



Foglio N.

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ISTITUTO AUTONOMO CASE POPOLARI - BRINDISI

GESTIONE CASE PER LAVORATORI - ROMA

Impresa: Consorzio Ravennate delle Cooperative di  
Produzione e Lavoro - Ravenna

Edificio C - D

Calcoli Statici C - D (II)

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Calcoli statici delle strutture in elevazione.

Per le analisi dei carichi si rimanda al I° fascicolo.

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Travata I-2-3-4

$$N_{I-2} = 2820 \times 3,30^2 \times 0,0875 = 2700 \text{ Kgm.}$$

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

$$\sigma_c / \sigma_f = 42 / 1600$$

$$b = 30 \text{ cm}$$

$$A_f = 3,85 \text{ cm}^2 : 5 \phi 10$$

$$\tau = 4650 / 30 \times 43 = 3,6 \text{ Kg/cm}^2 < 6$$

$$M_{2-3} = 2820 \times 3,75^2 \times 0,070 = 2800 \text{ Kgm.}$$

$$\sigma_c / \sigma_f = 43 / 1600$$

$$A_f = 4,05 \text{ cm}^2 : 3 \phi 10 \text{ d} + 2 \phi 12 \text{ p.}$$

$$\tau = 5300 / 30 \times 43 = 4,10 \text{ Kg/cm}^2$$

$$M_{3-4} = 3360 \times 3,80^2 \times 0,0875 = 4250 \text{ kgm.}$$

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

$$r = 0,290$$

$$\sigma_c / \sigma_f = 65 / 1400$$

$$b = 100 \text{ cm} + 10$$

$$A_f = 18 \text{ cm}^2 = 9 \phi 16, A'_f = 0,50 A_f = 9 \text{ cm}^2 = 5 \phi 16$$

$$T = 6400 \text{ Kg}, S = 36.400 \text{ Kg.}$$

$$12 \phi 6 : 0,57 \times 12 \times 1600 = 11000 \text{ Kg.}$$

$$8 \text{ " } : 8 \times 920$$

$$4 \phi 16 \text{ p} : 8,04 \times 1600 \times 1,41 = 18000 \text{ Kg.}$$



Stessa trave alla quota del I° solaio:

$$H = 50 \text{ cm} \quad \sigma_c / \sigma_f = 55 / 1600$$

$$b = 30 \text{ cm} \quad A_f = 6,20 \text{ cm}^2$$

$$\tau = 5 \text{ Kg/cm}^2$$

### Travata 5-6-7-8

#### Campata 5-6

$$- M_5 = 4792 \text{ Kgm}$$

$$- M_6 = 5943 \text{ Kgm}$$

$$T_{6-5} = 6900 + (5943 - 4792) / 5,25 = 6900 + 220 = 7120 \text{ Kg.}$$

$$M_{5-6} = 7120^2 / 2 \times 2800 - 5943 \times 0,70 = 9000 - 4200 = 4800 \text{ Kgm}$$

$$H = 20 \text{ cm} \quad \sigma_c / \sigma_f = 65 / 1300$$

$$b = 110 \text{ cm} + 10 \quad A_f = 22 \text{ cm}^2 = 11\phi 16 \quad 22$$

$$r = 0,285 \quad A'_f = 11 \text{ cm}^2 = 5\phi 16 + 2\phi 8$$

$$T = 6800 \text{ Kg} \quad S = 50.000 \text{ Kg}$$

$$15\phi 6 \text{ 2br} : 920 \times 15 = 13800 - \text{Kg.}$$

$$10'' \quad " : 920 \times 10 = 9200 - "$$

$$6\phi 16 \text{ p} : 12,06 \times 2260 = 27400 - \text{Kg.}$$

#### Campata 6 - 7

$$M_{\min} = 3140 - (3411 + 1790) / 2 = 3140 - 2600 = + 540 \text{ Kgm.}$$

$$M_{\max} = 3140 - 2600 \times 0,70 = 3140 - 1800 = + 1340 \text{ Kgm.}$$

Si arma con 3  $\phi$  16 d + 2  $\phi$  16 p.

Campata 7-8

$$M_{mx} = 3680 - (2480 + 1676) \times 0,70 / 2 = 3600 - 1450 = 2150 \text{ Kgm}$$

$$\sigma_c / \sigma_f = 50 / 1600$$

$$A_f = 8,20 \text{ cm}^2 \quad 4 \phi 16 + 4 \phi 8$$

$$A'_f = 4,10 \text{ cm}^2 \quad 2 \phi 12 + 4 \phi 8$$

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Travata 9-10-11-12Mensola 9

$$- M = 1900 \times 2^2 / 2 = 3800 \text{ Kgm}$$

$$H = 20 \text{ cm} \quad \sigma_c / \sigma_f = 55 / 1400$$

$$b = 110 \text{ cm} \quad A'_f = A_f = 17 \text{ cm}^2 = 7 \phi 18$$

$$- M_{-10} = 4085 \times 81 / 64,5 = 5100 \text{ Kgm.}$$

$$+ M_{9-10} = 4085 \times 4,05^2 \times 0,125 - (3800 + 5100) \times 0,70 / 2 = 8700 - 3100 = 5600 \text{ Kgm.}$$

$$H = 20 \text{ cm} \quad \sigma_c / \sigma_f = 63 / 1400$$

$$b = 110 \text{ cm} + 10 \quad A'_f = A_f = 23,80 \text{ cm}^2 = 10 \phi 18$$

$$r = 0,265$$

$$T = 8200 \text{ Kg} \quad S = 50000 \text{ Kg}$$

$$13 \phi 6 \text{ 4br} = 2 \times 920 \times 13 = 24000 \text{ Kg}$$

$$6 \phi 16 \text{ cav} = 6 \times 2.01 \times 2260 = 27400 \text{ Kg}$$

Al I° solaio:

$$H = 50 \text{ cm} \quad b = 30 \text{ cm} + 10 \quad \sigma_c / \sigma_f = 55 / 1600$$

$$A_f = 8,20 \text{ cm}^2 \quad 3 \phi 14 \text{ d } 2 \phi 16 \text{ p.}$$



$$- M_n = 4085 \times 39/53 = 3000 \text{ Kgm}$$

$$M_{\text{IO-min II}} = 3100 - (5100 + 3000)/2 = 3100 - 4050 = 950 \text{ Kgm.}$$

$$M_{\text{IO-II mx}} = 3100 - 4050 \times 0,50 = + 1075 \text{ Kgm}$$

$$A'_f = A_f = 2 \phi 18 + 4 \phi 8 = 7. \text{ ag cm}^2$$

$$M_{\text{II-12}} = 2272 \times 2,90^2 \times 0,0875 = 1700 \text{ Kgm.}$$

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

$$\sigma_c / \sigma_f = 60/1600$$

$$b = 70 \text{ cm}$$

$$A_f = 6,50 \text{ cm}^2 : 4\phi 14 + 3 \phi 8 = 7.66 \text{ cm}^2$$

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$$M_{\text{13-14}} = 2735 \times 4,20^2 \times 0,105 = 5100 \text{ Kgm}$$

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

$$\sigma_c / \sigma_f = 53/1600$$

$$b = 30 \text{ cm}$$

$$A_f = 7.60 \text{ cm}^2 \quad 5\phi 14 = 7.70 \text{ cm}^2$$

$$T = 5750 \text{ Kg}$$

$$T = 4,45 \text{ Kg/cm}^2$$

### Travata 17-18-19-20

#### Campata 17-18

$$M = 2950 \times 2,85^2 \times 0,075 = 1800 \text{ Kgm}$$

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

$$\sigma_c / \sigma_f = 57/1600$$

$$b = 70 \text{ cm}$$

$$A_f = 6,80 \text{ cm}^2 \quad 4 \phi 10 + 2 \phi 16 = 7,116 \text{ cm}^2$$

$$A'_f = 3,40 \text{ cm}^2 : 4 \phi 10$$

$$M_{\text{18-19}} = 2950 \times 2,15^2 \times 0,070 = 970 \text{ Kgm}$$

$$\sigma_c / \sigma_f = 44 / 1600$$

$$A_f = 3,70 \text{ cm}^2 \quad 6 \phi 10$$

Travata 2I-22-23-24 ecc.

$$M_{2I-22} = 2760 \times 4,20^2 \times 0,0875 = 4300 \text{ Kgm}$$

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

$$\sigma_c / \sigma_f = 65 / 1400$$

$$b = 100 + 10 \text{ cm}$$

$$A_f = 18 \text{ cm}^2 = 9 \phi 16$$

$$T = 5650 \text{ Kg}$$

$$A'_f = 9 \text{ cm}^2 = 5 \phi 16$$

$$4 \phi 16 p = 8,04 \times 2260 = 18000 - \text{Kg}$$

$$S = 36000 \text{ Kg} \quad 12 \phi 6 \text{ br} = 12 \times 920 = 11000 \text{ Kg}$$

$$8 \text{ " " } = 6 \times 920 = 7360 \text{ Kg}$$

$$M_{22-23} = 3300 \times 4,05^2 \times 0,070 = 3800 \text{ Kgm}$$

$$\sigma_c / \sigma_f = 62 / 1400$$

$$A_f = 16,80 \text{ cm}^2 : 4 \phi 16 d + 4 \phi 16 p + 2 \phi 8$$

$$A'_f = 8,40 \text{ cm}^2 : 4 \phi 16 + 2 \phi 8$$

$$M_{23-24} = 3300 \times 2,40^2 \times 0,070 = 1340 \text{ Kgm}$$

$$\sigma_c / \sigma_f = 43 / 1600$$

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

$$M_{24-25} = 3490 \times 3,95^2 \times 0,075 = 4100 \text{ Kgm}$$

come 2I-22

$$A_f = 18 \text{ cm}^2 = 9 \phi 16$$

$$A'_f = 9 \text{ cm}^2 = 5 \phi 16$$

$$M_{25-26} = 2350 \times 3,90^2 \times 0,0875 = 3150 \text{ Kgm}$$

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

$$\sigma_c / \sigma_f = 46 / 1600$$

$$b = 30 \text{ cm}$$

$$A_f = 4,50 \text{ cm}^2$$

$$3 \phi 12 d + 2 \phi 14 p$$

Travata 27-28-29

$$M_{27-28} = 3125 \times 2,85^2 \times 0,0875 = 2220 \text{ Kgm}$$

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

$$\sigma_c / \sigma_f = 38 / 1600$$

$$b = 30 \text{ cm}$$

$$A_f = 3,20 \text{ cm}^2 : 2 \phi 10 \text{ p} + 2 \phi 12 \text{ d}$$

$$M_{28-29} = 3125 \times 2,15^2 \times 0,0875 = 1270 \text{ Kgm}$$

$$\sigma_c / \sigma_f = 28 / 1600$$

$$A_f = 1,80 \text{ cm}^2 \quad 2 \phi 10 \text{ d} + 1 \phi 10 \text{ p}$$

Travata 30-31 ecc.

$$M_{30-31} = 2980 \times 4,20^2 \times 0,0875 = 4600 \text{ Kgm}$$

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

$$\sigma_c / \sigma_f = 57 / 1600$$

$$b = 30 \text{ cm}$$

$$A_f = 6,60 \text{ cm}^2 : 3 \phi 12 \text{ d} + 1 \phi 14 \text{ p} +$$

$$+ 1 \phi 16 \text{ p}$$

$$\tau = 6300 / 30 \times 43 \quad 4,85 \text{ Kg/cm}^2$$

$$M_{31-32} = 2980 \times 4,05^2 \times 0,070 = 3400 \text{ Kgm}$$

$$\sigma_c / \sigma_f = 5 \text{ cm}^2 \quad 3 \phi 10 \text{ d} + 2 \phi 14 \text{ p.}$$

$$M_{32-33} = 2980 \times 2,40^2 \times 0,070 = 1200 \text{ Kgm}$$

$$\sigma_c / \sigma_f = 27 / 1600$$

$$A_f = 1,70 \text{ cm}^2 \quad 3 \phi 10$$



$$M_{33-34} = 2980 \times 3,95^2 \times 0,095 = 4400 \text{ Kgm}$$

$$\sigma_c / \sigma_f = 56 / 1600$$

$$A_f = 6.400 \text{ cm}^2 \quad 3 \phi \text{ I2 d} + 2 \phi \text{ I4 p}$$

#### Travata I-5-I2

$$M_{I-5} = 1885 \times 3,75^2 \times 0,095 = 2540 \text{ Kgm}$$

$$H = 20 \text{ cm} \quad \sigma_c / \sigma_f = 62 / 1400$$

$$b = 70 \quad A_f = 11,50 \text{ cm}^2 : 4 \phi \text{ I4 d} + 4 \phi \text{ I4 p}$$

$$\text{a quota I° solaio} \quad A'_f = 4 \phi \text{ I4}$$

$$H = 50 \text{ cm} \quad \sigma_c / \sigma_f = 41 / 1600 \quad A_f = 3,70 \text{ cm}^2 = 5 \phi \text{ I0}$$

#### Travata 4-8-20

$$- M_4 = 1885 \times 1^2 / 2 = 1000 \text{ Kgm}$$

$$H = 20 \text{ cm} \quad \sigma_c / \sigma_f = 42 / 1400$$

$$b = 70 \text{ cm} \quad A_f = 4.40 \text{ cm}^2 : 6 \phi \text{ I4} + 2 \phi \text{ I2}$$

$$M_{4-8} = 1885 \times 3,75^2 \times 0,0875 = 2340 \text{ Kgm}$$

$$\sigma_c / \sigma_f = 60 / 1400$$

$$A_f = 10,70 \text{ cm}^2 : (2 \phi \text{ I2} + 2 \phi \text{ I4}) \text{ d} + 4 \phi \text{ I4 p}$$

$$A'_f = 5,35 \text{ cm}^2 \quad 2 \phi \text{ I2} + 2 \phi \text{ I4}$$

$$M_{8-20} = 1885 \times 3,55^2 \times 0,0875 = 2100 \text{ Kgm}$$

$$\sigma_c / \sigma_f = 60 / 1600$$

$$A_f = 8 \text{ cm}^2 : 4 \phi \text{ I2 d} + 4 \phi \text{ I2 p}$$

$$A'_f = 4 \text{ cm}^2 : 4 \phi \text{ I2 d}$$

Travata 9-I4 e I3-2I-30

$$M_{9-I4} = 1885 \times 1,50^2 \times 0,875 = 370 \text{ kgm}$$

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

$$\sigma_c / \sigma_f = 31 / 1400$$

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

$$A_f = 1,60 \text{ cm}^2 : 2 \phi I4 + 2 \phi 8$$

$$M_{I3-2I} = 1885 \times 2,95^2 \times 0,0875 = 1450 \text{ Kgm}$$

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

$$\sigma_c / \sigma_f = 55 / 1600$$

$$b = 70 + 10$$

$$A_f = 5,50 \text{ cm}^2 \quad 4 \phi 10 + 2 \phi I4$$

$$M_{2I-30} = 1885 \times 4,20^2 \times 0,095 = 3200 \text{ Kgm}$$

$$\sigma_c / \sigma_f = 65 / 1400$$

$$A_f = 14 \text{ cm}^2 \quad (2 \phi I4 + 2 \phi I6) + 4 \phi I6$$

$$A'_f = 7 \text{ cm}^2 \quad 2 \phi I4 + 2 \phi I6$$

a quota I° solaio:

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

$$\sigma_c / \sigma_f = 46 / 1600$$

$$A_f = 4,60 \text{ cm}^2 : 3 \phi 10 d + 2 \phi I2 p$$

$$M_{25-34} = 1885 \times 4,20^2 \times 0,105 = 3500 \text{ Kgm}$$

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

$$\sigma_c / \sigma_f = 70 / 1400$$

$$b = 70 \times 10 \text{ cm}$$

$$A_g = 15,50 \text{ cm}^2 : 4 \phi I6d + 4 \phi I6 p$$

$$A'_f = 8 \text{ cm}^2 : 4 \phi I6$$



$$M_{I9-29} = 3885 \times 4,25^2 \times 0,105 = 7350 \text{ Kgm}$$

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

$$\sigma_c / \sigma_f = 61/1400$$

$$b = 30 + 10 \text{ cm}$$

$$A_f \beta 12,40 \text{ cm}^2 : 3 \phi I6 d + 2 \phi I4 p + 2 \phi I6 p$$

$$T = 6,5 \text{ Kg/cm}^2$$

$$S = 20700 \text{ Kg}$$

$$(2 \phi I4 + 2 \phi I6) = 16000 \text{ Kg}$$

$$25/2 \text{ staffe } \phi 6 = 11000 "$$

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$$M_{I5-24} = 1370 \times 2,50^2 \times 0,105 = 870 \text{ Kgm}$$

$$I7-26$$

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

$$\sigma_c / \sigma_f = 58/1400$$

$$b = 30 \text{ cm}$$

$$A_f = 3,85 \text{ cm}^2 : 2 \phi I2d + 1 \phi I6_p$$

$$A'_f = 1,92 \text{ cm}^2 : 2 \phi I2$$

### S C A L A

Rampe (soletta a sbalzo)

$$a = 16,5 \text{ cm}$$

$$p = 30 \text{ cm}$$

$$q = 875 \text{ Kg/m}^2$$

$$d = 28^\circ 50' \quad \cos = 0,876$$

$$q' = 875 \times 0,876 = 770 \text{ Kg/m} \quad A' = 20 \text{ kg}$$

$$M = 770 \times 1,20^2 / 2 + 20 \times 1,20 = 550 + 24 = 574 \text{ Kgm}$$

$$H = 10 \text{ cm}$$

$$\sigma_c / \sigma_f = 53/1400 \text{ Kg/cm}^2$$

$$h = 8,5 \text{ cm}$$

$$A_f = 5,30 \text{ cm}^2/\text{m} : 5 \phi I2/\text{m}$$

$$b = 100 \text{ cm}$$

$$A'_f = 2,66 \text{ cm}^2/\text{m} : 5 \phi 8 / \text{m}$$

$$T = 950 / 770 = 1,24 \text{ Kg/cm}^2$$

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Trave I6-I7

## I) Secondo la rampa

a) Flessione:

$$M = 1860 \times 3.00^2 \times 0,10 = 1700 \text{ Kgm}$$

$$H = 60 \text{ cm} \quad 33/1600$$

$$b = 20 \text{ cm} \quad A_f = 2 \text{ cm}^2 + 1,26 = 3,26 \text{ cm}^2$$

$$2 \phi I6 = 4.02 \text{ cm}^2$$

$$b) \text{ Taglio: } = \tau = 2800/20 \times 53 = 2,70 \text{ Kg/cm}^2$$

c) Torsione:

$$\text{Momento torcente corrente: } M_t = 574 \text{ Kgm/m}$$

$$M_t = 574 \times 1,50 = 860 \text{ Kgm}$$

$$\tau_t = 3,74 \times 86000/60 \times 400 = 13,30 \text{ Kg/cm}^2$$

$$U = (56 + 16) \times 2 = 144 \text{ cm}$$

$$F = 56 \times 16 = 896 \text{ cm}^2$$

$$S_{fe} = 86000 \times 144/2 \times 1440 \times 896 = 5 \text{ cm}^2/8 = 0,63 \text{ cm}^2$$

$$I \phi I0 = 0,79 \text{ cm}^2$$

$$S_{fs} = 86000/2 \times 1400 \times 896 = 0,035 \text{ cm}^2/\text{cm}$$

$$\text{con staffe } \phi 8 : d = 0,500/0,035 = 14,30 \text{ cm}$$

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2) al piano

$$a) \text{ Flessione: } q = 1740 \text{ Kg/m} , Q = 2800 \text{ Kg} \approx 3000 \text{ Kg},$$

$$M_t = 860 + 574 = 1434 \text{ Kgm}$$

$$M = 1740 \times 4.95^2 \times 0,0875 + 3000 \times 3 \times 1,95 \times 0,70 / 4.95 = 3750 + 2500 = 6250 \text{ Kgm.}$$

$$H = 70 \text{ cm} \quad \sigma_c/\sigma_f = 58/1600$$

$$b = 20 \text{ cm} \quad A_f = 6,40 \text{ cm}^2 + 1,20 = 7,60 \text{ cm}^2$$

$$3 \phi I8$$

b) Taglio:

$$\tau_{mx} = (4500 + 1800) / 20 \times 62 = 5,00 \text{ Kg/cm}^2$$

 $\tau =$ c) Torsione:

$$M = 1434 \times 3.00 / 4,95 = 870 \text{ Kgm}$$

$$\tau_t = 87000 \times 3,65 / 70 \times 400 = 11,3 \text{ Kg/cm}^2$$

$$U = (66 + 16) \times 2 = 164 \text{ cm}$$

$$F = 66 \times 16 = 1056 \text{ cm}^2$$

$$S_{fe} = 87000 \times 164 / 2 \times 1400 \times 1056 = 4.80 \text{ cm}^2 / 8 = 0.60 \text{ cm}^2$$

$$I \phi 10 = 0,79 \text{ cm}^2$$

$$S_{fs} = 87000 / 2 \times 1400 \times 1056 = 0,030 \text{ cm}^2 / \text{cm}$$

$$C_{on} \text{ staffe } \phi 8 : d = 0,500 / 0,030 = 16,6 \text{ cm}$$

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