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FORMULAE - LECTURE 14

Time dependent behaviour of geomaterials

$$C_\alpha = -\frac{\Delta e}{\Delta log t} \qquad C_{\alpha\varepsilon} = \frac{\Delta\varepsilon}{\Delta \log t} = \frac{C_\alpha}{1+e_0}$$

$$\varepsilon_z^v(t) = C_{\alpha\varepsilon}\log\left(1+\frac{t}{t_i}\right)$$

$$d\varepsilon_i^e = \frac{d\sigma}{E_i} \qquad d\varepsilon_v = \frac{\sigma}{\eta}dt$$

Viscoelastic model

$$\sigma = E_i\varepsilon_i^e = \sigma = E_v\varepsilon_v^e + \eta\dot{\varepsilon}_v^e$$

$$\varepsilon = \varepsilon_i^e + \varepsilon_v^e = \frac{\sigma}{E_i} + \frac{\sigma}{E_v}\left(1-e^{-t/t_r}\right) \qquad t_r = \frac{\eta}{E_v}$$

Elastic visco-plastic model

$$\varepsilon = \varepsilon_i^e + \varepsilon_v^p$$

Maxwell model

$$\varepsilon = \frac{\sigma}{E_i} + \frac{\sigma}{\eta}t$$

Bingham model

if $\sigma < \sigma_{pc}$ → $\varepsilon = \varepsilon_i^e = \dfrac{\sigma}{E_i}$

if $\sigma > \sigma_{pc}$ → $\varepsilon = \dfrac{\sigma}{E_i} + \dfrac{\sigma - \sigma_{pc}}{\eta}t$