		= 1300
		11000 Kg

Pilastro 3; 4; 5; 11; 12; 13; 19; 20; 21; 22;

3 - 2		= 5800
3 - 4		= 5800
p.p.		= 1400
		13000 Kg

Pilastro 8; 16;

8 - 9		= 5800
8 - 33		= 2100
p.p.		= 1100
		9000 Kg

Pilastro 25; 32; 33; 42; 43; 50;

25 - 1		= 2100
25 - 57	$1000 \times \frac{5,35}{2}$	= 2700
25 - 26	$3100 \times \frac{3,40}{2}$	= 5300
P.P.		= 1400
		11500 Kg

Pilastro 26; 31;

26 - 25		= 5300
26 - 27	$3100 \times \frac{3,75}{2}$	= 5800
P.P.		= 1400
		12500 Kg

Pilastro 27; 30;

27 - 26		= 5800
27 - 28	$3100 \times \frac{2,60}{2}$	= 4000
P.P.		= 1200
		11000 Kg

Pilastro 28; 29; 37; 38;

28 - 27		= 4000
28 - 29	$2300 \times \frac{2,20}{2}$	= 2500
29 - 51	$1000 \times \frac{1,60}{2}$	= 800
P.P.		= 1200
		8500 Kg

Pilastro 34, 41, 44, 49,

34 - 33

= 5300

34 - 35

$$3100 \times \frac{3,40}{2}$$

= 5300

p.p.

= 1400

12000 Kg

Pilastro 35, 40,

35 - 34

= 5300

35 - 36

$$3100 \times \frac{3,00}{2}$$

= 4700

p.p.

= 1500

11500 Kg

Pilastro 36, 39,

36 - 35

= 4700

36 - 37

= 4000

p.p.

= 1300

10000 Kg

Pilastro 45, 48,

45 - 44

= 5300

45 - 46

$$3100 \times \frac{4,00}{2}$$

= 6200

p.p.

= 1500

13000 Kg

Pilastri 46; 47;

46 - 45		= 6200
46 - 55		= 800
46 - 47		= 2500
P.P.		= 1500
		11000 Kg

Pilastri 51; 52; 53; 54; 55; 56;

51 - 28		= 800
51 - 59	$2000 \times \frac{4,20}{2}$	= 4200
P.P.		= 1500
		6500 Kg

Pilastro 57; 62; 63; 70; 71; 78;

57 - 25		= 2700
57 - 58	$3700 \times \frac{3,35}{2}$	= 6200
P.P.		= 1100
		10000 Kg

Pilastro 58; 61

58 - 57		= 6200
58 - 59	$3700 \times \frac{5,30}{2}$	= 9800
P.P.		= 1500
		17500 Kg

Pilastro 59; 60;

59 - 58

= 9800

59 - 51

= 4200

p.p.

= 1500

15500 Kg

Pilastro 64; 69;

64 - 63

= 6200

64 - 65

$$3700 \times \frac{3,45}{2}$$

= 6400

p.p.

= 1400

14000 Kg

Pilastro 65; 68;

65 - 64

= 6400

65 - 66

$$3700 \times \frac{5,20}{2}$$

= 9600

p.p.

= 1500

17500 Kg

Pilastro 66; 67;

66 - 65

= 9600

66 - 53

= 4200

p.p.

= 1200

15000 Kg

Pilastro 72; 77;

72 - 73

$$3700 \times \frac{3,35}{2}$$

= 6200

72 - 71

= 6200

p.p.

= 1100

13500 Kg

Pilastro 13; 76;

73 - 72

= 6200

73 - 74

$$3700 \times \frac{3,60}{2}$$

= 6700

p.p.

= 1100

14000 Kg

Pilastro 74; 75;

74 - 73

= 6700

74 - 55

= 4200

p.p.

= 1100

12000 Kg

- Armatura travi rovesce -

- Analisi di carico sul terreno -

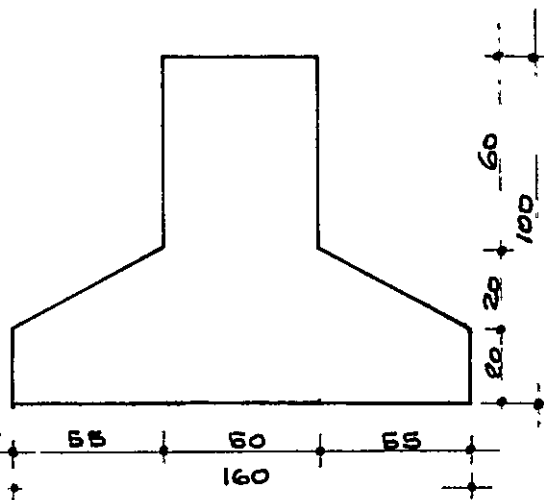
pilastrini	-	5.799.000
p.p. travi		<u>201.000</u>
		6.000.000 Kg

- Tensioni sul terreno -

$$\sigma_t = \frac{6.000.000}{4.074.200} = 1,47 \text{ Kg/cm}^2$$

Trave 1-2-3-4-5-6-7; 8-9-10-11-12-13-14-15-16; 17-18-19-20-21-22-23-24;

- Caratteristiche geometriche -
vedi disegno



- Carico sulla trave -

$$\frac{5.799.000}{4.074.200} > 160 \times 100 = 22700 \text{ Kg/ml}$$

- Armatura a flessione

$$M_{\text{inc}} = \frac{1}{12} q l^2 = \frac{1}{12} 22700 \times 3,35^2 = 21200 \text{ Kgm} \quad B = 50 \quad H = 100''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$\sigma_c = 44 \text{ Kg/cm}^2$$

$$A_f = 17,6 \text{ cm}^2$$

$$M_{\text{camp}} = 21200 \text{ Kgm}$$

$$b = 160'' \quad H = 100''$$

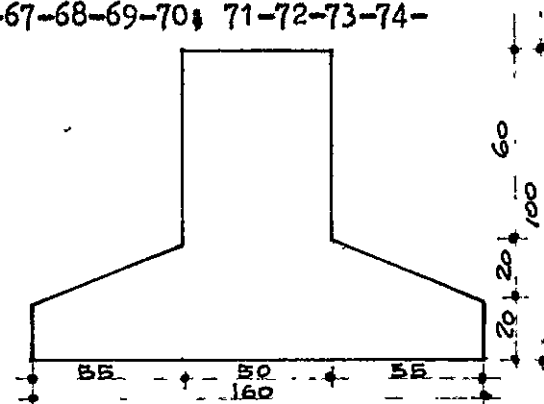
$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$\sigma_c = 22 \text{ Kg/cm}^2$$

$$A_f = 16,4 \text{ cm}^2$$

Travi 57-58-59-60-61-62; 63-64-65-66-67-68-69-70; 71-72-73-74-75-76-77-78;

- Caratteristiche geometriche -
vedi disegno



- Armatura a flessione

$$M_{inc} = \frac{1}{12} 25500 \times \overline{5,25}^2 = 58700 \text{ Kgm} \quad b = 50'' \quad H = 100''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$\sigma_c = 80 \text{ Kg/cm}^2$$

$$A_f = 49,8 \text{ cm}^2$$

$$8 \varnothing 30 \text{ (56,55 cm}^2\text{)}$$

- Verifica a doppia armatura:

$$A_f = A'_f = 56,55 \text{ cm}^2$$

$$A_f^x = 113,10 \text{ cm}^2$$

$$h^x = \frac{96+4}{2} = 50 \text{ cm}$$

$$h = 96''$$

$$h' = 4''$$

$$b = 50''$$

$$x = 30,51 \text{ cm}$$

$$\sigma_c = 53 \text{ Kg/cm}^2$$

- Armatura trasversale

$$M = \frac{1}{2} 25500 \times \overline{0,65}^2 = 5400 \text{ Kgm}$$

$$b = 100'' \quad H = 40''$$

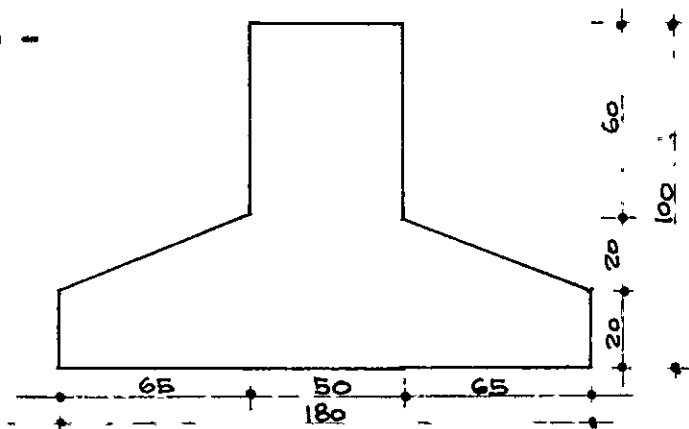
$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$\sigma_c = 37 \text{ Kg/cm}^2$$

$$A_f = 10,7 \text{ cm}^2/\text{ml}$$

Travi 25-26-27-28-29-30-31-32; 33-34-35-36-37-38-39-40-41-42;
43-44-45-46-47-48-49-50;

- Caratteristiche geometriche -
vedi disegno



- Carico sulla trave -

$$1,42 \times 100 \times 1,80 = 25500 \text{ Kg/ml}$$

- Armatura a flessione

$$M_{inc} = \frac{1}{12} 25500 \times 3,35^2 = 23800 \text{ Kgm} \quad b = 50'' \quad H = 100''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 46 \text{ Kg/cm}^2 \quad A_f = 19,5 \text{ cm}^2$$

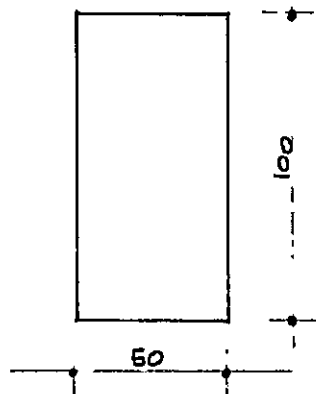
$$M_{camp} = 23800 \text{ Kgm} \quad b = 180'' \quad H = 100''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 22 \text{ Kg/cm}^2 \quad A_f = 18,5 \text{ cm}^2$$

Travi 1-25-57; (3-4)-28; (4-5)-29; 51-59; 52-60; 7-32-62;
8-33-63; (11-12)-37; (12-13)-38; 53-66; 54-67; 16-42-70;
17-43-71; 20-46-55-74; 21-47-56-75; 24-50-78;

- Caratteristiche geometriche -

vedi disegno



- Carico sulla trave

$$1,42 \times 0,50 \times 100 = 7100 \text{ Kg/ml}$$

- Armatura a flessione

$$M_{camp} = M_{inc} = \frac{1}{12} 7100 \times 5,30^2 = 16600 \text{ Kgm} \quad b = 50'' \quad H = 100''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 37 \text{ Kg/cm}^2 \quad A_f = 13,4 \text{ cm}^2$$

SEZIONE ED ARMATURA PILASTRI PIANO FONDAZIONI E PIANO TERRA

N°	P	A ^{te}	A ^f	Armatura	sezione	A _{ci}	σ _c
	tn	cmq	cmq		cm × cm	cmq	Kg/cmq
1-7-17-24	49	1000	8,0	8 ø 14	40 × 40	1723	29
2-6-9-10-14-15-18-23	71,5	1500	12	8 ø 14	40 × 40	1723	41
3-4-5-11-12-13-19-20-21-22	84,5	1750	14	10 ø 14	40 × 50	2153	40
8-16	58,5	1250	10	8 ø 14	40 × 40	1723	34
25-32-33-42-43-50	75	1550	12,4	8 ø 14	40 × 40	1723	43
26-31	81	1670	13,4	10 ø 14	40 × 50	2153	38
27-30	71,5	1500	12	8 ø 14	40 × 40	1723	41
28-29-37-38	55	1150	9,2	12 ø 14	60 × 60 × 25	2559	22
34-41-44-49	78	1600	12,8	8 ø 14	40 × 40	1723	45
35-40	75	1550	12,4	8 ø 14	40 × 40	1723	44
36-39	65	1350	10,8	8 ø 14	40 × 40	1723	38
45-48	84,5	1750	14	10 ø 14	40 × 50	2153	40
46-47	71,5	1500	12	12 ø 14	60 × 60 × 25	2559	28
51-52-53-54-55-56	42	870	7	6 ø 14	25 × 40	1092	39
57-62-63-70-71-78	65	1350	10,8	8 ø 14	40 × 40	1723	38
58 - 61	114	2350	18,8	12 ø 14	40 × 60	2585	44

59 - 60	101	2100	16,8	12 ø 14	40 × 60	2585	39
64 - 69	91	1900	15,2	10 ø 14	40 × 50	2153	43
65 - 68	114	2350	18,8	12 ø 14	40 × 60	2585	44
66 - 67	97,5	2000	16	10 ø 14	40 × 50	2153	45
72 - 77	88	1800	14,4	10 ø 14	40 × 50	2153	41
73 - 76	91	1900	15,2	10 ø 14	40 × 50	2153	42
74 - 75	78	1600	12,8	10 ø 14	40 × 50	2153	36

Staffe ø 8" /15"

SEZIONE ED ARMATURA PILASTRI PIANO PRIMO E SECONDO

N°	sezione	armatura
1-7-17-24	40 × 30	8 ø 12
2-6-9-10 14-15-18 23-	40 × 40	8 ø 14
3-4-5-11 12-13-19 20-21-22	40 × 40	8 ø 14
8-16	40 × 30	8 ø 12
25-32-33 42-43-50	40 × 40	8 ø 14
26-31	40 × 40	8 ø 14
27-30	40 × 40	8 ø 14
28-29-37 38	60 × 60 × 25	12 ø 12
34-41-44 49	40 × 40	8 ø 14
35-40	40 × 40	8 ø 14
36-39	40 × 30	8 ø 12

N°	sezione	armatura
45-48	40 × 40	8 ø 14
46-47	60 × 60 × 25	12 ø 12
51-52-53 54-55-56	25 × 40	6 ø 12
57-62-63 70-71-78	40 × 30	8 ø 12
58-61	40 × 50	10 ø 14
59-60	40 × 50	10 ø 14
64-69	40 × 40	8 ø 14
65-68	40 × 50	10 ø 14
66-67	40 × 50	10 ø 14
72-77	40 × 40	8 ø 14
73-76	40 × 40	8 ø 14
74-75	40 × 40	8 ø 14

Staffe ø 6" / 15"

SEZIONE ED ARMATURA PILASTRI PIANO TERZO E QUARTO

N°	sezione	armatura
1-7-17-24	30 × 30	8 ø 12
2-6-9-10-14-15-18-23	30 × 30	8 ø 12
3-4-5-11-12-19-20-21-22	40 × 30	8 ø 12
8-16	30 × 30	8 ø 12
25-32-33-42-43-50	30 × 30	8 ø 12
26-31	40 × 30	8 ø 12
27-30	30 × 30	8 ø 12
28-29-37-38	60 × 60 × 25	12 ø 12
34-41-44-49	40 × 30	8 ø 12
35-40	40 × 30	8 ø 12
36-39	30 × 30	8 ø 12

N°	sezione	armatura
45-48	40 × 30	8 ø 12
46-47	60 × 60 × 25	12 ø 12
51-52-53-54-55-56	25 × 40	6 ø 12
57-62-63-70-71-78	30 × 30	8 ø 12
58-61	40 × 40	8 ø 12
59-60	40 × 40	8 ø 12
64-69	40 × 30	8 ø 12
65-68	40 × 40	8 ø 12
66-67	40 × 40	8 ø 12
72-77	40 × 30	8 ø 12
73-76	40 × 30	8 ø 12
74-75	40 × 30	8 ø 12

Staffe ø 6" / 15"

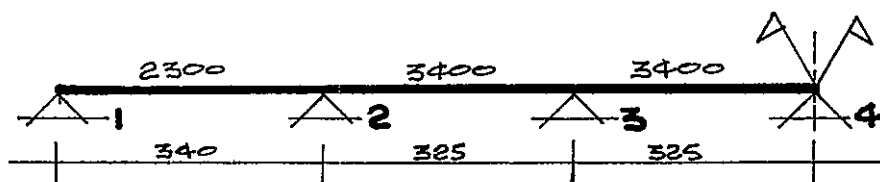
SEZIONE ED ARMATURA PILASTRI PIANO V° E ATTICO

Pilastro 28-29-37-38-46-47	60 × 60 × 25	8 ø 10
Tutti gli altri	30 × 30	8 ø 10

Staffe ø 6" / 15"

- Armatura travi a flessione -

Trave 1-2-3-4-5-6-7

**- Armatura a flessione -**

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25 \text{ cm}$$

$$b = 80 \text{ cm}$$

Sezione 1; 1-2;

$$M = \frac{1}{14} 2300 \times \overline{3,40}^2 = 1900 \text{ Kgm}$$

$$\sigma_o = 42 \text{ Kg/cm}^2$$

$$A_f = 6,5 \text{ cm}^2$$

Sezione 2; 3; 4;

$$M = \frac{1}{12} 3400 \times \overline{3,25}^2 = 3000 \text{ Kgm}$$

$$\sigma_o = 55 \text{ Kg/cm}^2$$

$$A_f = 10,2 \text{ cm}^2$$

Sezione 2-3

$$M = \frac{1}{16} 3400 \times \overline{3,25}^2 = 2250 \text{ Kgm}$$

$$\sigma_o = 46 \text{ Kg/cm}^2$$

$$A_f = 7,5 \text{ cm}^2$$

Sezione 3-4

$$M = \frac{1}{18} 3400 \times \overline{3,25}^2 = 2000 \text{ Kgm}$$

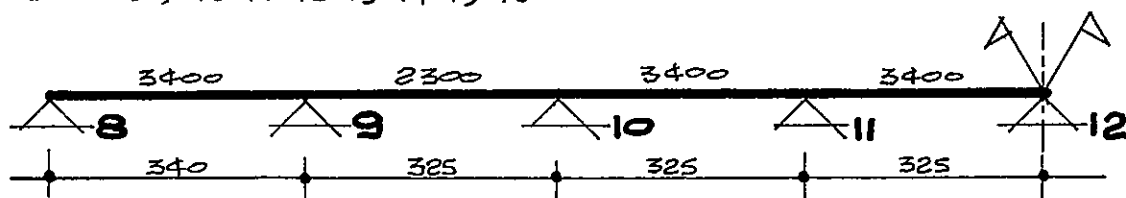
$$\sigma_o = 44 \text{ Kg/cm}^2$$

$$A_f = 6,9 \text{ cm}^2$$

Taglio massimo $T = 5500 \text{ Kg}$

$$\tau_{\max} = \frac{5500}{23 \times 0,9 \times 80} = 3,35 \text{ Kg/cm}^2$$

Trave 8-9-10-11-12-13-14-15-16



- Armatura a flessione -

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25 \text{ cm}$$

$$b = 80 \text{ cm}$$

Sezione 8; 8-9;

$$M = \frac{1}{14} 3400 \times \overline{3,40}^2 = 2800 \text{ Kgm}$$

$$\sigma_c = 53 \text{ Kg/cm}^2$$

$$A_f = 9,5 \text{ cm}^2$$

Sezione 9

$$M = \frac{1}{12} 3400 \times \overline{3,40}^2 = 3300 \text{ Kgm}$$

$$\sigma_c = 59 \text{ Kg/cm}^2$$

$$A_f = 11,4 \text{ cm}^2$$

Sezione 9-10

$$M = \frac{1}{16} 2300 \times \overline{3,25}^2 = 1500 \text{ Kgm}$$

$$\sigma_c = 37 \text{ Kg/cm}^2$$

$$A_f = 5,1 \text{ cm}^2$$

Sezione 10; 11; 12;

$$M = \frac{1}{12} 3400 \times \overline{3,25}^2 = 3000 \text{ Kgm}$$

$$\sigma_c = 55 \text{ Kg/cm}^2$$

$$A_f = 10,2 \text{ cm}^2$$

Sezione 10-11; 11-12;

$$M = \frac{1}{18} 3400 \times \overline{3,25}^2 = 2000 \text{ Kgm}$$

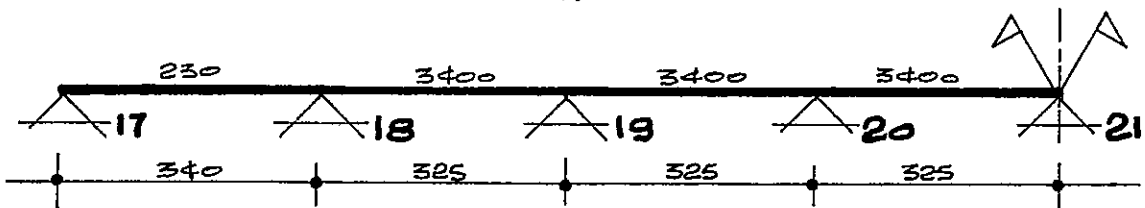
$$\sigma_c = 44 \text{ Kg/cm}^2$$

$$A_f = 6,9 \text{ cm}^2$$

Taglio massimo $T = 5800 \text{ Kg}$

$$\tau_{\max} = \frac{5800}{23 \times 0,9 \times 80} = 3,5 \text{ Kg/cm}^2$$

Trave 17-18-19 -20-21-22-23-24;



- Armatura a flessione -

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25 \text{ cm}$$

$$b = 80 \text{ cm}$$

Sezione 17; 17-18;

$$M = \frac{1}{14} 2300 \times \overline{3,40}^2 = 1900 \text{ Kgm}$$

$$\sigma_c = 42 \text{ Kg/cm}^2$$

$$A_f = 6,5 \text{ cm}^2$$

Sezione 18; 19; 20; 21;

$$M = \frac{1}{12} 3400 \times \overline{3,25}^2 = 3000 \text{ Kgm}$$

$$\sigma_c = 55 \text{ Kg/cm}^2$$

$$A_f = 10,2 \text{ cm}^2$$

Sezione 18-19

$$M = \frac{1}{16} 3400 \times \overline{3,25}^2 = 2250 \text{ Kgm}$$

$$\sigma_c = 46 \text{ Kg/cm}^2$$

$$A_f = 7,5 \text{ cm}^2$$

Sezione 19-20; 20-21;

$$M = \frac{1}{18} 3400 \times \overline{3,25}^2 = 2000 \text{ Kgm}$$

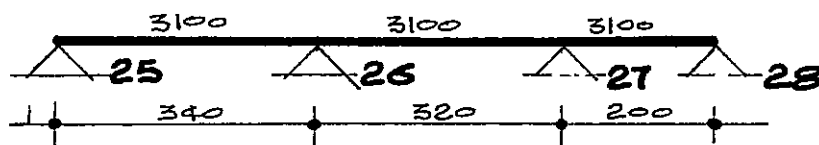
$$\sigma_c = 44 \text{ Kg/cm}^2$$

$$A_f = 6,9 \text{ cm}^2$$

Taglio massimo $T = 5500 \text{ Kg}$

$$\tau_{\max} = \frac{5500}{23 \times 0,9 \times 80} = 3,35 \text{ Kg/cm}^2$$

Trave 25-26-27-28; 29-30-31-32;



- Armatura a flessione -

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25 \text{ cm}$$

$$b = 80 \text{ cm}$$

Sezione 25-26; 25

$$M = \frac{1}{14} 3100 \times \overline{3,40}^2 = 2600 \text{ Kgm}$$

$$\sigma_c = 51 \text{ Kg/cm}^2$$

$$A_f = 8,9 \text{ cm}^2$$

Sezione 26

$$M = \frac{1}{12} 3100 \times \overline{3,40}^2 = 3000 \text{ Kgm}$$

$$\sigma_c = 55 \text{ Kg/cm}^2$$

$$A_f = 10,3 \text{ cm}^2$$

Sezione 26-27

$$M = \frac{1}{16} 3100 \times \overline{3,10}^2 = 2000 \text{ Kgm}$$

$$\sigma_c = 44 \text{ Kg/cm}^2$$

$$A_f = 6,9 \text{ cm}^2$$

Sezione 27

$$M = \frac{1}{12} 3100 \times \overline{3,20}^2 = 2600 \text{ Kgm}$$

$$\sigma_c = 51 \text{ Kg/cm}^2$$

$$A_f = 8,9 \text{ cm}^2$$

Sezione 27-28; 28

$$M = \frac{1}{14} 3100 \times \overline{2,00}^2 = 900 \text{ Kgm}$$

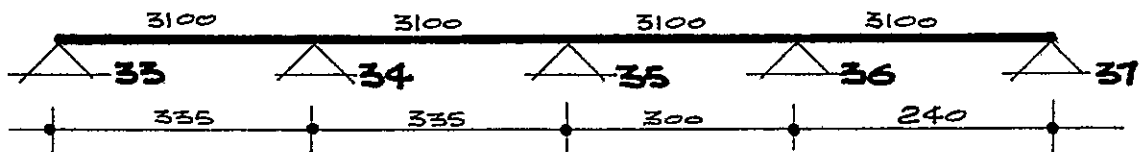
$$\sigma_c = 28 \text{ Kg/cm}^2$$

$$A_f = 3,1 \text{ cm}^2$$

Taglio massimo $T = 5300 \text{ Kg}$

$$\tau_{\max} = \frac{5300}{23 \times 0,9 \times 80} = 3,2 \text{ kg/cm}^2$$

Trave 33-34-35-36-37; 38-39-40-41-42;



- Armatura a flessione -

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25 \text{ cm}$$

$$b = 80 \text{ cm}$$

Sezione 33; 33-34;

$$M = \frac{1}{14} 3100 \times 3,35^2 = 2500 \text{ Kgm}$$

$$\sigma_c = 49 \text{ Kg/cm}^2$$

$$A_f = 8,4 \text{ cm}^2$$

Sezione 34; 35

$$M = \frac{1}{12} 3100 \times 3,35^2 = 2900 \text{ Kgm}$$

$$\sigma_c = 54 \text{ Kg/cm}^2$$

$$A_f = 9,9 \text{ cm}^2$$

Sezione 34-35

$$M = \frac{1}{16} 3100 \times 3,35^2 = 2200 \text{ Kgm}$$

$$\sigma_c = 46 \text{ Kg/cm}^2$$

$$A_f = 7,5 \text{ cm}^2$$

Sezione 35-36

$$M = \frac{1}{16} 3100 \times 3,00^2 = 1700 \text{ Kgm}$$

$$\sigma_c = 40 \text{ Kg/cm}^2$$

$$A_f = 5,8 \text{ cm}^2$$

Sezione 36

$$M = \frac{1}{12} 3100 \times 3,00^2 = 2300 \text{ Kgm}$$

$$\sigma_c = 47 \text{ Kg/cm}^2$$

$$A_f = 7,8 \text{ cm}^2$$

Sezione 36-37; 37

$$M = \frac{1}{14} 3100 \times 2,40^2 = 1300 \text{ Kgm}$$

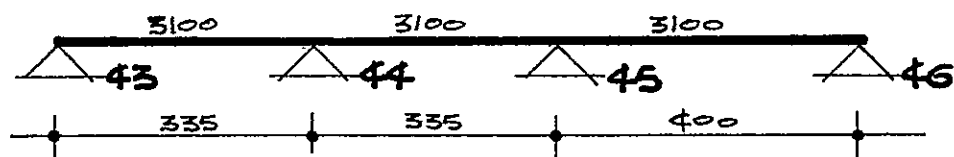
$$\sigma_c = 34 \text{ Kg/cm}^2$$

$$A_f = 4,3 \text{ cm}^2$$

Taglio massimo $T = 5200 \text{ Kg}$

$$\tau_{\max} = \frac{5200}{23 \times 0,9 \times 80} = 3,15 \text{ Kg/cm}^2$$

Trave 43-44-45-46; 47-48-49-50;



- Armatura a flessione -

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25 \text{ cm}$$

$$b = 80 \text{ cm}$$

Sezione 43; 43-44;

$$M = \frac{1}{14} 3100 \times \overline{3,35}^2 = 2500 \text{ Kgm}$$

$$\sigma_c = 50 \text{ Kg/cm}^2$$

$$A_f = 8,6 \text{ cm}^2$$

Sezione 44

$$M = \frac{1}{12} 3100 \times \overline{3,35}^2 = 2900 \text{ Kgm}$$

$$\sigma_c = 54 \text{ Kg/cm}^2$$

$$A_f = 10 \text{ cm}^2$$

Sezione 44-45

$$M = \frac{1}{16} 3100 \times \overline{3,35}^2 = 2200 \text{ Kgm}$$

$$\sigma_c = 46 \text{ Kg/cm}^2$$

$$A_f = 7,4 \text{ cm}^2$$

Sezione 45

$$M = \frac{1}{12} 3100 \times \overline{4,00}^2 = 4100 \text{ Kgm}$$

$$\sigma_c = 67 \text{ Kg/cm}^2$$

$$A_f = 14,3 \text{ cm}^2$$

Sezione 45-46; 46

$$M = \frac{1}{14} 3100 \times \overline{4,00}^2 = 3600 \text{ Kgm}$$

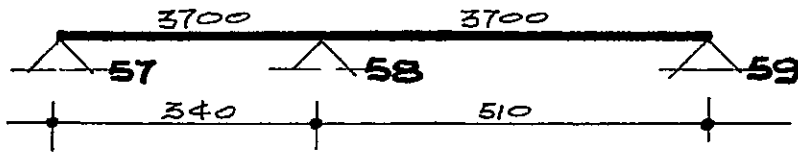
$$\sigma_c = 62 \text{ Kg/cm}^2$$

$$A_f = 12,5 \text{ cm}^2$$

Taglio massimo $T = 6200 \text{ Kg}$

$$\tau_{\max} = \frac{6200}{23 \times 0,9 \times 80} = 3,8 \text{ Kg/cm}^2$$

Trave 57-58-59; 60-61-62;



- Armatura a flessione -

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25 \text{ cm}$$

$$b = 120 \text{ cm}$$

Sezione 57; 57-58;

$$M = \frac{1}{14} 3700 \times \overline{3,40}^2 = 3050 \text{ Kgm}$$

$$\sigma_c = 44 \text{ Kg/cm}^2$$

$$A_f = 10,4 \text{ cm}^2$$

Sezione 58

$$M = \frac{1}{12} 3700 \times \overline{5,10}^2 = 8000 \text{ Kgm}$$

$$\sigma_c = 79 \text{ Kg/cm}^2$$

$$A_f = 28,0 \text{ cm}^2$$

Sezione 58-59; 59

$$M = \frac{1}{14} 3700 \times \overline{5,10}^2 = 6900 \text{ Kgm}$$

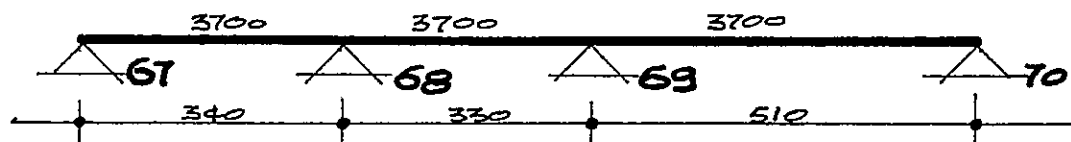
$$\sigma_c = 72 \text{ Kg/cm}^2$$

$$A_f = 24,0 \text{ cm}^2$$

Taglio massimo $T = 9500 \text{ Kg}$

$$\tau_{\max} = \frac{9500}{23 \times 0,9 \times 120} = 3,8 \text{ Kg/cm}^2$$

Trave 63-64-65-66;67-68-69-70



- Armatura a flessione -

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25 \text{ cm}$$

$$b = 120 \text{ cm}$$

Sezione 67; 67-68;

$$M = \frac{1}{14} 3700 \times \overline{3,40}^2 = 3050 \text{ Kgm}$$

$$\sigma_c = 44 \text{ Kg/cm}^2$$

$$A_f = 10,4 \text{ cm}^2$$

Sezione 68

$$M = \frac{1}{12} 3700 \times \overline{3,40}^2 = 3600 \text{ Kgm}$$

$$\sigma_c = 48 \text{ Kg/cm}^2$$

$$A_f = 12,1 \text{ cm}^2$$

Sezione 68-69

$$M = \frac{1}{16} 3700 \times \overline{3,30}^2 = 2600 \text{ Kgm}$$

$$\sigma_c = 39 \text{ Kg/cm}^2$$

$$A_f = 8,4 \text{ cm}^2$$

Sezione 69

$$M = \frac{1}{12} 3700 \times \overline{5,10}^2 = 8000 \text{ Kgm}$$

$$\sigma_c = 79 \text{ Kg/cm}^2$$

$$A_f = 28,00 \text{ cm}^2$$

Sezione 69; 69-70;

$$M = \frac{1}{14} 3700 \times \overline{5,10}^2 = 6900 \text{ Kgm}$$

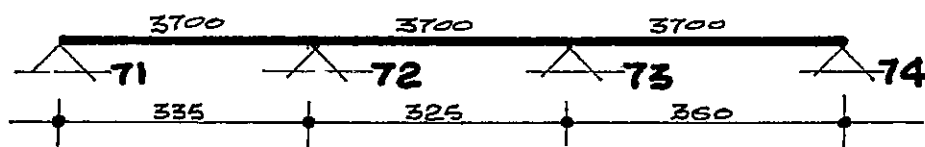
$$\sigma_c = 72 \text{ Kg/cm}^2$$

$$A_f = 24 \text{ cm}^2$$

Taglio massimo $T = 9500 \text{ Kg}$

$$\tau_{\max} = \frac{9500}{23 \times 0,9 \times 120} = 3,8 \text{ Kg/cm}^2$$

Trave 71-72-73-74



- Armatura a flessione -

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25 \text{ cm}$$

$$b = 120 \text{ cm}$$

Sezione 71; 71-72;

$$M = \frac{1}{14} 3700 \times \overline{3,35}^2 = 3000 \text{ Kgm}$$

$$\sigma_c = 43 \text{ Kg/cm}^2$$

$$A_f = 10 \text{ cm}^2$$

Sezione 72

$$M = \frac{1}{12} 3700 \times \overline{3,35}^2 = 3500 \text{ Kgm}$$

$$\sigma_c = 47 \text{ Kg/cm}^2$$

$$A_f = 11,8 \text{ cm}^2$$

Sezione 72-73

$$M = \frac{1}{16} 3700 \times \overline{3,25}^2 = 2500 \text{ Kgm}$$

$$\sigma_c = 39 \text{ Kg/cm}^2$$

$$A_f = 8,4 \text{ cm}^2$$

Sezione 73

$$M = \frac{1}{12} 3700 \times \overline{3,60}^2 = 4000 \text{ Kgm}$$

$$\sigma_c = 52 \text{ Kg/cm}^2$$

$$A_f = 13,8 \text{ cm}^2$$

Sezione 73-74

$$M = \frac{1}{14} 3700 \times \overline{3,60}^2 = 3500 \text{ Kgm}$$

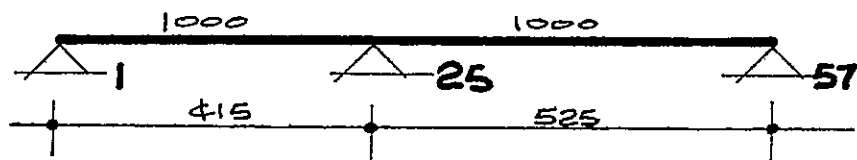
$$\sigma_c = 47 \text{ Kg/cm}^2$$

$$A_f = 11,8 \text{ cm}^2$$

Taglio massimo $T = 6700 \text{ Kg}$

$$\tau_{\max} = \frac{6700}{23 \times 0,9 \times 120} = 2,7 \text{ Kg/cm}^2$$

Trave 1-25-57; 7-32-62; 8-33-63; 16-42-70;
17-43-71; 24-50-78;



- Armatura a flessione -

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25 \text{ cm}$$

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

Sezione 1; 1-25;

$$M = \frac{1}{14} 1000 \times 4,15^2 = 1250 \text{ Kgm}$$

$$\sigma_c = 44 \text{ Kg/cm}^2$$

$$A_f = 2,3 \text{ cm}^2$$

Sezione 25

$$M = \frac{1}{12} 1000 \times 5,25^2 = 2300 \text{ Kgm}$$

$$\sigma_c = 63 \text{ Kg/cm}^2$$

$$A_f = 8,0 \text{ cm}^2$$

Sezione 25-57; 57

$$M = \frac{1}{12} 1000 \times 5,25^2 = 2000 \text{ Kgm}$$

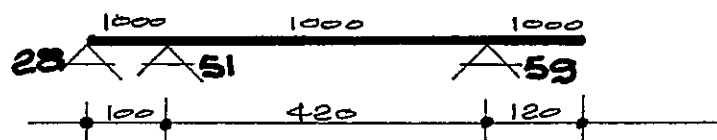
$$\sigma_c = 57 \text{ Kg/cm}^2$$

$$A_f = 6,9 \text{ cm}^2$$

Taglio massimo $T = 2600 \text{ Kg}$

$$\tau_{\max} = \frac{2600}{23 \times 0,9 \times 50} = 2,5 \text{ Kg/cm}^2$$

Travi 28-51-59; 29-52-60; 37-53-66; 38-54-67;
46-55-74; 47-56-25;



- Armatura a flessione -

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

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

$$b = 25 \text{ cm}$$

Sezione 51; 59,

$$M = \frac{1}{12} 1000 \times 4,20^2 = 1500 \text{ Kgm}$$

$$\sigma_c = 31 \text{ Kg/cm}^2$$

$$A_f = 2,4 \text{ cm}^2$$

Sezione 51-66

$$M = \frac{1}{14} 1000 \times 4,20^2 = 1300 \text{ Kgm}$$

$$\sigma_c = 28 \text{ Kg/cm}^2$$

$$A_f = 2,0 \text{ cm}^2$$

Taglio massimo $T = 2100 \text{ Kg}$

$$\tau_{\max} = \frac{2100}{25 \times 0,9 \times 48} = 2,0 \text{ Kg/cm}^2$$

- Vano scala -**- Analisi di carico**

gradino

$$\begin{array}{rcl}
 \text{p.p.} & \frac{20+3,5}{2} \times 1,00 \times 1,00 \times 2500 & = 300 \\
 \text{sovracc. perm.} & & = 200 \\
 \text{sovracc. accid.} & & = 400 \\
 & & \hline
 & & 900 \text{ Kg/mq}
 \end{array}$$

trave a ginocchio

$$\begin{array}{rcl}
 \text{rampa} & 900 \times 1,15 & = 1040 \\
 \text{tompagno} & & = 700 \\
 \text{p.p.} & 0,25 \times 0,60 \times 1,00 \times 2500 & = 360 \\
 & & \hline
 & & 2100 \text{ Kg/ml}
 \end{array}$$

- Calcolo travi a ginocchio

a flessione

$$M_{\text{inc}} = \frac{1}{12} 2100 \times 4,20^2 = 3100 \text{ Kgm} \quad \text{per } H = 60'' \quad b = 25''$$

$$\sigma_F = 1400 \text{ Kg/cm}^2 \quad \sigma_o = 38 \text{ Kg/cm}^2 \quad A_F = 4,15 \text{ cm}^2$$

$$M_{\text{camp}} = \frac{1}{14} 2100 \times 4,20^2 = 2650 \text{ Kgm} \quad \text{per } H = 60'' \quad b = 25''$$

$$\sigma_F = 1400 \text{ Kg/cm}^2 \quad \sigma_o = 35 \text{ Kg/cm}^2 \quad A_F = 3,60 \text{ cm}^2$$

a torsione

$$m_i = \frac{1}{2} 900 \times 1,15^2 = 595 \text{ Kg} \quad t_i = 900 \times 1,15 = 1040 \text{ Kg}$$

$$m_t = 595 + 1040 \times 0,125 = 725 \text{ Kgm} \quad M_t = 725 \times \frac{3,80}{2} = 1380 \text{ Kgm}$$

$$\psi = 3 + \frac{2,6}{0,45 + \frac{60}{25}} = 3,91$$

$$\tau_t = \frac{391 \times 1380}{60 \times 25^2} = 14 \text{ Kg/cm}^2$$

- Armatura a torsione

$F = 1100 \text{ cmq}$

$U = 150 \text{ cmq}$

$$\varepsilon_{f1} = \frac{138000 \times 150}{2 \times 1400 \times 1100} = 6,70 \text{ cmq}$$

$$\varepsilon_{fs} = \frac{138000}{2 \times 1400 \times 1100} = 0,045 \text{ cmq/cm}$$

- Armatura gradino

$$M = \frac{1}{2} 900 \times 1,15^2 \times 0,30 = 180 \text{ Kgm} \quad H = \frac{20+3}{2} = 11,5'' \quad b = 30''$$

$\sigma_f = 1400 \text{ Kg/cmq}$

$\sigma_c = 50 \text{ Kg/cmq}$

$A_f = 1,47 \text{ cmq}$

- Armatura pianerottoli

$H = 20''$

$q = 800 \text{ Kg/cmq}$

$l = 2,45 \text{ m}$

vincolo incastro

$$M_{inc} = \frac{1}{12} 800 \times 2,45^2 = 420 \text{ Kgm} \quad \text{per } H = 20'' \quad b = 100''$$

$\sigma_f = 1400 \text{ Kg/cmq}$

$\sigma_c = 21 \text{ Kg/cmq}$

$A_f = 1,8 \text{ cmq}$

$$M_{camp} = \frac{1}{14} 800 \times 2,45^2 = 360 \text{ Kgm} \quad \text{per } H = 20'' \quad b = 100''$$

$\sigma_f = 1400 \text{ Kg/cmq}$

$\sigma_c = 19 \text{ Kg/cmq}$

$A_f = 1,5 \text{ cmq}$

- SOLAIO -Solaio $H = 20'' + 5''$ $i = 50''$ **- Analisi di carico**

p.p.		= 160
soletta	$0,05 \times 1,00 \times 1,00 \times 2500$	= 125
sovracc. perm.		= 115
sovracc. accid.		= 200
		600 Kg/mq

$$q = 600 \times 0,50 = 300 \text{ Kg/ml}$$

$$l = 3,15 \text{ m}$$

$$\text{luce di calcolo } l = 3,15 \times 1,05 = 3,30 \text{ m}$$

$$\text{per } \sigma_f = 1400 \text{ Kg/cm}^2 \quad H = 25'' \quad b = 50''$$

$$M_{inc} = \frac{1}{12} 300 \times 3,30^2 = 270 \text{ Kgm} \quad \sigma_c = 19 \text{ Kg/cm}^2 \quad A_f = 0,95 \text{ cm}^2$$

$$M_{camp} = \frac{1}{14} 300 \times 3,30^2 = 235 \text{ Kgm} \quad \sigma_c = 17 \text{ Kg/cm}^2 \quad A_f = 0,75 \text{ cm}^2$$

$$l = 4,25 \text{ m}$$

$$\text{luce di calcolo } l = 4,25 \times 1,05 = 4,50 \text{ m}$$

$$\text{per } \sigma_f = 1400 \text{ Kg/cm}^2 \quad H = 25'' \quad b = 50''$$

$$M_{inc} = \frac{1}{12} 300 \times 4,50^2 = 510 \text{ Kgm} \quad \sigma_c = 26 \text{ Kg/cm}^2 \quad A_f = 1,7 \text{ cm}^2$$

$$M_{camp} = \frac{1}{14} 300 \times 4,50^2 = 435 \text{ Kgm} \quad \sigma_c = 24 \text{ Kg/cm}^2 \quad A_f = 1,45 \text{ cm}^2$$

Zone ribassate $H = 12'' + 4''$ **- Analisi di carico**

p.p.	= 100
soletta	= 100
sovracc. perm.	= 150
sovracc. accid.	= 200
	550 Kg/mq

$$q = 550 \times 0,50 = 275 \text{ Kg/ml}$$

per $H = 16''$ $b = 50''$ luce di calcolo $l = 4,50 \text{ m}$

$$M_{\text{inc}} = \frac{1}{12} 275 \times 4,50^2 = 460 \text{ Kgm} \quad \sigma_c = 43 \text{ Kg/cm}^2 \quad A_f = 2,55 \text{ cm}^2$$

$$M_{\text{camp}} = \frac{1}{14} 275 \times 4,50^2 = 400 \text{ Kgm} \quad \sigma_c = 40 \text{ Kg/cm}^2 \quad A_f = 2,20 \text{ cm}^2$$

- SPORTI -

- Analisi di carico $H = 16'' + 4''$

p.p.	= 140
soletta	= 100
sovracc. occid.	= 110
sovracc. perm.	= 400
	750 Kg/mq

$$H = 20'' + 5''$$

p.p.	= 160
soletta	= 125
sovracc. perm.	= 115
sovracc. occid.	= 400
	800 Kg/mq

$$q = 750 \times 0,50 = 375 \text{ Kg/ml} \quad l = 1,40 \text{ m}$$

$$M = \frac{1}{2} 375 \times 1,40^2 = 365 \text{ Kgm} \quad \text{per } H = 20'' \quad b = 50''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 29 \text{ Kg/cm}^2 \quad A_f = 1,6 \text{ cm}^2$$

$$q = 800 \times 0,50 = 400 \text{ Kg/ml} \quad l = 1,20 \text{ m}$$

$$M = \frac{1}{2} 400 \times 1,20^2 = 290 \text{ Kgm} \quad \text{per } H = 25'' \quad b = 50''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 19 \text{ Kg/cm}^2 \quad A_f = 0,95 \text{ cm}^2$$

- Copertura torrino vano scala -

Solari

$$q = 170 \times 2,7 = 459 \text{ Kg/m}^2$$

$$l = 260 \times 1,7 = 442 \text{ cm}$$

$$M_{inc} = \frac{1}{14} 459 \times 2,80 = 115 \text{ Kgcm} \quad h = 20'' \quad b = 50''$$

$$\sigma_c = 18 \text{ Kg/cm}^2 \quad A_f = 0,65 \text{ cm}^2$$

$$M_{camp} = \frac{1}{10} 459 \times 2,80 = 128 \text{ Kgcm} \quad h = 20'' \quad b = 50''$$

$$\sigma_c = 21 \text{ Kg/cm}^2 \quad A_f = 0,9 \text{ cm}^2$$

Trave 28-37-46

Analisi di carico

$$q = 550 \times \frac{1,67}{2} = 461 \text{ Kg/m}^2$$

$$p.p. = \frac{300}{1000 \text{ Kg/m}^2}$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad h = 50'' \quad b = 25''$$

$$M_{22} = \frac{1}{22-37} = \frac{1}{14} 1000 \times 1,71^2 = 200 \quad \sigma_c = 15 \text{ Kg/cm}^2 \quad A_f = 1 \text{ cm}^2$$

$$M_{35} = \frac{1}{12} 1000 \times 3,80^2 = 1200 \quad \sigma_c = 27 \text{ Kg/cm}^2 \quad A_f = 1,9 \text{ cm}^2$$

$$M_{35-42} = M_{42} = \frac{1}{14} 1000 \times 3,80^2 = 1000 \quad \sigma_c = 25 \text{ Kg/cm}^2 \quad A_f = 1,6 \text{ cm}^2$$