

Shrinkage Strain following Spain's EHE 1999 structural concrete code



$f_{ck} := 35 \cdot \text{MPa}$

$HR := 70$

Relative humidity, enter in percent, i.e, 0 to 100 and without % symbol

$A_c := 900 \cdot \text{cm}^2$

section of the structural member

$u := 1.2 \text{m}$

exposed perimeter

Type := 1

1 for normal
2 for submerged structures

$t_s := 1 \cdot \text{day}$

age at which shrinkage starts



$$\beta_{HR} := \begin{cases} -1.55 \cdot \left[1 - \left(\frac{HR}{100} \right)^3 \right] & \text{if Type} = 1 \\ 0.25 & \text{otherwise} \end{cases}$$

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

$$\epsilon_s := \left(570 - 5 \cdot \frac{f_{ck}}{\text{MPa}} \right) \cdot 10^{-6} \quad \epsilon_{cs0} := \epsilon_s \cdot \beta_{HR}$$

$$\beta_s(t, t_s) := \sqrt{\frac{\frac{t - t_s}{\text{day}}}{0.035 \cdot \left(\frac{e}{\text{mm}} \right)^2 + \left(\frac{t - t_s}{\text{day}} \right)}}$$

$$\epsilon_{cs}(t, t_s) := \epsilon_{cs0} \cdot \beta_s(t, t_s)$$

$T_{\text{end}} := 100 \cdot \text{year}$

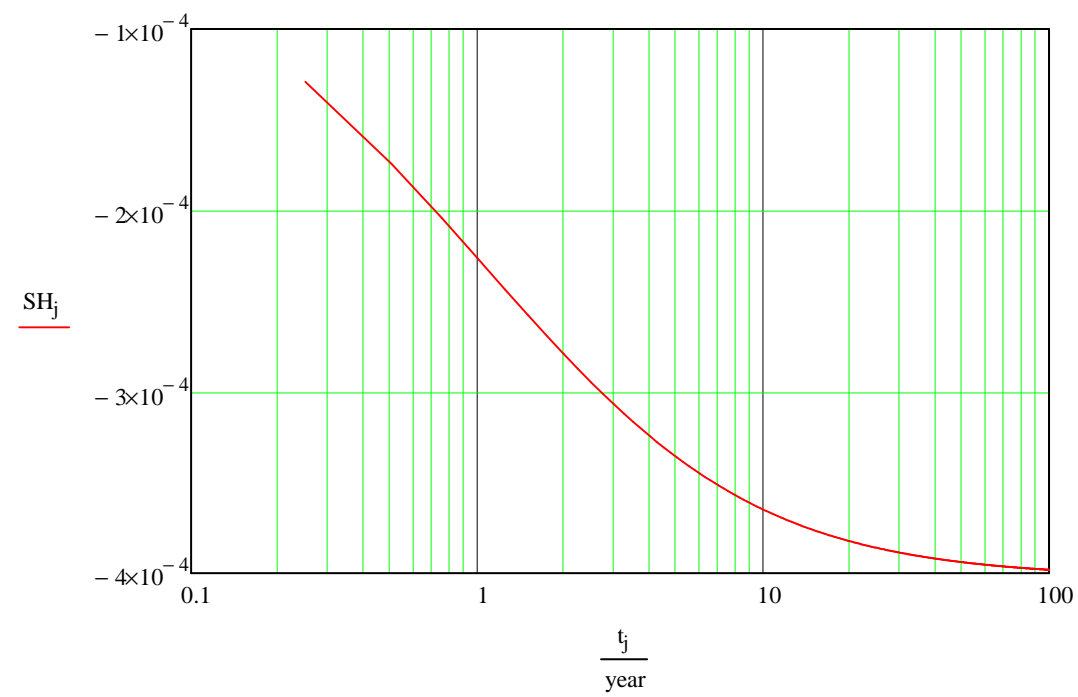
Parts := 400

$j := 1 \dots \text{Parts} + 1$

$$t_j := \frac{T_{\text{end}}}{\text{Parts}} \cdot (j - 1)$$

$$SH_j := \epsilon_{cs}(t_j, t_s)$$





- Note that the strains are represented negative and lower are bigger

$T := 50\text{-year}$ time at which the shrinkage strain is required $\epsilon_{cs}(T, t_s) = -0.000394$ the required unrestrained shrinkage strain to age

- considerably more shrinkage is predicted by EHE code than previous EP-93
- EHE seems to be more in accord with current trends