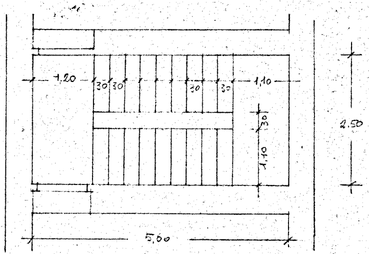
ISTITUTO NAZIONALE
CASE POPOLARI
BRINDISI

IMPRESA: DOTT. ING. S. DE LUCA

CALCOLI C.A. SCALE "A" E "B"

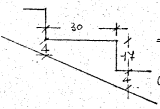
CALCOLATORE:

BARI - LÌ 29/2/1956



SCALA "A"

- Altezza piano generico: lordi m. 3,37
- Altezza piano ultimo: lordi m. 3,45



GRADINI

Analisi dei carichi su ogni ml. di gradino

Carico rif.: $\frac{0,21+0,04}{2} \times 0,30 \times 2500 = \sim 95$ Kg

gradi: $0,03 \times 0,35 \times 2400 = 25$ "

sott $0,02 \times 0,17 \times 2400 = 8$ "

malta $= 12$ "

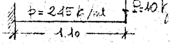
140

carico accid. K/mq $350 \times 0,30 = 105$

$p = 245$ K/ml

Carico conc.: 25 K/ml di ringh. × 0,40; P = ~ 10 K

MOMENTI



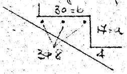
$M_1 = 245 \times \frac{1.10^2}{2} = \sim 150$ Kgm

$M_2 = 10 \times 1.10 = \sim 10$ "

$M = 160$ Kgm

VERIFICA SEZIONE

Rettangolo equivalente del gradino:



$h = \frac{17}{2} + 4 = 12,5$ cm ; $d = 10$; $b = 30$

Assumo per armature $3\phi 8 = 1,51$ cmq

$$y = \frac{10 \times 1,51}{30}\left\{-1+\sqrt{1+\frac{2\times 30\times 10}{10\times 1,51}}\right\} = 2,70 \text{ cm}$$

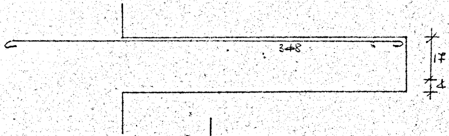
$$\sigma_c = \frac{2\,M}{b\,y\,(d-\frac{y}{3})} = \frac{2\times 16000}{30\times 2,7\times 9} = \frac{32.000}{730} = \sim 44 \text{ kg/cmq}$$

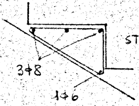
$$\sigma_f = \frac{M}{A_f(d-\frac{y}{3})} = \frac{16000}{1,51\times 9} = 1180 \text{ kg/cmq}$$

TAGLIO

$$T = (245\times 1.10) + 10 = 280 \text{ kg}$$

$$\tau_{x2} = \frac{T}{b\,(d-\frac{y}{3})} = \frac{280}{30\times 9} = \frac{280}{270} \cong 1,10 \text{ kg/cmq}$$





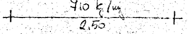
STAFFE φ 6/OGNI 30 cm

PIANEROTTOLI

(solaio h = 16+4 = 20 cm - solette e nervature)

Analisi carichi:

pp. soletta 0,04 × 2500 =	100	kg/mq
pignatte	60	"
travette	100	"
	260	
pavimento	60	
intonaco e malta posa	40	
p	360	kg/mq
sovracc. acc.	350	"
	710	kg/mq



luce teorica m. 2,70

$$M = \frac{1}{10}\,p\,l^2 = \frac{1}{10}\,710 \cdot \overline{2,70}^2 = 518 \text{ kgm}$$

$n = 10$; $\sigma_c = 45$ kg/cmq ; $\sigma_f = 1400$ kg/cmq

$\alpha = 0,446$

$$d = 0,446\sqrt{\frac{51800}{100}} = \sim 10 \text{ cm} \quad h = 20;\ d = 18 \quad t = 0,919\times 18 = 16,5$$

$$A_f = \frac{51800}{1400\times 16,5} = 2,25 \text{ cmq/ml di soletta}$$

$$\boxed{h = 20 \text{ cm}}$$

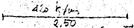
ARMATURA
- PIAN. AL PIANO: (larghezza m. 1.20) 1φ8+1φ6 (0,78)/travetto
- " INTERMEDIO: (" m. 1.10) 2φ6 (0,57)/travetto

SOLAIO COPERTURA VANO SCALA "A"

Costituito da soletta e nervature distanti 30 cm ; h=12+4=16 cm

Analisi carichi:

pp.	200	k/mq
asfalto	20	"
pavim.	60	"
intonaco	40	
	320	k/mq
– Sovracc. acc.	100	"
p =	420	k/mq



luce teorica m. 2,70

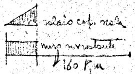
$M = \frac{1}{8} p l^2 = \frac{1}{8} 420 \cdot \overline{2,70}^2 = 385$ Kgm

$d = 0,446 \sqrt{\frac{38500}{100}} = \sim 9$ cm   h = 16 cm ; d = 14 cm ; t = 0,919 × 14 = 12,9 cm

$\sigma_f = \frac{38500}{1400 \times 12,9} = 2,15$ cmq / ml di soletta

0,65 cmq / ogni travetto 1ø8+1ø6 (0,78 cmq)

VERIFICA RIBALTAMENTO GRADINI ULTIMO PIANO



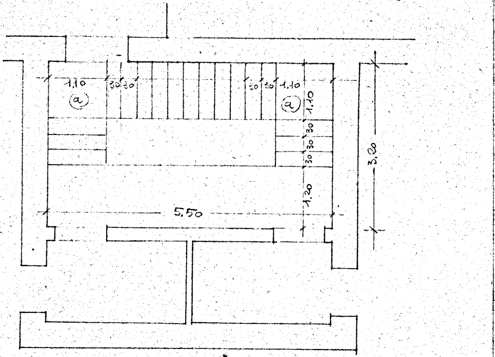
– Momento di incastro max per ogni gradino 160 Kgm

Momento stabilizzante:

1) Solaio cop. vano scala: $M_1 = \frac{320 \times 2,50}{2} 0,30 \cdot \frac{1}{3} 0,43 =$ 18 Kgm

2) Muro sovrastante ultima rampa: $M_2 = 0,43 \times 3,00 \times 0,30 \times 1800 \times \frac{1}{2} 0,43 =$ 155 "

Totale M = 173 Kgm



SCALA "B"

– Altezza piano generico: lordi m. 3.27

– Altezza piano ultimo: lordi m. 3.45

GRADINI A SBALZO: come scala "A"

PIANEROTTOLI QUADRATI ⓐ

A sbalzo dal muro trasversale – soletta piena h = 14 cm

– Analisi carichi:

pp.	0,14 × 2500	=	350	k/mq
pavim. marmo	0,03 × 2400	=	72	"
malta pavim. e intonaco			75	"
			497	k/mq
Sovracc. acc.			350	"
		p = ~	850	k/mq

$M = 850 \frac{\overline{1,10}^2}{2} = 515$ Kgm

$d = 0,446 \sqrt{\frac{51500}{100}} = \sim 11$ cm

$h = 14$ cm; $d = 12$ cm; $t = 0,919 \times 12 = 11$ cm

$A_f = \frac{51500}{1400 \times 11} = 3,35$ cmq/ml di soletta

cioè 5φ10 (3,93) su tutta la soletta m. 1,10

$\boxed{h = 14 \text{ cm}}$

TAGLIO:

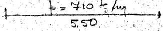
$T = 850 \times 1,10 = 935$ Kg

$\tau_{mx} = \frac{935}{100 \times 11} = \frac{935}{1100} = 0,85$ Kg/cmq

DIANEROTTOLO RETTANGOLARE

— Solaio con soletta e nervature $h = 20$ cm
interasse nervature 30 cm.

Analisi carichi (v. pianerottoli scala "A") $p = 710$ Kg/mq



luce teorica m. 5,75

$M = \frac{1}{9} 710 \cdot \overline{5,75}^2 = 2600$ Kgm

$d = 0,446 \sqrt{\frac{260000}{100}} = \sim 22$ cm

arrotondando $h = 20$ cm; $d = 18$ cm; $t = 0,919 \times 18 = 16,5$ cm

$A_f = \frac{260000}{1400 \times 165} = 11.3$ cmq/ml di soletta

ARMATURA: 1φ16 + 1φ14 (3,56 cmq) in ogni travetto

VERIFICA: $f = \frac{n A_f}{b} = \frac{10 \times 11.3}{100} = 1,13$

$y = 1,13 \left(-1 + \sqrt{1 + \frac{2 \times 18}{1,13}}\right) = 1,13 \times 5,74 = \sim 6,5$

$\sigma_c = \frac{2 \times 260000}{100 \times 6,5 \cdot 16,5} \quad \frac{520000}{10.720} \leq 48$ Kg/cmq

$\sigma_f = \frac{260000}{11,3 \times 16,5} = \sim 1400$ Kg/cmq

TAGLIO: $T = 710 \times \frac{5,50}{2} = 1950$ Kg

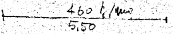
$\tau_{mx} = \frac{1950}{100 \times 16,5} = \sim 1.2$ Kg/cmq

(All'incastro; zona piena)

SOLAIO COPERTURA VANO SCALA "B"

soletta e nervature $h = 20$ cm

Analisi carichi: p.p. 360 Kg/mq
Sovracc. acc. 100 "
Totale $p = 460$ Kg/mq



luce teorica m. 5,75

$M = \frac{1}{8} 460 \cdot \overline{5,75}^2 = 1900$ Kgm

$d = 0,446 \sqrt{\frac{190000}{100}} = \sim 19$ cm $\quad t = 0,919 \times 18 = 16,5$ cm

$A_f = \frac{190000}{1400 \times 16.5} = 8,25$ cmq/ml di soletta

ARMATURA: ogni travetto cmq 2,50 = 1φ12 + 1φ14 (2,67 cmq)