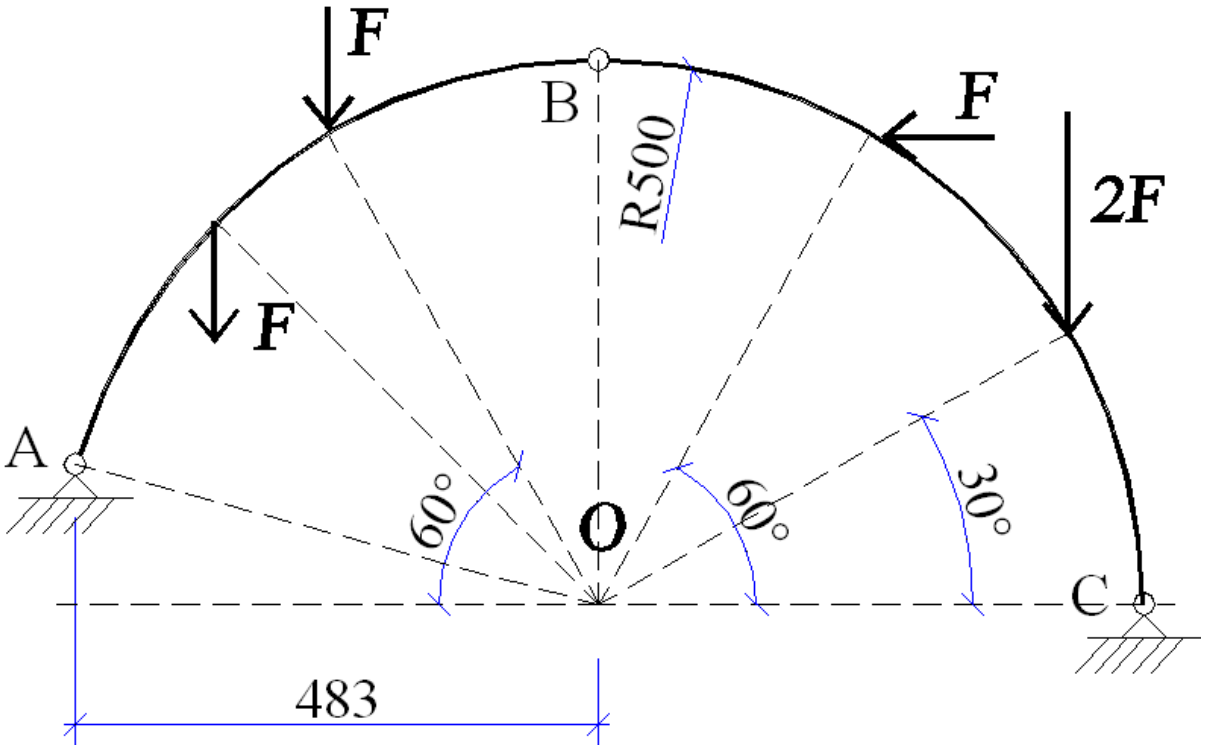
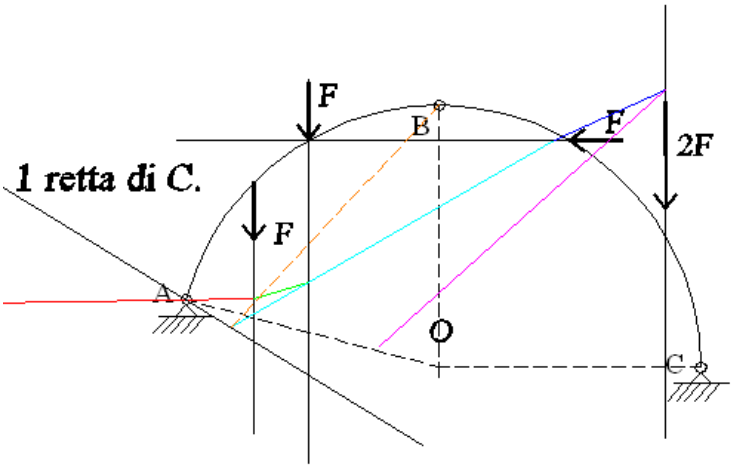
**SCIENZA DELLE COSTRUZIONI II: TEORIA DELLE STRUTTURE TRASPARENTI**

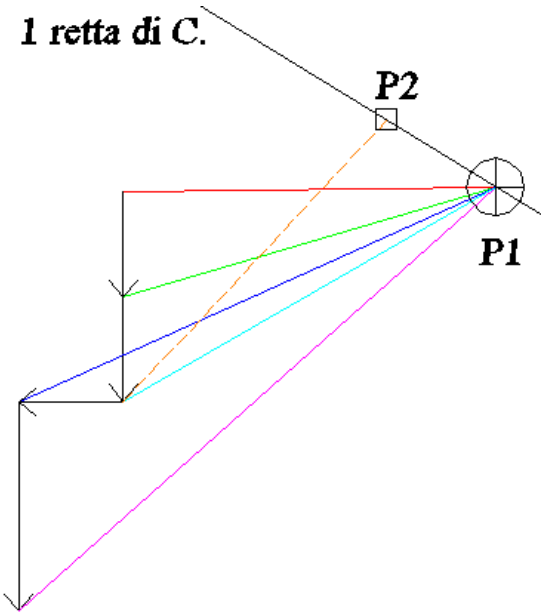
*Prof. Brighenti* - Prova scritta del **31/03/2015**

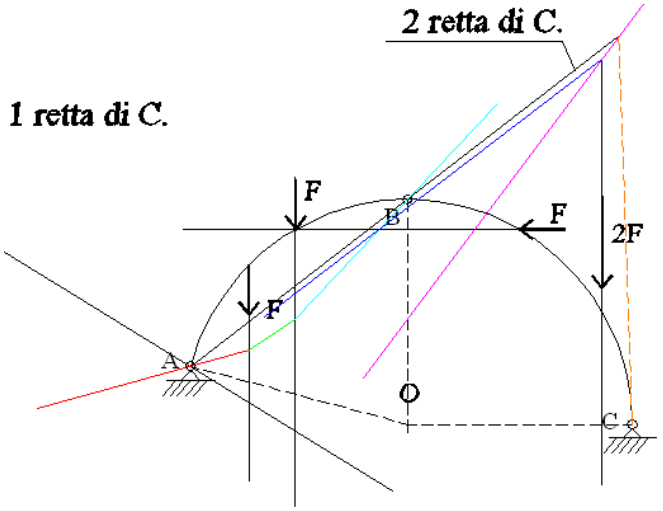
SOLUZIONE

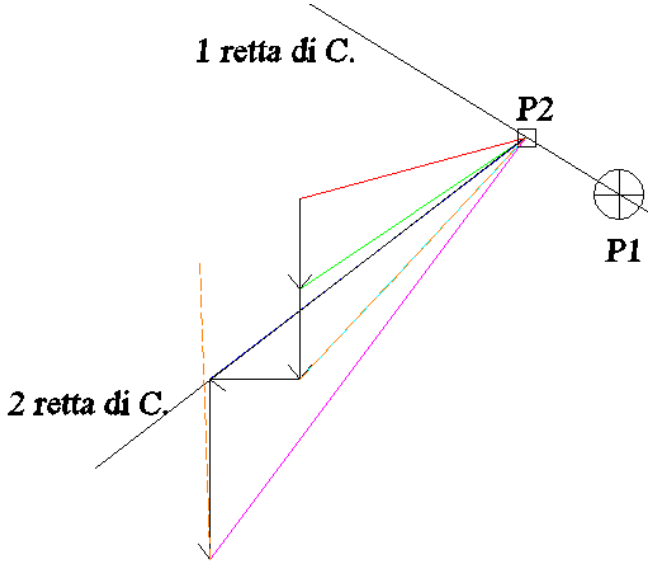
1)

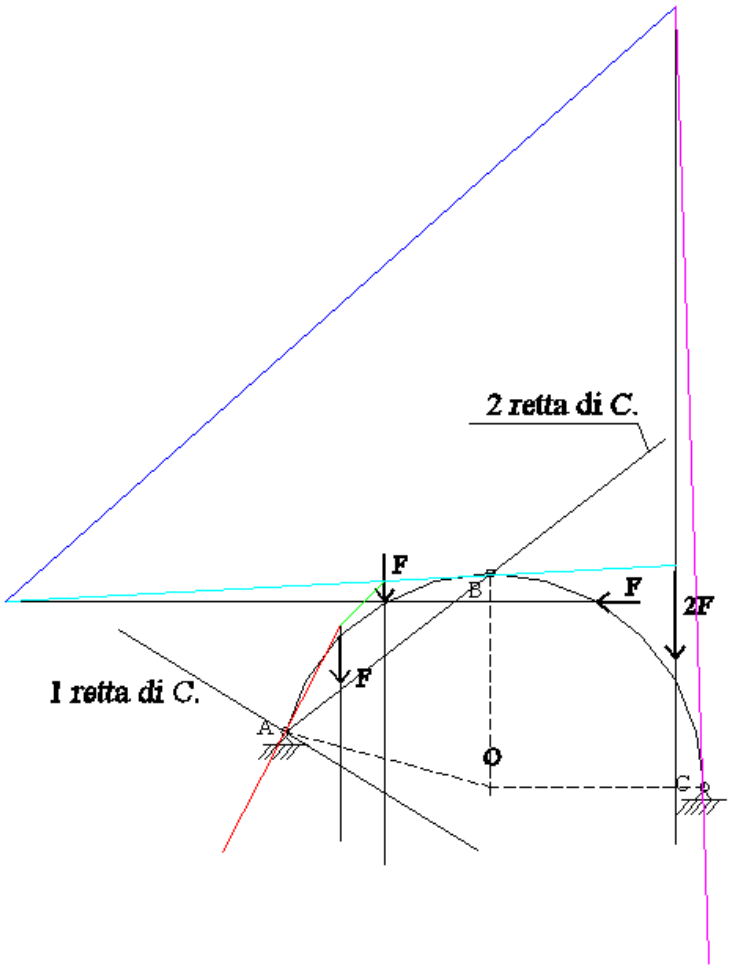


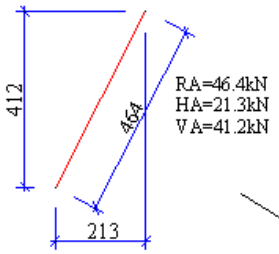



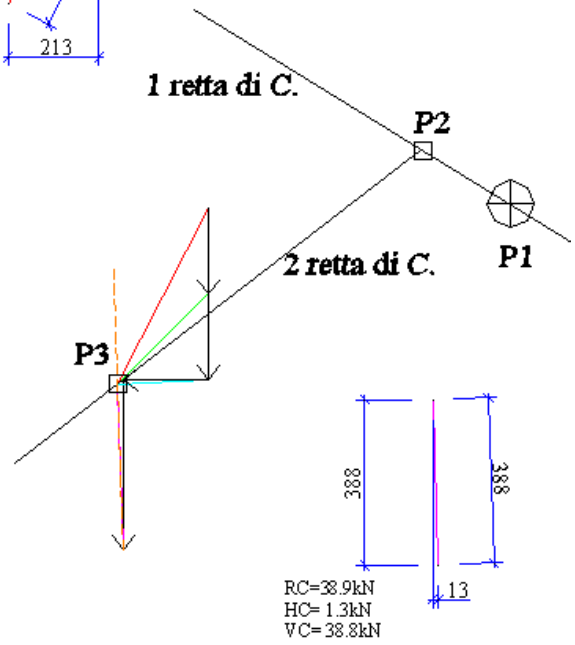




2 retta di C.
1 retta di C.
F
F
F
2F
A
B
C
O


1 retta di C.
P2
P1
2 retta di C.

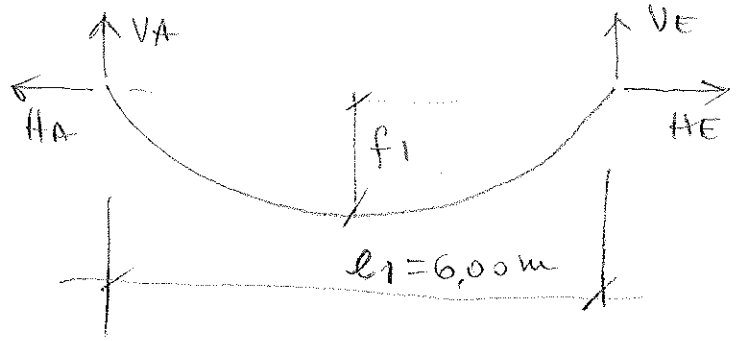

2 retta di C.
1 retta di C.
F
F
F
2F
A
B
C
O


412
464
213
RA=46.4kN
HA=21.3kN
VA=41.2kN


1 retta di C.
P2
P1
2 retta di C.
P3

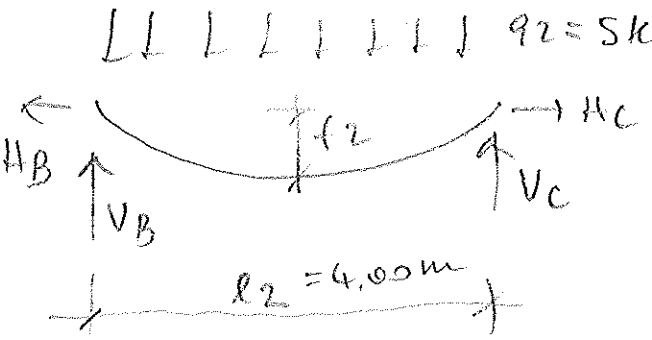

388
388
13
RC=38.9kN
HC= 1.3kN
VC= 38.8kN

2)



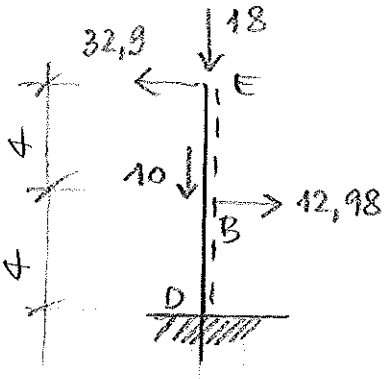

$$f_1 = \frac{\sqrt{l_1}}{4}\sqrt{6(L_1 - l_1)} = 0{,}82\ m$$

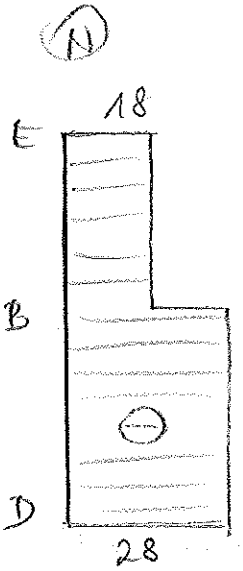
$$H = \frac{q_1 l_1^2}{8 f_1} = \frac{6 \cdot 6^2}{8 \cdot 0{,}82} = 32{,}9\ KN \qquad V_A = V_E = \frac{q_1 l_1}{2} = 18\ KN$$

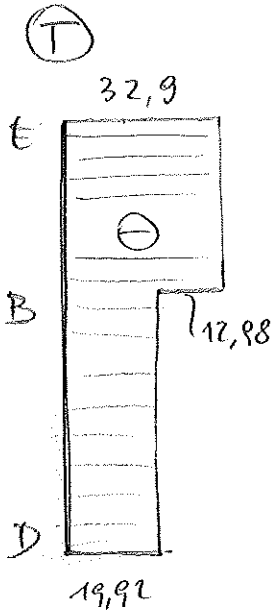


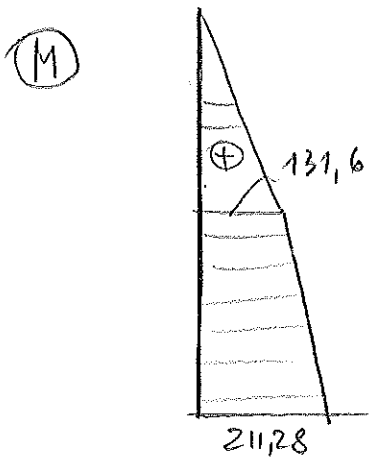

$$f_2 = \frac{\sqrt{l_2}}{4}\sqrt{6(L_2 - l_2)} = 0{,}77\ m$$

$$H = \frac{q_2 l_2^2}{8 f_2} = \frac{5 \cdot 4^2}{8 \cdot 0{,}77} = 12{,}98\ KN \qquad V_B = V_C = \frac{q_2 l_2}{2} = 10\ KN$$

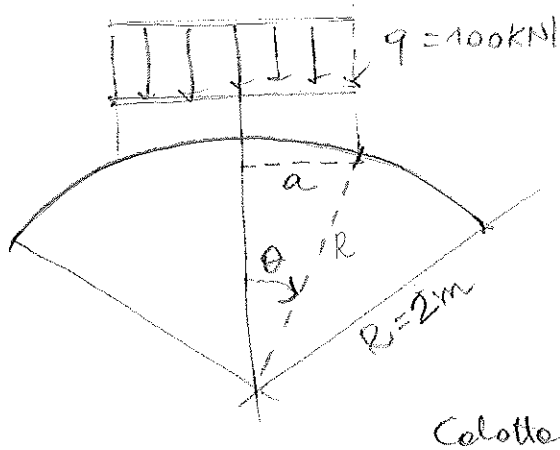


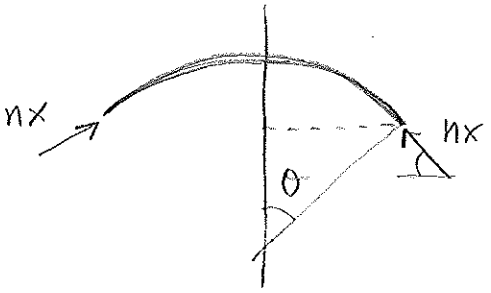
3)




$a = R \sin\theta$

$Q(\theta) = \pi a^2 q = \pi R^2 \sin^2\theta \cdot q$

## Calotta sferica




Equilibrio verticale:

$2\pi R \sin\theta \cdot nx \cdot \sin\theta = Q(\theta)$

$2\pi R \sin^2\theta \, nx = \pi R^2 \sin^2\theta \cdot q$

$nx = \frac{Rq}{2} = \frac{2 \cdot 100}{2} = -100 \text{ KN/m}$

$\sigma_x = \frac{100 \cdot 10^3}{0{,}08} = -1{,}25 \cdot 10^6 \text{ Pa}$

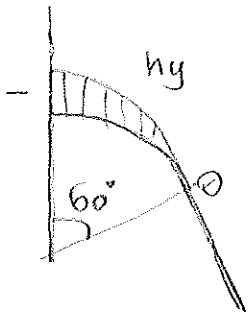
$\frac{nx}{Rx} + \frac{ny}{Ry} = -pt \rightarrow \frac{nx}{R} + \frac{ny}{R} = -pt \qquad pt = q \cdot \cos\theta$

$ny = R \cdot \left(-q\cos\theta - \frac{nx}{R}\right) = -qR\cos\theta - nx = -qR\cos\theta - \frac{qR}{2} = -qR\left(\cos\theta - \frac{1}{2}\right)$

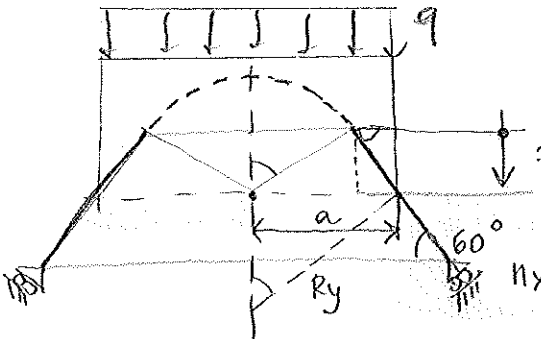
per $\theta = 60°$ $\quad ny = -100 \cdot 2\left(\cos 60° - \frac{1}{2}\right) = 0$

per $\theta = 0°$ $\quad ny = -100 \cdot 2\left(1 - \frac{1}{2}\right) = -100 \text{ KN/m}$

$\sigma_y = \frac{-100 \cdot 10^3}{0{,}08} = -1{,}25 \cdot 10^6 \text{ Pa}$




## Zona conica




$a(z) = R \sin 60° + z / tg\, 60° = 1{,}73 + 0{,}58 \cdot z$

$Q(z) = \pi a^2 q = \pi q \underbrace{(1{,}73 + 0{,}58z)^2}_{a}$ ; $Ry = \frac{a}{\sin 60°}$

$nx \cdot 2\pi a \sin 60° = \pi q (1{,}73 + 0{,}58z)^2$ ; $\frac{nx}{\infty} + \frac{ny}{a/\sin 60°} = -q\cos 60°$

$ny = \frac{q}{a\, tg\, 60°}$

per $z = 0$: $\quad nx = -100 \text{ KN/m}$ ; $a = 1{,}73$ $\quad ny = -100 \text{ KN/m}$

per $z = 2{,}2$: $\quad nx^* = -173 \text{ KN/m}$ ; $a = 3{,}00$ $\quad ny = -173 \text{ KN/m}$

$\sigma^*_{x\,max} = |-2.16| \text{ MPa} < \bar{\sigma}_c = 5 \cdot 10^6$ verificato $\qquad \sigma_{y\,max} = |-2{,}16| \text{ MPa} < \bar{\sigma}_c$ verificato