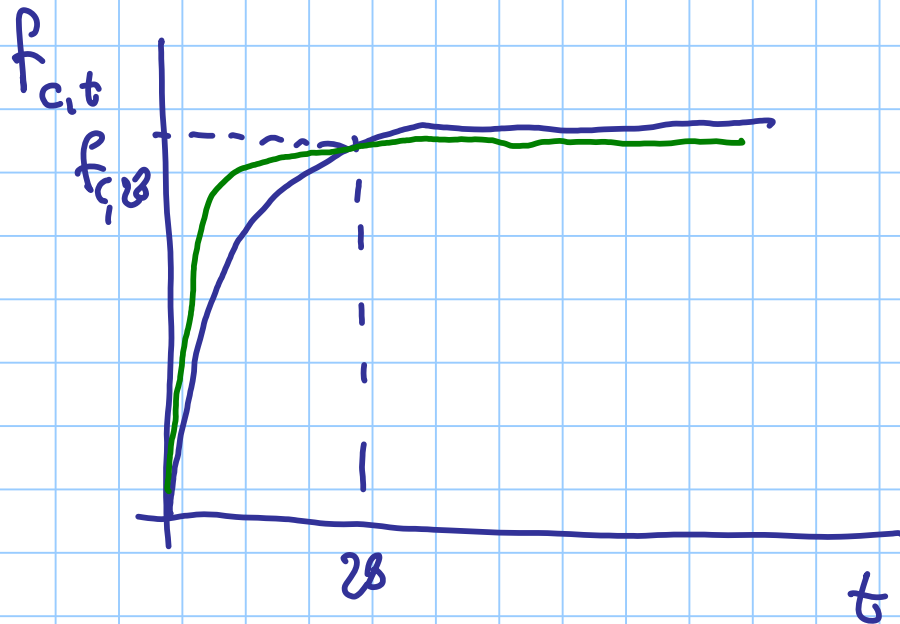


$$f_{c,t} = f_{c,28} e^{s(1 - \sqrt{28/t})}$$

$$s = 0.25 \quad \text{normal}$$

$$s = 0.10$$



RITIRO riduzione di volume

equivalente a una variazione uniforme
di temperatura $\Delta t < 0$

$$\Delta l = \alpha \Delta t l$$

$$\alpha = 10^{-5}$$

$\frac{\Delta l}{l} = \epsilon$ ritiro anlogico

$$\epsilon_{ca} = -2.5 (f_{ck} - 10) \times 10^{-6}$$

$$f_{ck} = 25 \text{ MPa}$$

$$\epsilon_{ca} = -3.75 \times 10^{-5}$$

$$\varepsilon_{cd,\infty} = K_h \cdot \varepsilon_{cd,0}$$

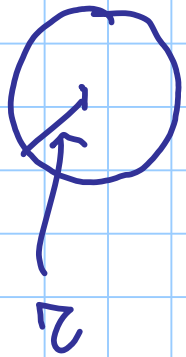
Tab. 5. Ritiro: valori di $\varepsilon_{cd,0}$ (da moltiplicare per 10^{-3})

f_{ck}	Umidità relativa (in %)					
	20	40	60	80	90	100
20	-0.62	-0.58	-0.49	-0.30	-0.17	0.00
40	-0.48	-0.46	-0.38	-0.24	-0.13	0.00
60	-0.38	-0.36	-0.30	-0.19	-0.10	0.00
80	-0.30	-0.28	-0.24	-0.15	-0.07	0.00

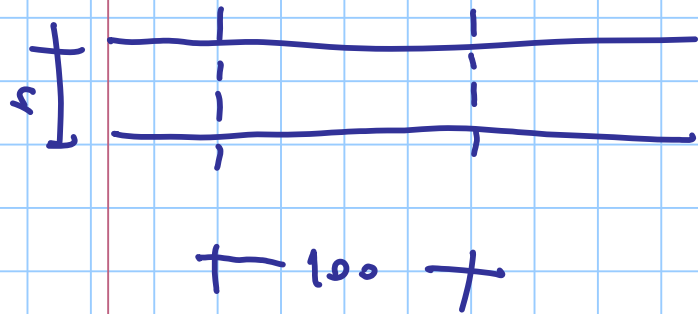
$$h_0 = \frac{2A}{u}$$

\swarrow area
 \nwarrow perimetro esp. alla trazione

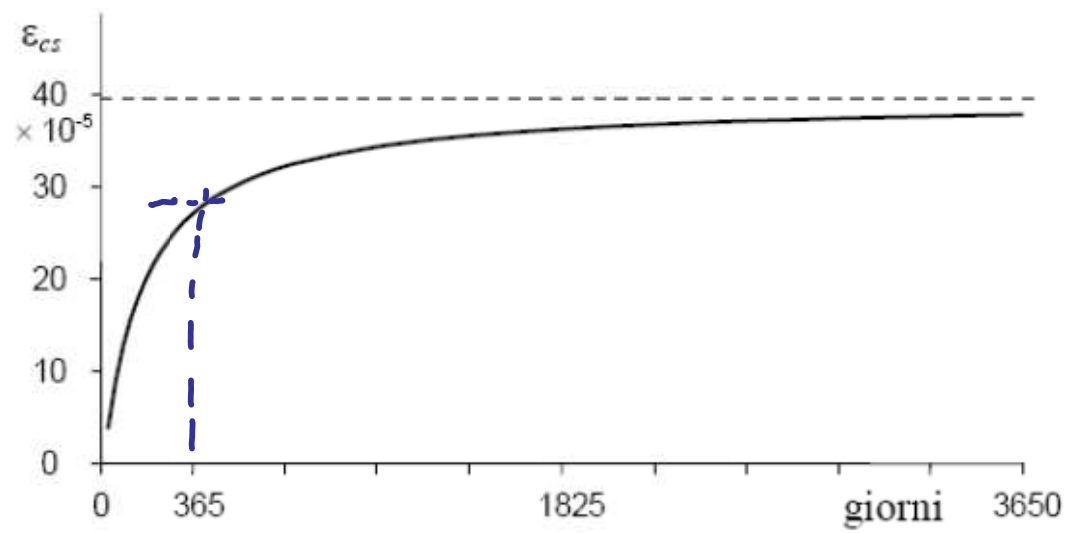
h_0 (mm)	k_h
100	1.00
200	0.85
300	0.75
≥ 500	0.70



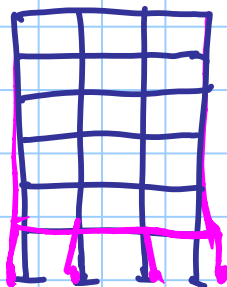
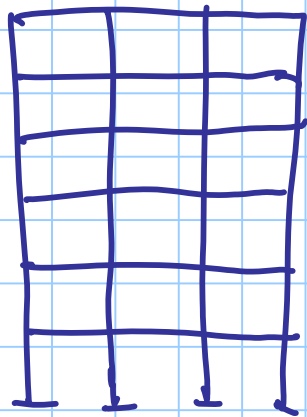
$$h_o \approx \frac{2\pi r^2}{2\pi r} = r$$



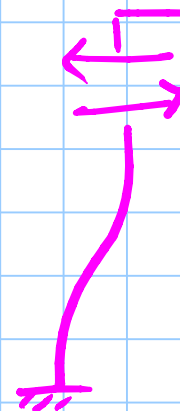
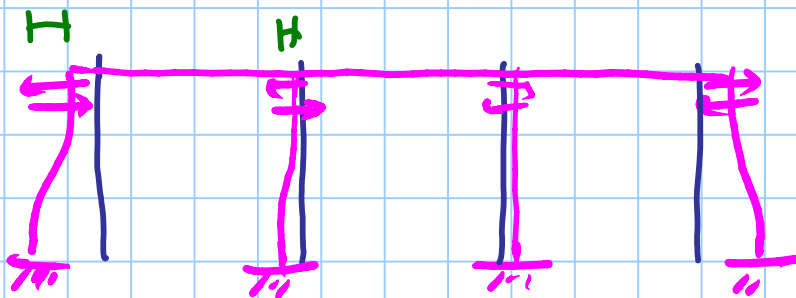
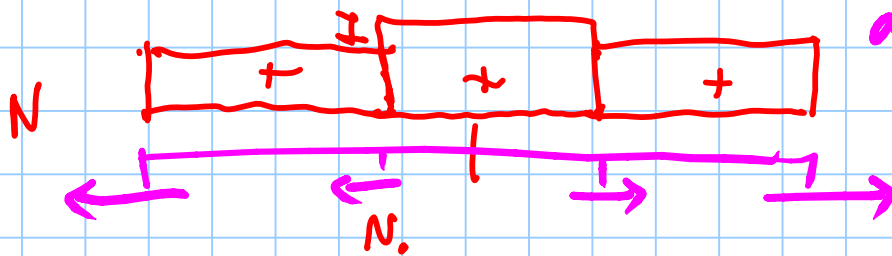
$$h_o \approx \frac{2 \times 100 \cdot S}{2 \times 100} = S$$



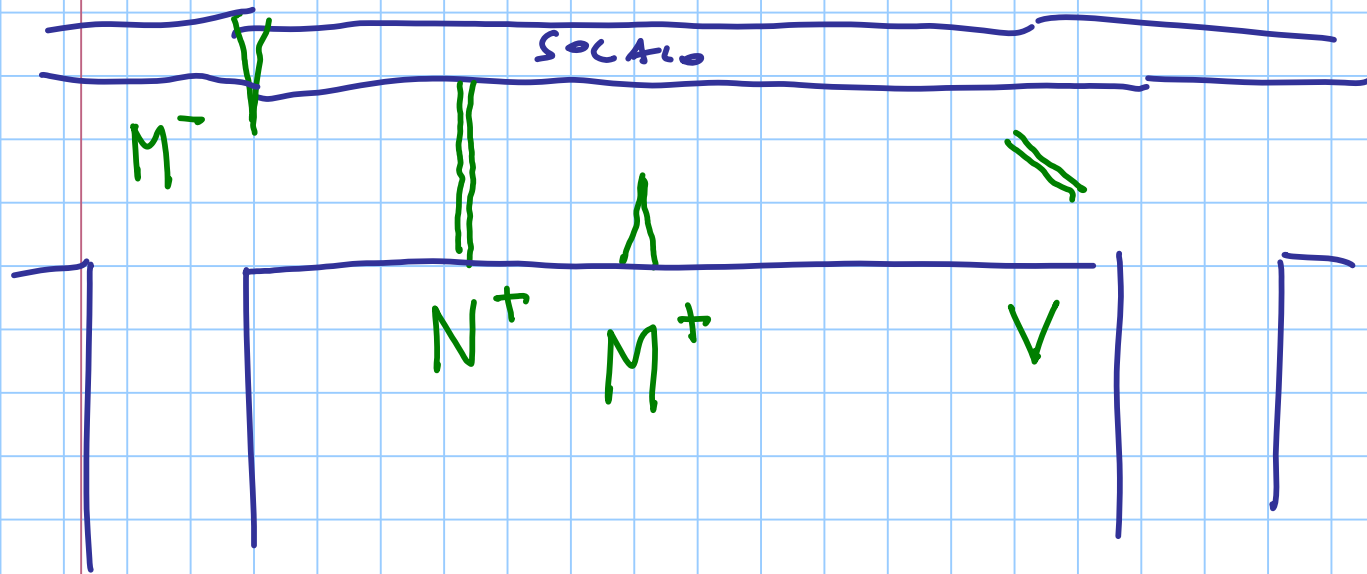
EFFETTI DEL RITIRO



effetti maggiori
ai piani inferiori



lesion: null aster in c.a.



EFFETTI VISCOSI

CREEP

FUAGE

incremento di deformazione
nel tempo

Tab. 7. Coefficiente finale di viscosità $\phi(t_{\infty}-t_0)$, per umidità relativa del 75%

t_0	$h_0 \leq 75 \text{ mm}$	$h_0 = 150$	$h_0 = 300$	$h_0 \geq 600$
3 giorni	3.5	3.2	3.0	2.8
7 giorni	2.9	2.7	2.5	2.3
15 giorni	2.6	2.4	2.2	2.1
30 giorni	2.3	2.1	1.9	1.8
≥ 60 giorni	2.0	1.8	1.7	1.6

B 450 C

$\underbrace{\hspace{1.5cm}}$

f_y

$$f_{yk} = 450 \text{ MPa}$$

$$f_{tk} = 540 \text{ MPa}$$

B 450 A

meno duttile

diametri

ϕ 8 mm

$\phi 8$

$\phi 10, \phi 12, \phi 14, \phi 16, \phi 18, \phi 20 \dots \phi 30$

\swarrow
 0.78 cm^2

\downarrow
 1.54 cm^2

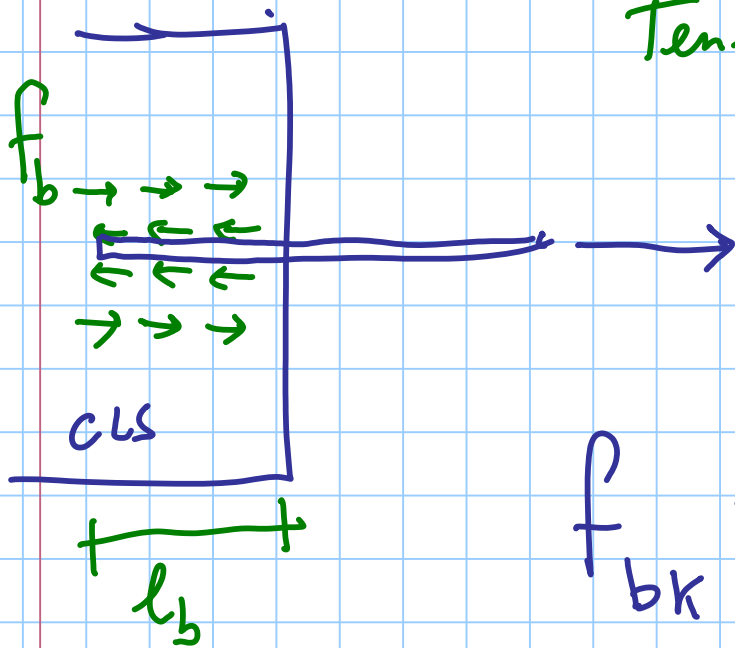
\downarrow
 3.14 cm^2

$$f_{yk} = 450 \text{ MPa}$$

$$f_{yd} = \frac{450}{1.15} = 391.3 \text{ MPa}$$

b = bond

Tensioni di aderenza



lunghezza
di ancoraggio

C25/30

$$f_{bk} = 2.25$$

$$f_{ctk} \leftarrow 1.80$$

$$f_{bd} = 2.25 \quad f_{ctd} = 2.70 \text{ MPa}$$