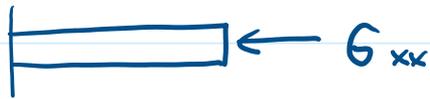


Constitutive Relation

2019년 7월 15일 월요일 오후 11:34

Constitutive relation = Relation between Stress and Strain



$$\sigma_{xx} = E \epsilon_{xx}$$

↑ Effective stress ↑ Young's modulus

rock strain

Thermal stress and strain



30°C → 60°C → expansion → stress? → $\sigma_{Th} = 0$

Why? it's not constrained (not fixed)



30°C → 60°C → expansion → fixed → compressive stress

$$\epsilon_{Th} = \beta_r \Delta T$$

thermal strain linear thermal expansion coefficient

$$E \epsilon_{xx} = \sigma + E \beta_r \Delta T \rightarrow \sigma = E \epsilon_{xx} - E \beta_r \Delta T = E (\epsilon_{xx} - \beta_r \Delta T)$$

Is this relation valid for a 3D body?

No. Why? See the material.

For 3D,

$$\sigma = C : [\epsilon - \beta_r \Delta T I]$$