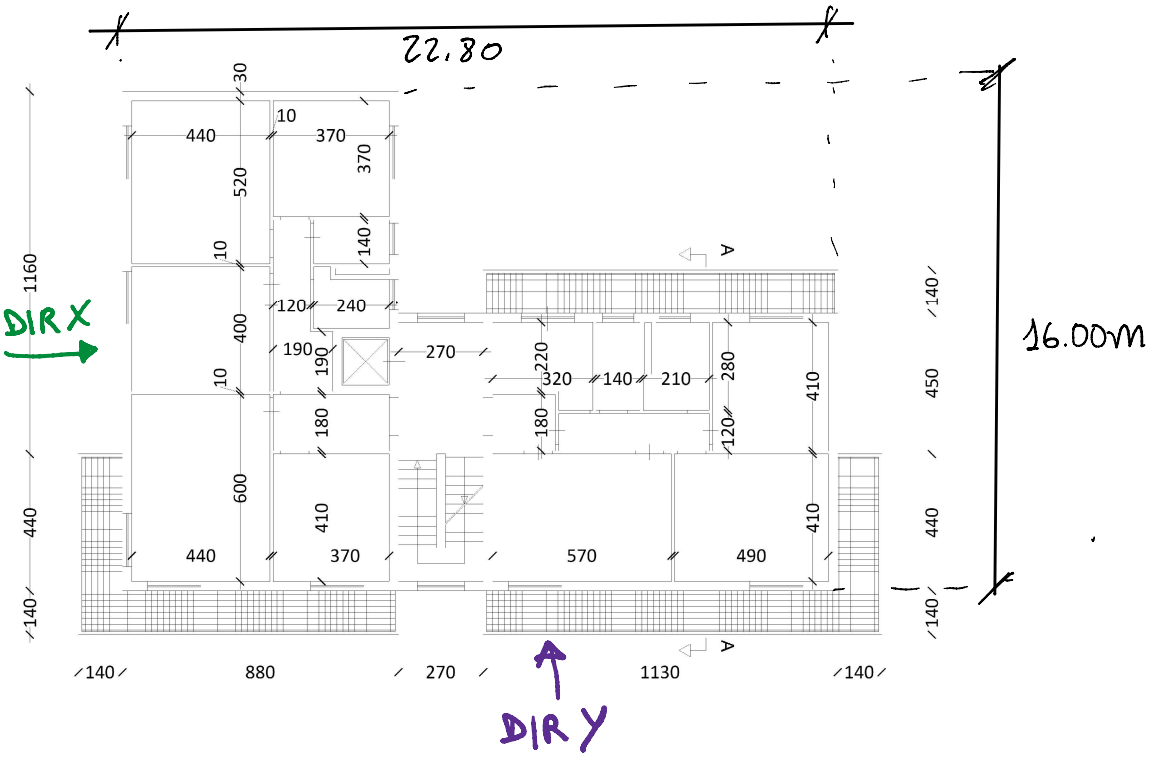
VENTO

giovedì 2 aprile 2020 13:57

EDIFICIO A 6 PIANI ; $h = 3.3\,m$

- PRESSIONE CINETICA DI RIFERIMENTO $q_r = 0.526\ kN/m^2$
- CATEGORIA DI ESPOSIZIONE IV

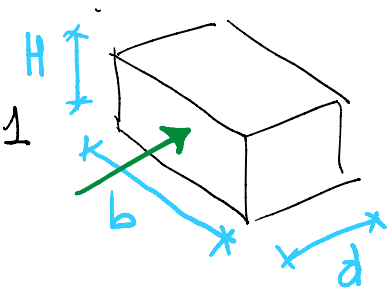


$$H_{TOT} = 6 \times 3.3\,m = 19.8\,m$$

VENTO IN DIREZIONE X

$b = 16.00\,m$
$d = 22.80\,m$
$H = 19.80\,m$

$$\frac{H}{d} = \frac{19.80}{22.80} = 0.87 \leq 1$$



COEFF. DI PRESSIONE

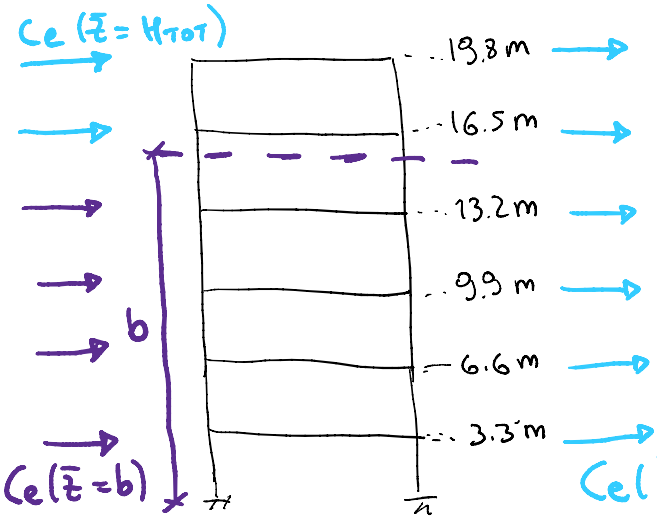
$$C_{pe}\,(\text{SOPRAVENTO}) = 0.7 + 0.1\frac{H}{d} = 0.787$$

$$C_{pe}\,(\text{SOTTOVENTO}) = -0.3 - 0.2\frac{H}{d} = -0.474$$

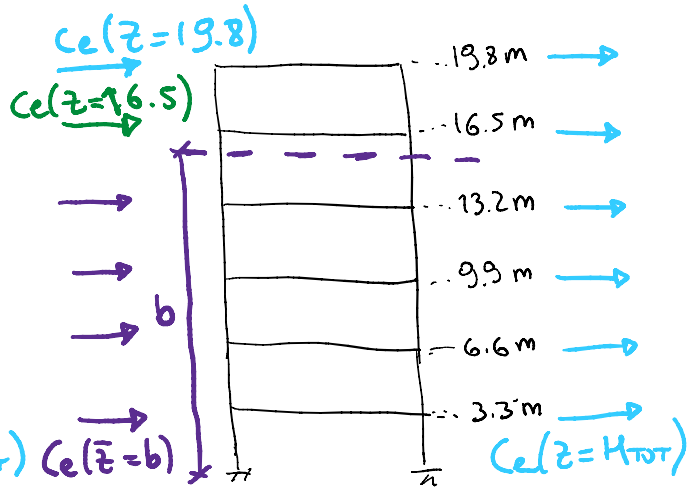
COEFF. DI ESPOSIZIONE

$$\frac{H}{b} = \frac{19{,}80}{16} > 1 \Rightarrow \text{EDIFICIO "ALTO"}$$

OPZIONE 1



OPZIONE 2



$$p_k = q_r C_d C_p \cdot C_e = q_r C_d \left[C_{pe}^{\text{SOPRAV.}} C_e^{\text{SOPRAV.}} - C_{pe}^{\text{SOTTOV.}} C_e^{\text{SOTTOV}} \right]$$

($C_d \rightarrow 1$)

Piano	z imp	qr [kN/m^2]	cp soprav	ze soprav	ce soprav	cp sottov	ze sottov	ce sottov	pk [kN/m^2]
6	19.8	0.526	0.787	19.8	2.27	-0.474	19.8	2.27	1.504
5	16.5	0.526	0.787	16.5	2.13	-0.474	19.8	2.27	1.449
4	13.2	0.526	0.787	16.0	2.11	-0.474	19.8	2.27	1.439
3	9.9	0.526	0.787	16.0	2.11	-0.474	19.8	2.27	1.439
2	6.6	0.526	0.787	16.0	2.11	-0.474	19.8	2.27	1.439
1	3.3	0.526	0.787	16.0	2.11	-0.474	19.8	2.27	1.439

VENTO IN DIREZIONE Y

COEFF. DI PRESSIONE

$b = 22,80\ m$

$d = 16.00\ m$

$H = 19,80\ m$

$\longrightarrow \quad \frac{H}{d} = \frac{19,80}{16,00} = 1,24 > 1$

C_{pe} (SOPRAVENTO) $= 0.8$

C_{pe} (SOTTOVENTO) $= -0.5 - 0.05\left(\frac{H}{d} - 1\right) = -0.512$

COEFF. DI ESPOSIZIONE

$\frac{H}{b} = \frac{19,80}{22,80} < 1 \quad \Rightarrow$ EDIFICIO "BASSO"

$C_e\ (z_e = H_{TOT})$ PER PARETI SOPRAVENTO E SOTTOVENTO

$$P_h = q_r C_d C_p \cdot C_e = q_r C_d \left[C_{pe}^{SOPRAV.} C_e^{SOPRAV.} - C_{pe}^{SOTTOV.} C_e^{SOTTOV} \right]$$

$$= 0,526 \frac{KN}{m^2} \times 1 \times \left[0,8 \times 2,27 + 0,512 \times 2,27 \right] =$$

$$= 1,565\ KN/m^2$$

STATI LIMITE

giovedì 2 aprile 2020 14:39

SLU → RESISTENZA DELLA STRUTTURA + PROGETTO (III STADIO)
- CARICHI: $G_d + Q_d + \sum \psi_{0i} Q_{di}$
- RESISTENZE: f_{cd}, f_{yd}

SLE → STATO LIMITE DI DEFORMAZIONE

→ STATO LIMITE DI FESSURAZIONE

→ STATO LIMITE DI TENSIONI IN ESERCIZIO

STATO LIMITE DI FESSURAZIONE

- AMPIEZZA FESSURA
- INNESCO FESSURAZIONE

I STADIO DI COMPORTAMENTO

$\sigma_c^+ \leq f_{ctk}$

$\sigma_c^+ \leq f_{cfk}$

STATO LIMITE DI TENSIONI DI ESERCIZIO

TENSIONI ELEVATE (CARICHI DI LUNGA DURATA) ⟹ ECCESSIVE DEF. VISCOSE

COMB. CARICO QUASI PERM.

$G_K + Q_K \psi_2$

$\sigma_c \leq 0.45 f_{ck}$

II STADIO DI COMPORTAMENTO

EVITARE FESSURAZIONE
PER FORTE COMPRESSIONE

II STADIO

COMB CARICO RARA

$$G_k + Q_k + \sum \psi_0 Q_{ki}$$

$$\sigma_c \leq 0.60 f_{ck}$$

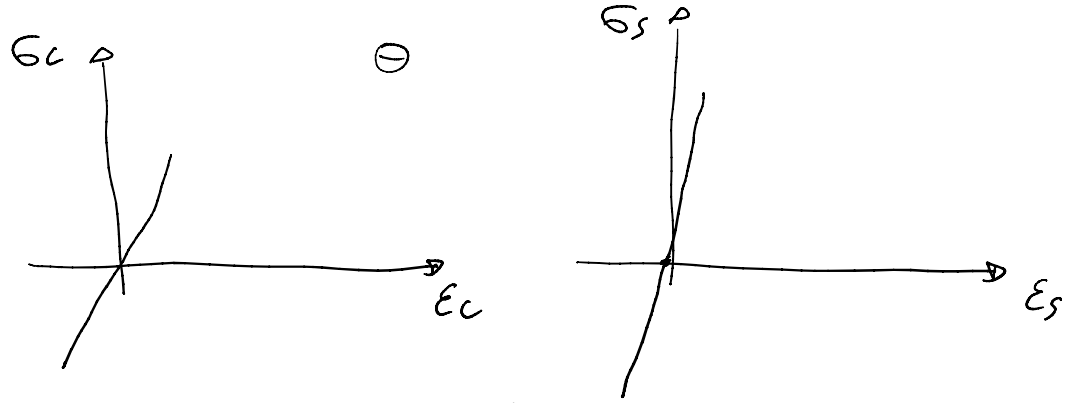
COMB CARICO RARA

$$\sigma_s \leq 0.8 f_{yk}$$

SFORZO NORMALE I STADIO

giovedì 2 aprile 2020 14:52

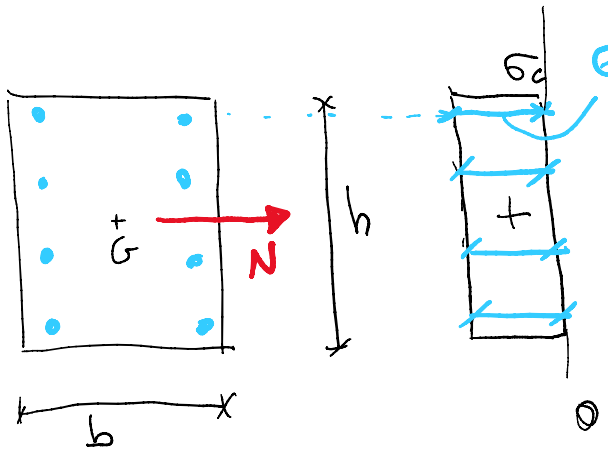
LEGAMI COSTITUTIVI



$N \neq 0 \quad ; \quad M_x = 0 \quad M_y = 0 \quad \Rightarrow$

$$\varepsilon_G = \frac{N}{EA} \qquad \chi_x = -\frac{M_y}{I_y E} \;(0) \qquad \chi_y = \frac{M_x}{I_x E} \;(0)$$

$$\Rightarrow \varepsilon = \varepsilon_G$$



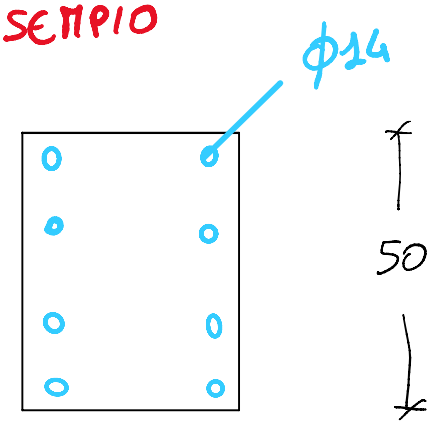
AREA CLS IDEALE

$$A_{ci} = bh + n A_{s\,tot}$$

$$\sigma_c = \frac{N}{A_{ci}}$$

$$\sigma_s = n\sigma_c \qquad n = \frac{E_s}{E_c}$$

ESEMPIO



$A_s = 8\,\phi 14$

C 25/30

B 450C

$N = 200$ KN (TRAZIONE)

$n = \frac{200'000\ MPa}{31500\ MPa} = 6{,}35$

$A_{ci} = bh + n \times 8 \times A_{\phi 14}$

$A_{\phi 14} = \frac{\pi \cdot \phi^2}{4} = \frac{3.14 \cdot 1{,}4^2}{4} = 1{,}54\ cm^2$

$A_{ci} = 30 \times 50 + 6{,}35 \times 8 \times 1{,}54 = 1578\ cm^2$

$\sigma_c^+ = \frac{N}{A_{ci}} = \frac{200\ KN}{1578\ cm^2} \frac{\times 10^3}{\times 10^2} = 1{,}27\ MPa$

CLS FESSURATO ? se $\sigma_c^+ > f_{ctk}$

$f_{ctk} = 0.7\, f_{ctm} = 0{,}7 \cdot 0{,}3 \sqrt[3]{f_{ck}^2} = 0{,}7 \times 0{,}3 \sqrt[3]{25^2} = 1{,}80 MPa$

NO CLS ANCORA REAGENTE

QUAL È $N_{FESSURAZIONE}$?

PONGO $\sigma_c^+ = f_{ctk} \rightarrow f_{ctk} = \frac{N_{fess}}{A_{ci}}$

$N_{fess} = A_{ci} \times f_{ctk}$

$N_{fess} = 1578\ cm^2 \times 1{,}80 \frac{N}{mm^2} \cdot \frac{10^2}{10^3} = 284\ KN$

TENSIONI NELL' ARMATURA PROVOCATE DA N_{fess}

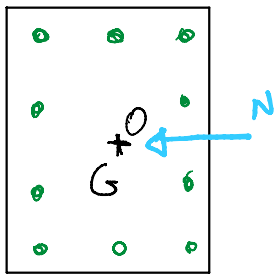
$$\sigma_s = n \times \underset{\sim}{\sigma_c} = 6{,}35 \times 1{,}80\ MPa = 11{,}43\ MPa$$

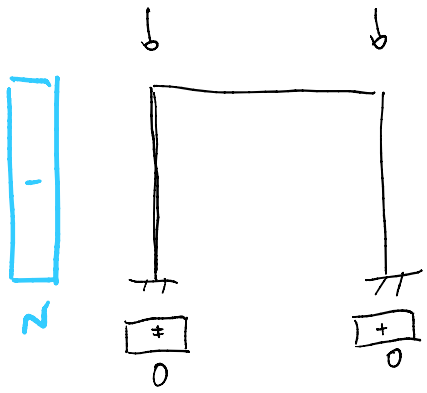
$\underset{\sim}{\sigma_c}$ per R_{ck}

NOTA

NEL MODELLO DI CALCOLO SONO UTILIZZATE LE SEZ. GEOMETRICHE DI CLS $\Rightarrow$ N È APPLICATO IN O.

PER AVERE N CENTRATO DEVO AVERE ARMATURE SIMMETRICHE $\Rightarrow$ $G \equiv O$

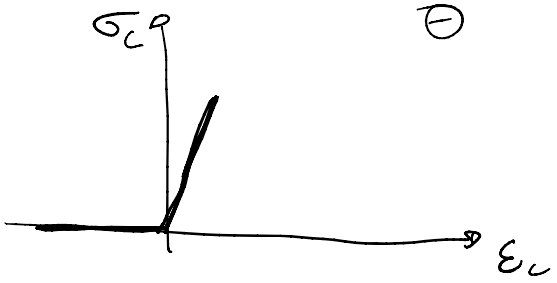


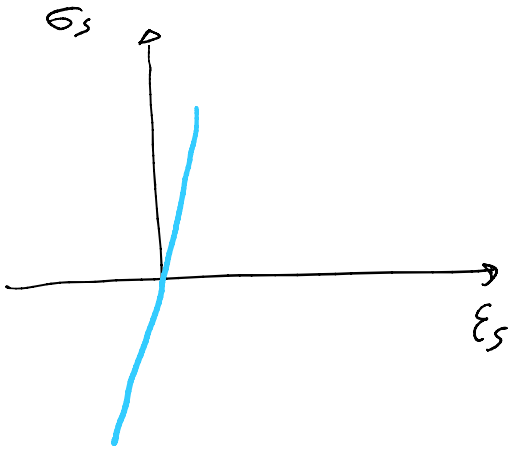


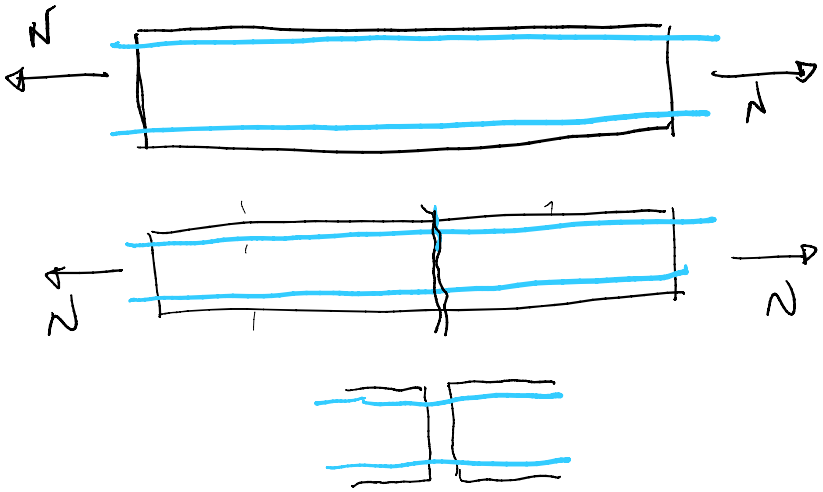
SFORZO NORMALE II STADIO

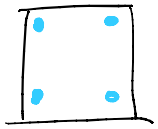
giovedì 2 aprile 2020 15:19

$N > 0$ TRAZIONE

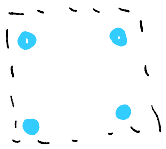






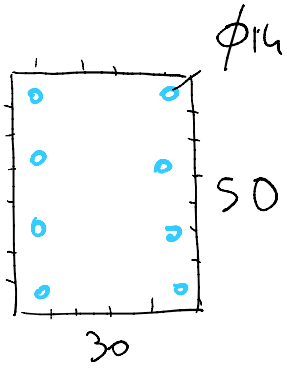


$\sigma^T \leq f_{ctk}$ I STADIO



$\sigma_c = 0$, $\sigma_s = \frac{N}{A_{s,tot}}$

ESEMPIO



$N = 284$ KN

$$\sigma_s = \frac{N}{A_{s,tot}} = \frac{284\ \text{KN}}{8 \times 1{,}54\ \text{cm}^2} \times 10$$

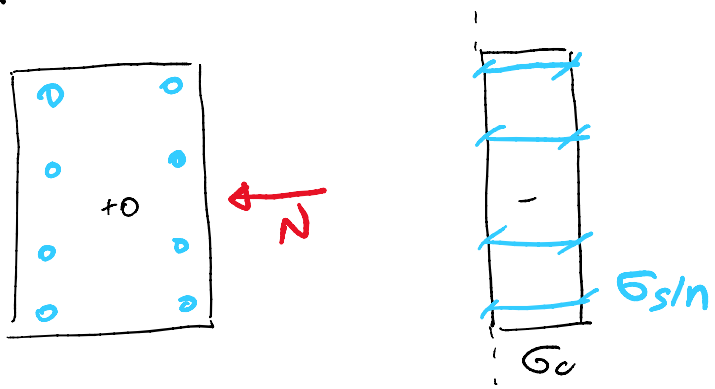
$= 230{,}5$ MPa

$\sigma_s \leq 0.8\, f_{yk}$ PER LIMITARE AMPIEZZA FESSURE

SFORZO NORMALE II STADIO

giovedì 2 aprile 2020 15:34

$N < 0$ COMPRESSIONE

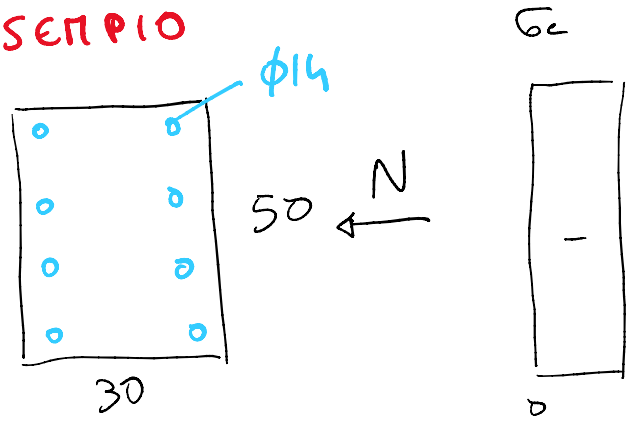


$$A_{ci} = \underbrace{A_c}_{bh} + n A_{s,tot} \qquad \sigma_c = \frac{N}{A_{ci}}$$

$$\sigma_s = n \cdot \sigma_c$$

CARICHI DI LUNGA DURATA $\Rightarrow$ $n = 15$

ESEMPIO



CARICHI LUNGA DURATA

B450C

C25/30

$N = -2000$ kN

$\sigma_c = ?$ $\sigma_s = ?$

$$A_{ci} = bh + n \cdot A_{s,tot} = 30 \times 50 + 15 \cdot 8 \times 1{,}54\ cm^2$$

$$= 1684\ cm^2$$

$$\sigma_c = \frac{-2000\ kN}{1684\ cm^2} \times 10 = -11{,}88\ MPa$$

Se N OTTENUTO DA COMB. RARA $0.6 f_{ck} = 0,6 \times 25 = 15\ MPa$

$11.88 < 15 \Rightarrow$ SODDISFATTA

SE N OTTENUTO DA COMB. QUASI PERMANENTE $0.45 f_{ck} = 0,45 \times 25 = 11.25\ MPa$

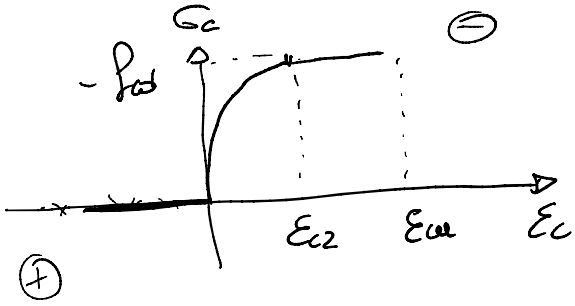
$11.88 > 11.25 \Rightarrow$ NON SODDISFATTA

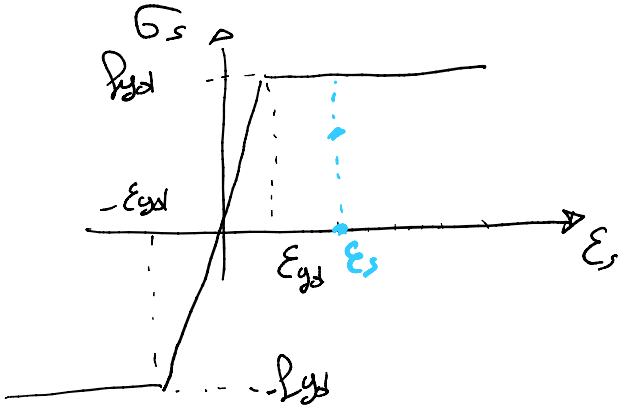
$$\sigma_s = n\sigma_c = -15 \times 11,88\ MPa = -178,2\ MPa$$

SFORZO NORMALE III STADIO

giovedì 2 aprile 2020 15:49

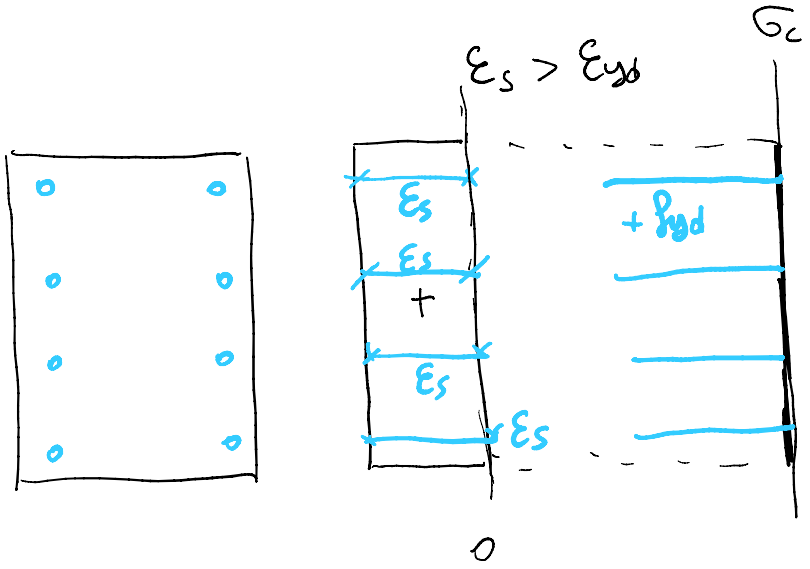
$N_{Ed} > 0$





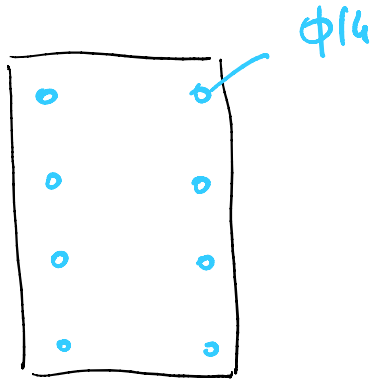
CALCOLARE N_{Rd}^{+}

- PARTO DA DIAGRAMMA ε LIMITE
- CALCOLO LE σ DAI LEGAMI COSTITUTIVI
- $N = \int \sigma \, dA$



$$N_{Rd}^{+} = \sum A_s \cdot \sigma_s = f_{yd} \cdot A_{s\,tot}$$

ESEMPIO



$N_{Rd} = ?$ B450C

$$f_{yd} = \frac{f_{yk}}{\gamma_s} = \frac{450\ MPa}{1.15} = 391{,}3\ \frac{N}{mm^2}$$

$$A_{s,tot} = 8 \times 1{,}54\ cm^2 = 12{,}32\ cm^2$$

$$N_{Rd} = 12{,}32\ cm^2 \times 391{,}3\ \frac{N}{mm^2} \times \frac{1}{10} =$$

$$= 482{,}1\ KN$$