

Object: Abutment & superstructure**INPUT****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 loading (i.e. removal formwork)** $t_0 := 5 \text{ days}$ **Studied time for determination of creep** $t_2 := 120 \text{ year} \quad t_2 = 43800 \text{ days}$

Input receipt

 $f_{cm} = [38 \ 38 \ 48 \ 48] \text{ MPa}$

CALCULATION**Area**

$$A_c := B \cdot H$$

Perimeter exposed to "air"

$$u := 2 \cdot B$$

Effective thickness structure

$$h_0 := \frac{2 \cdot A_c}{u}$$

Creep coefficients

The expressions for determining the creep coefficients are taken from SS-EN 1992-1-1 Annex B.1.

$$\alpha_1 := \left(\frac{35 \cdot MPa}{f_{cm}} \right)^{0.7} = \begin{bmatrix} 0.94 \\ 0.94 \\ 0.8 \\ 0.8 \end{bmatrix}$$

$$\alpha_2 := \left(\frac{35 \cdot MPa}{f_{cm}} \right)^{0.2} = \begin{bmatrix} 0.984 \\ 0.984 \\ 0.939 \\ 0.939 \end{bmatrix}$$

$$\alpha_3 := \left(\frac{35 \cdot MPa}{f_{cm}} \right)^{0.5} = \begin{bmatrix} 0.96 \\ 0.96 \\ 0.854 \\ 0.854 \end{bmatrix}$$

$$\varphi_{RH} := \begin{cases} \text{if } f_{cm} \leq 35 \text{ MPa} \\ \left| \begin{array}{l} \varphi_{RH} \leftarrow 38 \cdot MPa \\ \text{else} \\ \varphi_{RH} \leftarrow \left(1 + \frac{1 - RH}{0.1 \cdot \sqrt[3]{\frac{h_0}{mm}}} \cdot \alpha_1 \right) \cdot \alpha_2 \end{array} \right. \end{cases} \quad \varphi_{RH} = \begin{bmatrix} 1.184 \\ 1.158 \\ 1.08 \\ 1.065 \end{bmatrix}$$

$$\beta_0 := \frac{1}{0.1 + t_0^{0.20}} = 0.68$$

$$\beta_{f_{cm}} := \frac{16.8}{\sqrt{\frac{f_{cm}}{MPa}}} = \begin{bmatrix} 2.73 \\ 2.73 \\ 2.42 \\ 2.42 \end{bmatrix}$$

$$\beta_H := \begin{cases} \text{if } f_{cm} \leq 35 \cdot \text{MPa} \\ \quad \beta_{H,max} \leftarrow 1500 \\ \quad \text{if } 1.5 \cdot \left(1 + (0.012 \cdot 100 \cdot RH)^{18}\right) \cdot \frac{h_0}{mm} + 250 > \beta_{H,max} \\ \quad \quad \beta_H \leftarrow \beta_{H,max} \\ \quad \text{else} \\ \quad \quad \beta_H \leftarrow 1.5 \cdot \left(1 + (0.012 \cdot 100 \cdot RH)^{18}\right) \cdot \frac{h_0}{mm} + 250 \\ \text{if } f_{cm} > 35 \cdot \text{MPa} \\ \quad \beta_{H,max} \leftarrow 1500 \cdot \alpha_3 \\ \quad \text{if } 1.5 \cdot \left(1 + (0.012 \cdot 100 \cdot RH)^{18}\right) \cdot \frac{h_0}{mm} + 250 > \beta_{H,max} \\ \quad \quad \beta_H \leftarrow \beta_{H,max} \\ \quad \text{else} \\ \quad \quad \beta_H \leftarrow 1.5 \cdot \left(1 + (0.012 \cdot 100 \cdot RH)^{18}\right) \cdot \frac{h_0}{mm} + 250 \cdot \alpha_3 \end{cases}$$

$$\beta_H = \begin{bmatrix} 1440 \\ 1440 \\ 1281 \\ 1281 \end{bmatrix}$$

$$\beta_c := \left(\frac{t_2 - t_0}{\beta_H + t_2 - t_0} \right)^{0.3} = \begin{bmatrix} 0.99 \\ 0.99 \\ 0.99 \\ 0.99 \end{bmatrix}$$

$$\varphi_{t0} := \varphi_{RH} \cdot \beta_{fcm} \cdot \beta_0 = \begin{bmatrix} 2.18 \\ 2.13 \\ 1.77 \\ 1.75 \end{bmatrix}$$

RESULTS

$$\varphi_{t2} := \varphi_{t0} \cdot \beta_c = \begin{bmatrix} 2.16 \\ 2.11 \\ 1.76 \\ 1.73 \end{bmatrix}$$