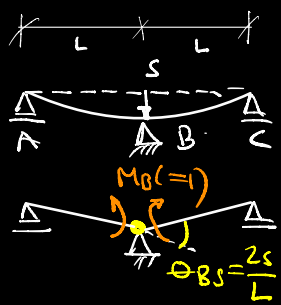
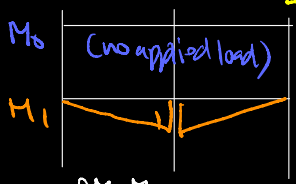
Support settlement
Effect of creep for fast/slow settlement

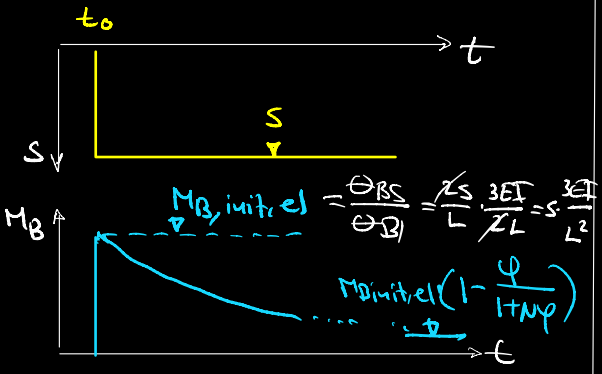




$$\Theta_{B0}=\int \frac{M_0 M_1}{EI}dx = 0$$

$$\Theta_{B1}=\int \frac{M_1 M_1}{EI}dx \left(=\frac{2L}{3EI}\right)$$

time-independent settlement
("fast" restraint)



short term compatibility: "stc"

$$\Theta_B = \overset{0}{\cancel{\Theta_{B0}}} + M_B(t_0)\,\Theta_{B1} \overset{!}{=} \Theta_{BS}$$

$$M_B(t_0)=\frac{\Theta_{BS}}{\Theta_{B1}} = M_{B,init,el}$$

time-dependent compatibility "tdc"

$$\Theta_B = \overset{0}{\cancel{\Theta_{B0}}}(1+\varphi) + M_B(t_0)\,\Theta_{B1}(1+\varphi) + \ldots$$
$$\ldots + \Delta M_B(t)\,\Theta_{B1}(1+N\varphi) = \cancel{\Theta_{BS}}$$

$$M_B(t_0)\,\varphi + \Delta M_B(t)\,(1+N\varphi) = 0$$

$$\rightarrow \Delta M_B(t) = -M_{B,init,el}\cdot\frac{\varphi}{1+N\varphi}$$

$$M_B(t) = M_{B,init,el} + \Delta M_B(t) =$$
$$= M_{B,init,el}\left(1-\frac{\varphi}{1+N\varphi}\right)$$

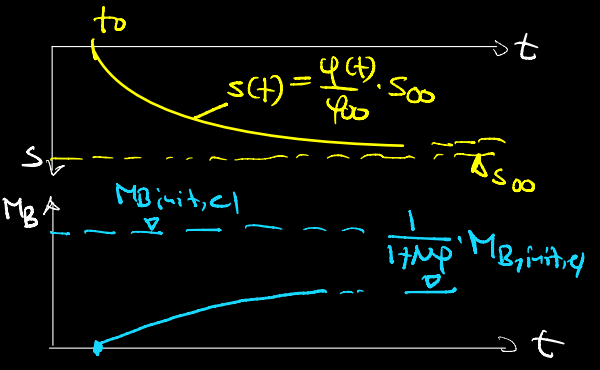
$t=\infty$: $\varphi_\infty=2$, $N=.8$

$$= M_{B,init,el}\left(1-\underbrace{\frac{2}{1+1.6}}_{0,23}\right)$$

initial full "elastic" restraint is reduced to 23%

≡ relaxation

time-dependent settlement
("slow" restraint)



stc:

$$\Theta_B = \overset{0}{\cancel{\Theta_{B0}}} + M_B(t_0)\cdot\Theta_{B1} = \Theta_{BS}(t=\infty)=0$$
$$\rightarrow M_B(t_0)=0$$

tdc:

$$\Theta_B = \overset{0}{\cancel{\Theta_{B0}}}(1+\varphi) + \overset{0}{\cancel{M_B(t_0)}}\cdot\Theta_{B1}(1+\varphi)$$
$$+\Delta M_B(t)\cdot\Theta_{B1}(1+N\varphi) = \cancel{\Theta_{BS}(t)}$$
$$= \Theta_{BS,\infty}\cdot\frac{\varphi}{\varphi_\infty}$$

$$\Delta M_B(t) = M_B(t) = \frac{\Theta_{BS,\infty}}{\Theta_{B1}}\cdot\frac{\varphi}{\varphi_\infty(1+N\varphi)}$$

$$M_B(t) = M_{B,init,el}\cdot\frac{\varphi}{\varphi_\infty(1+N\varphi)}$$

$\varphi_\infty \approx 2$, N.P. $\rightarrow \frac{2}{2(1+1.6)} \approx 0.38$

initially zero restraint, builds up to 38% of full elastic restraint with $s=s_\infty$