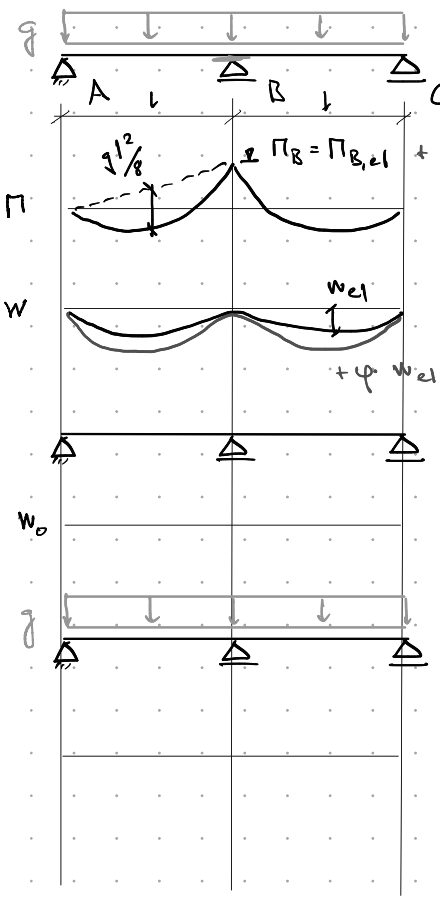
Effect of creep on two-span girder – time dependent force method



one casting system
"Eingusssystem"

Basic system (isostatic) + redundant variable BS + RV

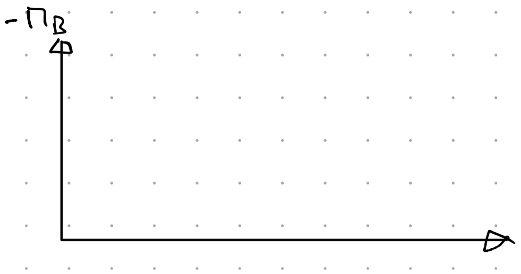
Relative rotation at B

Short-term compatibility (t=0)

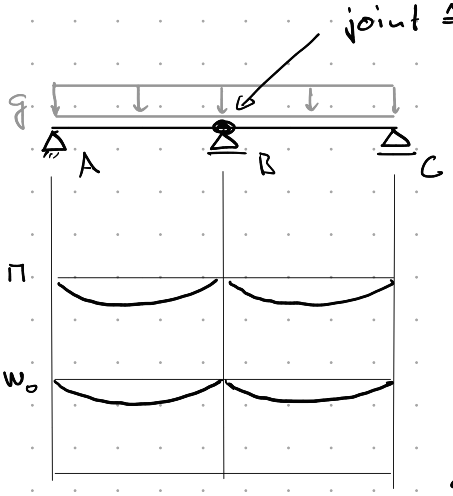
$$\delta_1 = \delta_{10}(1+\varphi) + X_1 \delta_{11}(1+\varphi) + \Delta X_1 \delta_{11}(1+\nu\varphi)$$

Time-dependent compatibility

$$\delta_1 = \delta_{10}(1+\varphi) + X_1 \delta_{11}(1+\varphi) + \Delta X_1 \delta_{11}(1+\nu\varphi)$$



here: for uncracked structure



staged construction
"Bauzustände"

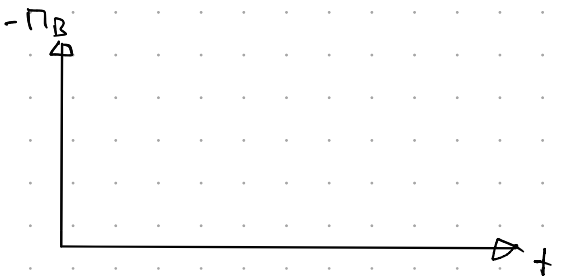
for systems of same age

two simply supported girders connected ≙ made continuous after applying g ($t = t_0$)

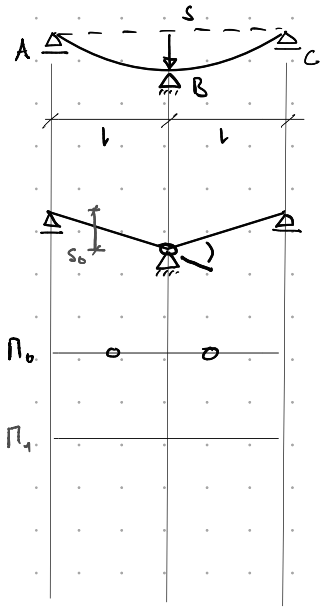
"stc" ($t = t_0$)

"tdc" ($t > t_0$)

$$\delta_1 = \delta_{10}(1+\varphi) + X_1 \delta_{11}(1+\varphi) + \Delta X_1 \delta_{11}(1+\nu\varphi)$$



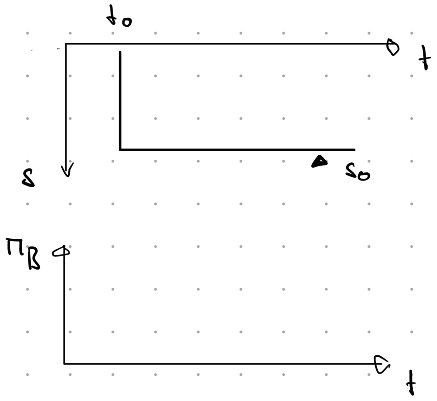
Support settlement
Effect of creep for fast / slow settlement



$$\delta_{10} = \int \frac{\Pi_0 \Pi_1}{EI} dx$$

$$\delta_{11} = \int \frac{\Pi_1 \cdot \Pi_1}{EI} dx$$

time-independent settlement ("fast" restraint)



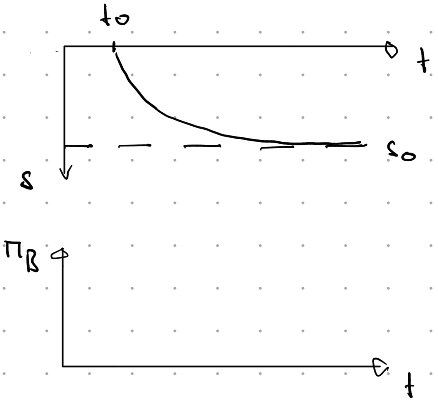
"stc", $t = t_0$

$$\delta_1 = \delta_{10}(1+\varphi) + X_1 \delta_{11}(1+\varphi) + \Delta X_1 \delta_{11}(1+\mu\varphi)$$

"tdc", $t > t_0$

$$\delta_1 = \delta_{10}(1+\varphi) + X_1 \delta_{11}(1+\varphi) + \Delta X_1 \delta_{11}(1+\mu\varphi)$$

time-dependent settlement ("slow" restraint)



"stc", $t = t_0$

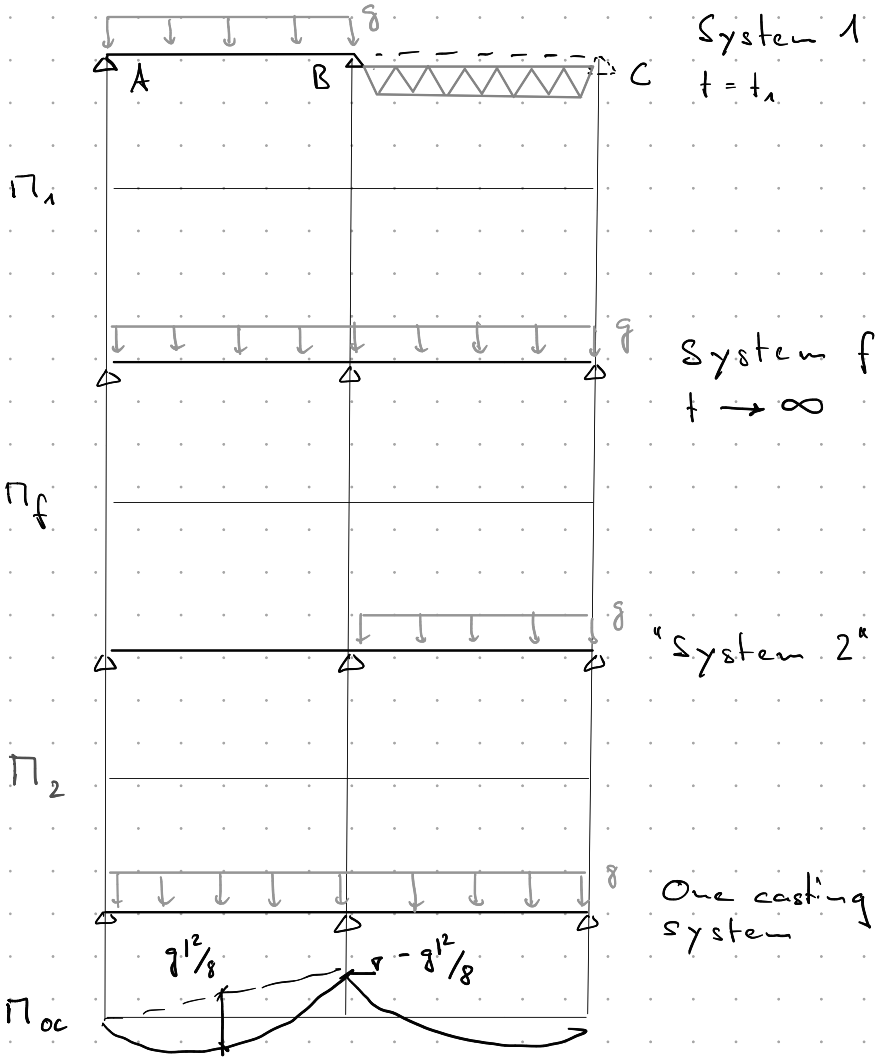
$$\delta_1 = \delta_{10}(1+\varphi) + X_1 \delta_{11}(1+\varphi) + \Delta X_1 \delta_{11}(1+\mu\varphi)$$

"tdc", $t > t_0$

$$\delta_1 = \delta_{10}(1+\varphi) + X_1 \delta_{11}(1+\varphi) + \Delta X_1(t) \delta_{11}(1+\mu\varphi)$$

staged construction

for systems of different age



System 1
$t = t_1$

System f
$t \to \infty$

"System 2"

One casting system

Approximation!

Approximation "20 : 80"