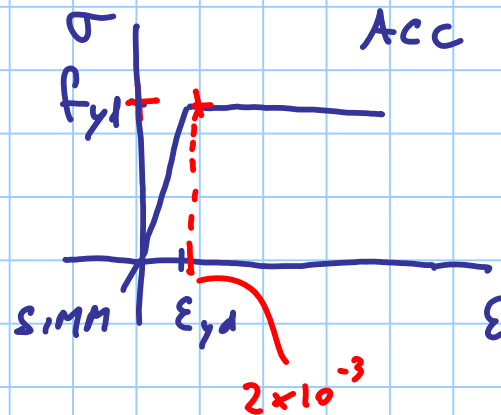
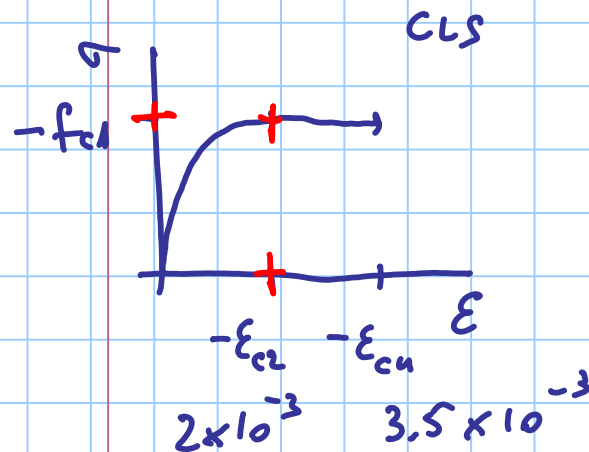
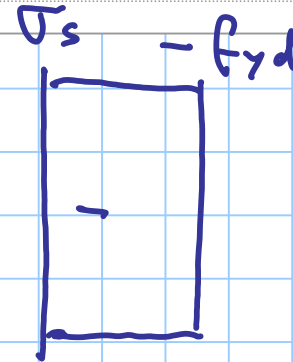
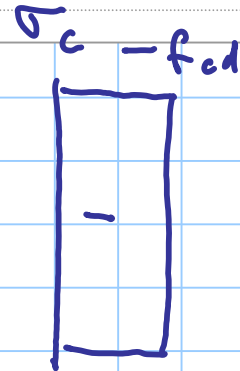
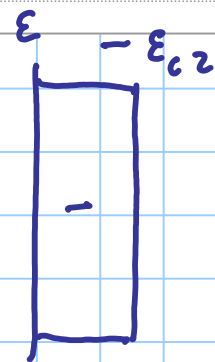
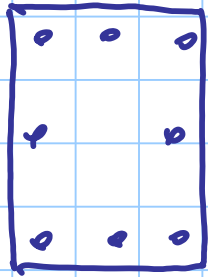


# COMPRESSIONE

S.L.U. (3° m.d.)

Titolo nota

26/03/2015



$$\epsilon_{yd} = \frac{f_{yd}}{E_s}$$

$$= \frac{391,2}{200000} = 1,96 \times 10^{-3}$$

per B450 c

il CLS può arrivare al massimo alla deformazione  $-\epsilon_{cu}$  ( $-3,5 \times 10^{-3}$ )  
 MA per azione uniformemente compressa il limite è  $-\epsilon_{c2}$  ( $-2 \times 10^{-3}$ )

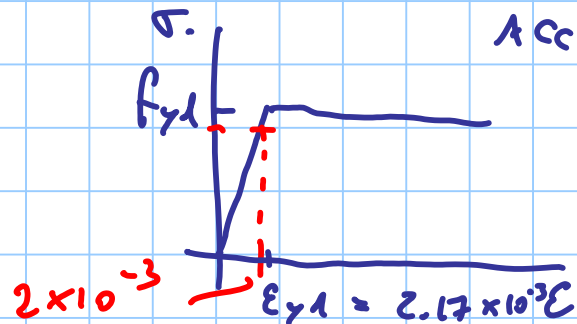
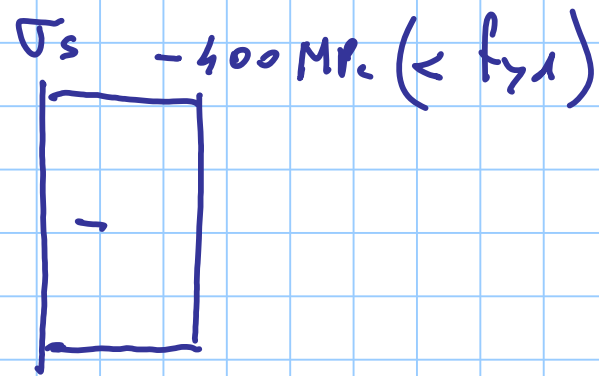
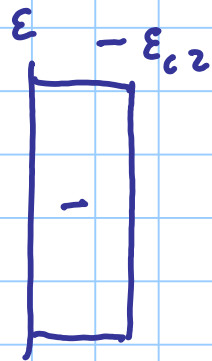
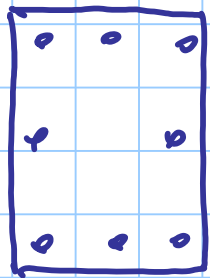
se usiamo un acciaio B500

$$f_{yk} = 500 \text{ MPa}$$

$$f_{yd} = \frac{500}{1,15} = 434.8 \text{ MPa}$$

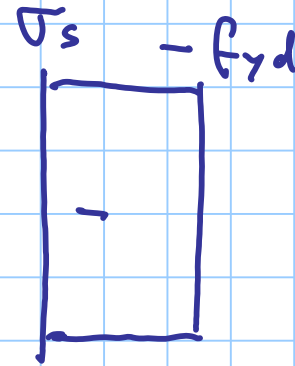
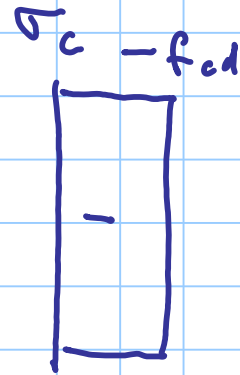
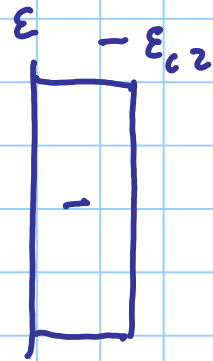
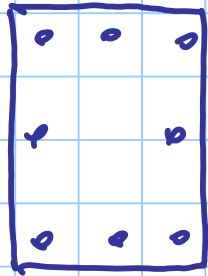
$$\epsilon_{yd} = \frac{434.8}{200000} = 2.17 \times 10^{-3}$$

per quest. acciaio:



per  $\epsilon = -2 \times 10^{-3}$   
siamo nel tratto lineare

$$\sigma_s = E_s \epsilon$$



$$N_{Rd} = \int \sigma dA = \int_{A_{cs}} \sigma_c dA_c + \int_{A_{st}} \sigma_s dA_s = -A_c f_{cd} - A_{s,1.T} f_{yd}$$

$$M_x = \int \sigma y dA = 0$$

30x40    6φ16    C25/30    B450C

$$\begin{aligned} N_{Rd} &= -1200 \times 14.17 - 12.06 \times 391.2 \\ &\quad \times 10^2 \times 10^{-3} \quad \times 10^2 \times 10^{-3} \\ &= -1700.4 - 471.8 = -2172.2 \text{ KN} \end{aligned}$$

Normative : considerare sempre anche  $M_{Ed}$

— e' possibile calcolarlo

— se non lo si calcola (perché molto piccolo) si usa :

$$M_{Ed} = N_{Ed} \cdot e$$

$$\text{con } e = \text{MAX} ( 0.05 h ; 20 \text{ mm} )$$

Example

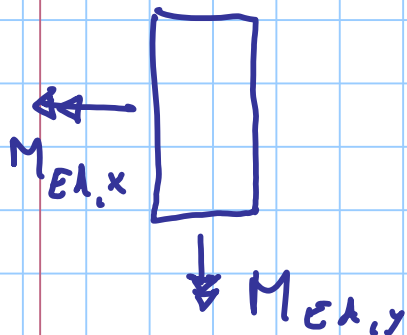
$$N_{ef} = 2000 \text{ kN}$$

pilar  $30 \times 50$  ( $h = 50 \text{ cm}$ )  $\rightarrow e = 0.05 \times 50 \text{ cm} = 2.5 \text{ cm} (25 \text{ mm})$

$$M_{Ed,x} = 2000 \times 2.5 \times 10^{-2} = 50 \text{ kNm}$$

pilar  $30 \times 50$  ( $h = 30 \text{ cm}$ )  $\rightarrow e = 0.05 \times 30 = 1.5 \text{ cm}$   
 $2 \text{ cm}$

$$M_{Ed,y} = 2000 \times 2 \times 10^{-2} = 40 \text{ kNm}$$



PROGETTO

kt.  $N_{Ed}$

$$N_{Rd} = \overbrace{A_c f_{cd}}^{N_{Ed}} + \overbrace{A_{s,rr} f_{yd}}^{0.2 N_{Ed}} \geq N_{Ed}$$

di compressione

per la normativa

$$A_{s,rr} f_{yd} \geq 0.1 N_{Ed}$$

myb. :  $N_{Rd} \geq 1.2 N_{Ed}$

Esempio edifici con

CARICHI UNITARI

	$q_k$	$T_{rem}$	$q_k$	$q_1$	$T_{rem}$	$q_1$	TOT d
SOLAIO	4.67	1.60	2.00	6.07	2.40	3.00	11.47 KN/m <sup>2</sup>
BALCONE	4.67	—	4.00	6.07	—	6.00	12.07 "
TAMPON.	7.0	—	—	9.1	—	—	9.1 KN/m
h.p. TREVES	2.85	—	—	3.69	—	—	3.69 "
SCALA	9.18 ?	—	4.00	11.93	—	6.00	17.93 KN/m <sup>2</sup>

pilastro alla base di 8 piani identici

pilastro porta, ~ ciascun piano (per SLU)

SOLAIO	13 m <sup>2</sup>	$\times 11.47$	=	190,0	kN
BALCONE	8 m <sup>2</sup>	$\times 12.07$	=	96.6	kN
TAMPON.	5 m	$\times 9.1$	=	45.5	kN
TERR.	5 m	$\times 3.69$	=	18.5	kN
p.p. pilastro				28.2	kN
				<hr/>	
				375.8	kN

Alla base  $N_{ed} = 375,8 \times 8 = 3006,4 \text{ kN}$



$$N_{Ed} = \overbrace{A_c f_{cd}}^{N_{Ed}} + \overbrace{A_{s, \text{tot}} f_{yd}}^{0.2 N_{Ed}}$$

40 x 60  
 30 x 80  
 (30 x 70)  
 ↑

$$A_c \geq \frac{N_{Ed}}{f_{cd}} = \frac{3006.4 \times 10^3}{14.17} \times 10^{-2} = 2122 \text{ cm}^2$$

$$A_{s, \text{tot}} \geq \frac{0.2 N_{Ed}}{f_{yd}} = \frac{0.2 \times 3006.4 \times 10^3}{391.2} \times 10^{-2} = 15.4 \text{ cm}^2$$

decido di usare

φ10	φ14	φ20
0.79	1.54	3.14 cm <sup>2</sup>

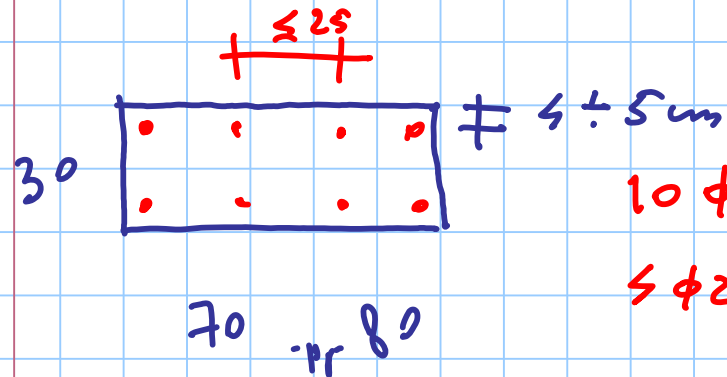
armatura longitudinale

$$\phi \geq 12 \text{ mm}$$

NTC 08

$$\text{distanza} \leq 25 \text{ cm}$$

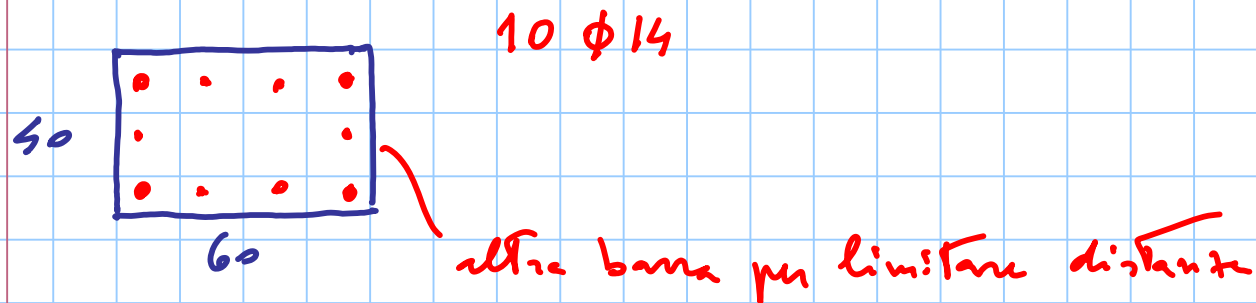
CONSIGLIO



se servono  $15.4 \text{ cm}^2$

10  $\phi 14$  (agg. 2 barre, p.es. sul lato cort.)

4  $\phi 20$  + 4  $\phi 14$  (i  $\phi 20$  alle spigoli.)



$$\rho = \frac{A_{s, \text{TOT}}}{A_c} = \frac{\frac{0.2 \cancel{N_{ed}}}{f_{yd}}}{\frac{\cancel{N_{ed}}}{f_{cd}}} = \frac{0.2 f_{cd}}{f_{yd}} = \frac{0.2 \times 14.17}{391.2} = 7.24 \times 10^{-3}$$

NORMATIVA  $\rho \geq 3 \times 10^{-3}$  ampiamente verificata  
 Es.  $30 \times 80 = 2400 \text{ cm}^2 \rightarrow A_{s, \text{TOT}} \geq 7.2 \text{ cm}^2$

nel passato  $\rho \geq 8 \times 10^{-3}$  o/11.  $6 \times 10^{-3}$

oggi, in zona sismica  $\rho \geq 10 \times 10^{-3}$

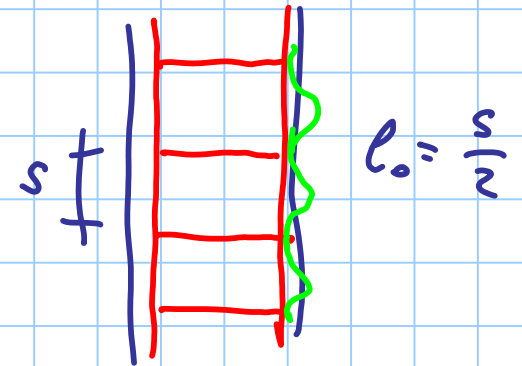
## ARMATURA TRASVERSALE

(staffe)

— instabilità dell'arm. l.y.

— armature a taglio

— confinamento



NORMATIVA  
NTC 08

$$s \leq 12 \phi_{min}$$

25 cm

Es. con  $\phi 8$

16.8 cm

→  
usare  $\phi 8/15$  cm

EC 2

anche: all'estremità ridurre

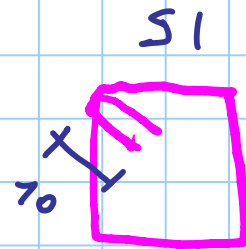
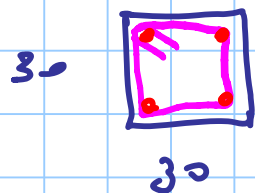
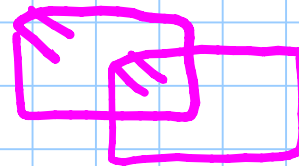
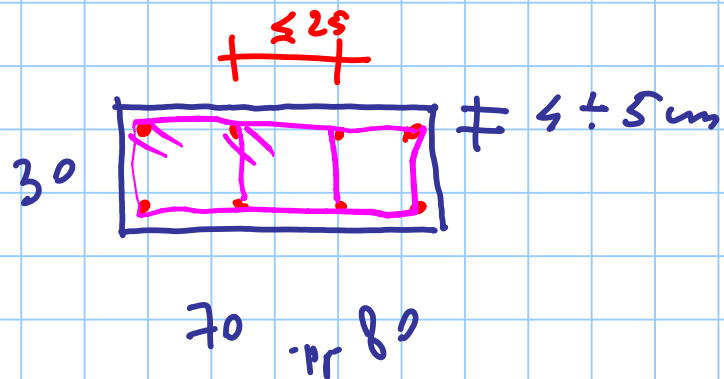
$\times 0.6$

→  $\phi 8/10$  cm

## STAFFE NELLA SEZIONE

1 barra long ogni max 25 cm

deve esserci un braccio di staffe che la lega



SBAGLIATO

