Titolo nota 24/03/2015

1° modello CLS resiste a Trazione

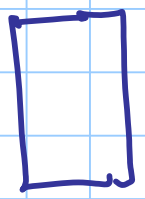
LINEARE

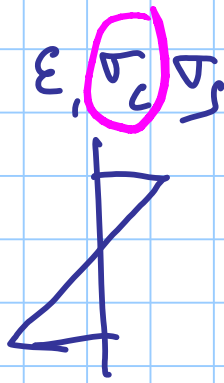
$$n = \frac{E_s}{E_c}$$

OMOGENEIZZAZIONE

A_s σ_s → $n\,\sigma_c$

$n A_s$ σ_c come fosse CLS





SEZIONE OMOGENEIZZATA definita a priori

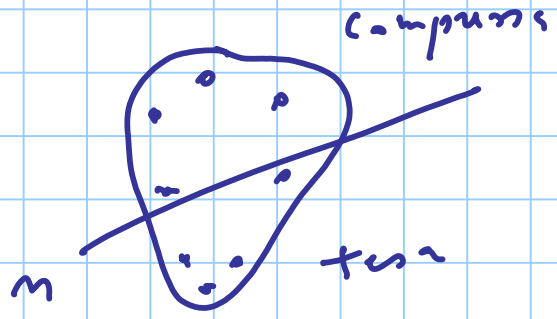
$\sigma_s = n\,\sigma_c$

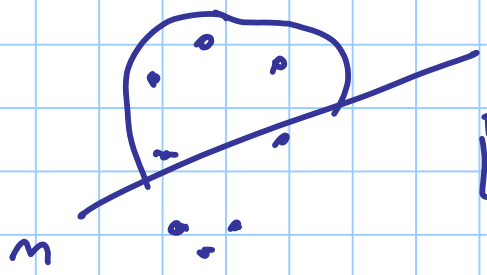
$\varepsilon = \frac{\sigma_c}{E_c}$

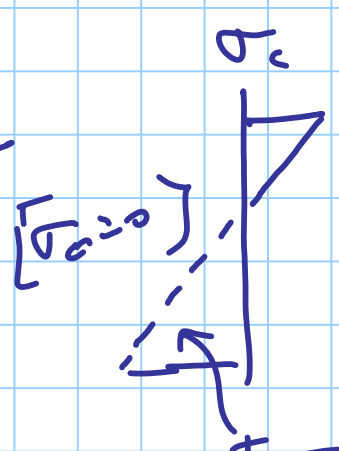
2° modello di comportamento

LINEARE

calcestruzzo non resistente a trazione







IS

$\sigma_s = n \sigma_c$

$\varepsilon = \frac{\sigma_c}{E_c}$

Tolgo CLS teso

Se conosco la posizione dell'asse neutro

- trascurare la parte di CLS teso
- omogeneizzare l'armatura

SEZ. REAGENTE

OMOGENEIZZATA

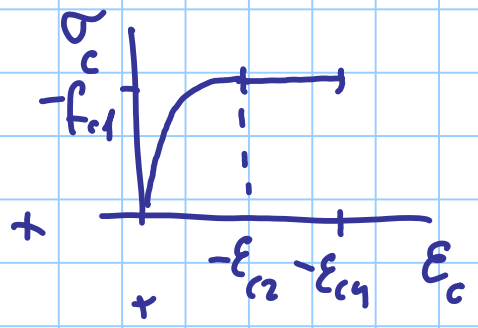
non nota a priori

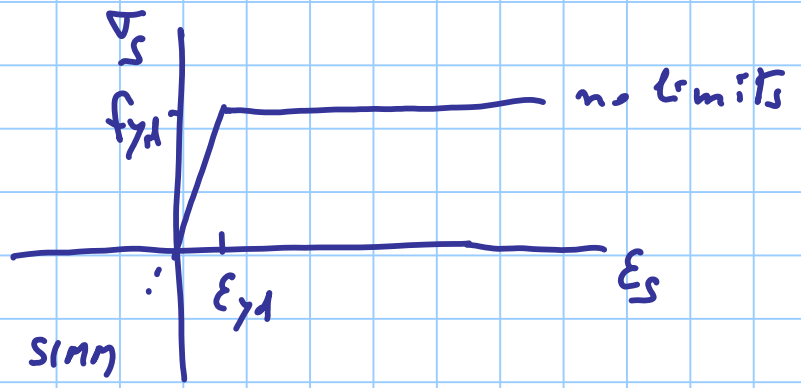
da calcolare ↙

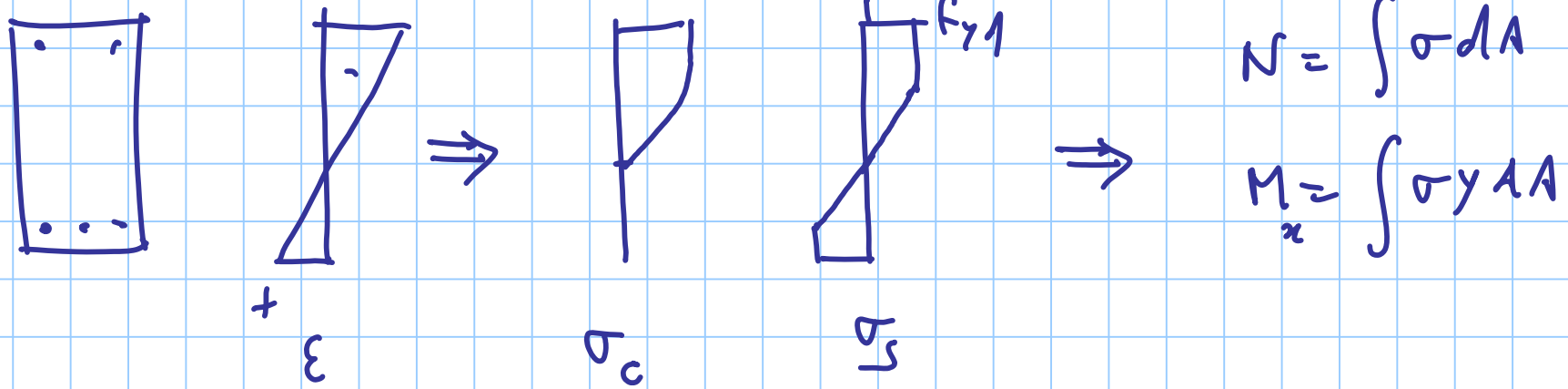
dipende da M, N

3° modello di comportamento

NON LINEARE







$$N = \int \sigma \, dA$$

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

SFORZO NORMALE

1° MODELLO DI COMPORTAMENTO

- TRAZIONE
- COMPRESSIONE

Sezione omogeneizzata

A_c calcestruzzo

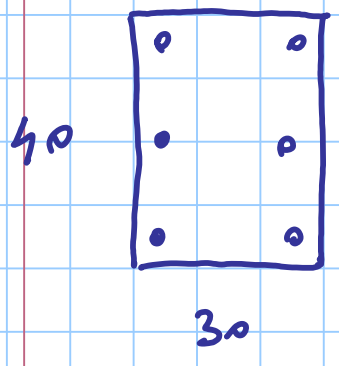
$A_{S,Tot}$ acciaio

area di calcestruzzo ideale

$$A_{ci} = A_c + n A_{S,Tot}$$

B450C
C 25/30

SEZIONE



$A_c = 1200\ cm^2$

$A_{s,TOT} = 12,06\ cm^2$

$A_{ci} = 1200 + 6.35 \times 12.06 = 1276,6\ cm^2$

1 ϕ16 $A_s = 2.01\ cm^2$

$n = \frac{E_s}{E_c} = \frac{200000}{31500} = 6,35$

$N = 50\ KN$

$\sigma_c = \frac{N}{A_{ci}} = \frac{50 \times 10^3}{1276,6 \times 10^2} = 0.39\ MPa$

$\sigma_s = n\,\sigma_c = 6,35 \times 0.39 = 2.49\ MPa$

per quale valore di N si fessura?

quando $\sigma_c = f_{ctk} = 1.80$ MPa

$\hookrightarrow \dfrac{N}{A_{ci}} = f_{ct}$ $\qquad N = A_{ci} f_{ct} = 1276.6 \times 1.80 = 229.8$ kN

$\times 10^2 \quad \times 10^{-3}$

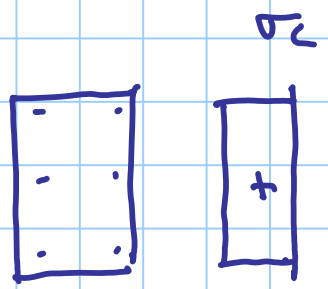
$N_r = +229.8$ kN sforzo normale di fessurazione

$\sigma_c = \dfrac{229.8 \times 10}{1276.6} = 1.80$ MPa

$\sigma_s = n \sigma_c = 6.35 \times 1.80 = 11.43$ MPa

$N = 229,0 \ kN$

$\sigma_c = 1.794 \ MPa < f_{ctk}$



per $t = \infty \qquad n = 15$

$A_{ci} = 1200 + 15 \times 12,06 = 1380,9 \ cm^2$

$\sigma_c = \dfrac{229 \times 10}{1380,9} = 1.658 \ MPa < f_{ctk}$

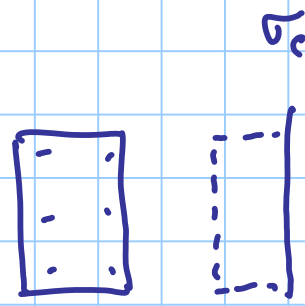
$\sigma_s = n \, \sigma_c = 15 \times 1.658 = 24.9 \ MPa$

e appena superato N_2 ?

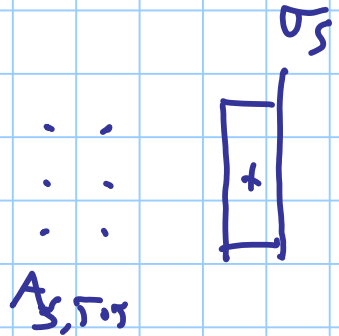
2° modello di comportamento

SEZIONE TUTTA TESA

(inutile omogeneizzare)



$$\sigma_s = \frac{N}{A_{s,tot}} = \frac{229.8 \times 10}{12.06} = 190.5 \text{ MPa}$$



CFR

	PRIMA	DOPO
σ_c	1,80	–
σ_s	11,4	190.5

2° modello di comportamento

COMPRESSIONE come 1° modello

$$\sigma_c = \frac{N}{A_{ci}} \qquad \sigma_s = n\,\sigma_c$$

30×40
$6\phi 16$

$N = 1000$ KN $t_\infty \rightarrow n = 15$

$A_{ci} = 1380{,}9\ cm^2$

$$\sigma_c = \frac{1000}{1380{,}9} \times 10 = 7.24 \text{ MPa}$$

$$\sigma_s = 15 \times 7{,}24 = 108.6 \text{ MPa}$$

OGGI

NEL PASSATO

con questo modello di comportamento

- verifica allo STATO Limite di tensioni in Esercizio.

  SLE tensioni

  $\sigma_c \leq 0.45 f_{cm}$ • $0.6 f_{cm}$

  $\sigma_s \leq 0.8 f_{ym}$ (forse)

- verifica di resistenza col met. delle Tensioni Ammissibili

  ~~$\sigma_c \leq \bar{\sigma}_c$~~ $\sigma_c \leq 0.7 \bar{\sigma}_c$

  $\sigma_s \leq \bar{\sigma}_s$

$$\bar{\sigma}_c = 6 + \frac{R_{ck} - 15}{4}$$

		$0{,}7\,\bar{\sigma}_c$
C 20/25	$6 + \frac{25-15}{4} = 8.5$ MPa	5,95 MPa
C 25/30	$6 + \frac{30-15}{4} = 9.75$ MPa	6.83 MPa

acciai:

Fe B38 K	$\bar{\sigma}_s = 215$ MPa
Fe B44 K	$\bar{\sigma}_s = 255$ MPa

3° modello di comportamento

TRAZIONE

$$N_{Rd} = A_{s,tot} \, f_{yd}$$

30 × 40

6 ϕ 16

B450C $f_{yk} = 450$ MPa $f_{yd} = 391.2$ MPa

$A_{s,tot} = 12{,}06$ cm²

$N_{Rd} = 12{,}06 \times 391.2 \times 10^{-1} = 471.8$ kN