

Object: Abutment & superstructure**Number of sections** $N := 4 \text{ pcs}$ **Geometry & concrete (C30/37, C35/45, C40/50 & C45/55)**

Section	B	H	Concrete
1	12,8	0,8	C30/37
2	12,8	1,2	C30/37
3	2,6	1,2	C40/50
4	2,6	1,7	C40/50
-	m	m	-

Relative humidity $RH := 80\%$ **Time of load (i.e. removal formwork)** $t_0 := 5 \cdot \text{days}$ **Studied time for determination of shrinkage** $t_2 := 120 \text{ year}$ $t_2 = 43800 \text{ days}$ **Cement class (S, N, R)** $Klass := \text{"N"}$ **Concrete age when drying starts** $t_s := 0 \cdot \text{days}$

Input receipt

 $f_{cm} = [38 \ 38 \ 48 \ 48] \text{ MPa}$ $f_{ck} = [30 \ 30 \ 40 \ 40] \text{ MPa}$ $f_{cmo} = 10 \text{ MPa}$

Basic drying shrinkage (SS-EN 1992-1-1, section 3.1.4, see equations 3.9 and 3.1)

$$k_h := \text{linterp} \left(\left([0 \ 100 \ 200 \ 300 \ 500 \ 10^4] \cdot \text{mm} \right), [1.00 \ 1.00 \ 0.85 \ 0.75 \ 0.70 \ 0.70], h_0 \right) = \begin{bmatrix} 0.70 \\ 0.70 \\ 0.70 \\ 0.70 \end{bmatrix}$$

$$\beta_{ds} := \frac{t_2 - t_s}{t_2 - t_s + 0.04 \cdot \sqrt{\left(\frac{h_0}{\text{mm}}\right)^3}} = \begin{bmatrix} 0.98 \\ 0.96 \\ 0.96 \\ 0.94 \end{bmatrix}$$

$$\varepsilon_{cd} := \beta_{ds} \cdot k_h \cdot \varepsilon_{cd,0} = \begin{bmatrix} 1.845 \cdot 10^{-4} \\ 1.814 \cdot 10^{-4} \\ 1.609 \cdot 10^{-4} \\ 1.569 \cdot 10^{-4} \end{bmatrix}$$

Autogenous-shrinkage, see EN 1992-1-1 §3.1.4, eqns. 3.11–3.13

$$\beta_{as} := 1 - e^{-0.2 \cdot \sqrt{t_2}} = 1.00$$

$$\varepsilon_{ca,\alpha} := 2.5 \cdot \left(\frac{f_{ck}}{\text{MPa}} - 10 \right) \cdot 10^{-6} = \begin{bmatrix} 5 \cdot 10^{-5} \\ 5 \cdot 10^{-5} \\ 7.5 \cdot 10^{-5} \\ 7.5 \cdot 10^{-5} \end{bmatrix}$$

$$\varepsilon_{ca} := \beta_{as} \cdot \varepsilon_{ca,\alpha} = \begin{bmatrix} 5 \cdot 10^{-5} \\ 5 \cdot 10^{-5} \\ 7.5 \cdot 10^{-5} \\ 7.5 \cdot 10^{-5} \end{bmatrix}$$

RESULTS**Total shrinkage, see SS-EN 1992-1-1 §3.1.4, eqn. 3.8**

$$\varepsilon_{cs} := \varepsilon_{cd} + \varepsilon_{ca} = \begin{bmatrix} 2.345 \cdot 10^{-4} \\ 2.314 \cdot 10^{-4} \\ 2.359 \cdot 10^{-4} \\ 2.319 \cdot 10^{-4} \end{bmatrix}$$