Thermal Strains

Effect of temperature:

two folds → properties = f(T) ⇐ negligible for "normal" ΔT

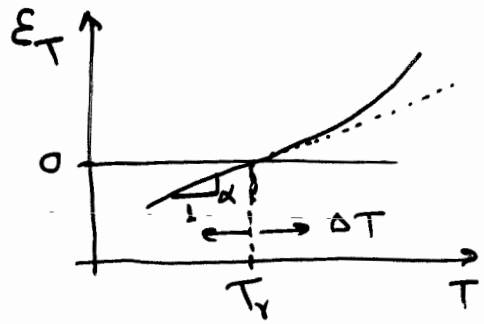
→ strain produced (w/ or w/o stress)

$$\varepsilon_T = \frac{\Delta l}{l_0}$$

$$\Delta T = T_t - T_r$$

where T_t is Temp. at anytime t

T_r is the reference temp.



α = linear coefficient of thermal expansion

(mm/mm °C or in/in °F)

$$\varepsilon_T = \alpha \Delta T \qquad [\![\Rightarrow \delta_T = \varepsilon_T L = \alpha \Delta T L]\!]$$

$$\varepsilon_{total} = \underset{\substack{\Downarrow \\ \text{loads}}}{\varepsilon_{mechanical}} + \underset{\substack{\Downarrow \\ \text{temp.}}}{\varepsilon_{thermal}}$$