Exercise 1: invert the thermo-elastic constitutive relation of strains in terms of stresses,

$$\varepsilon_{ij} = \frac{1}{2\mu}\left(\sigma_{ij} - \frac{\lambda}{3\lambda+2\mu}\sigma_{kk}\delta_{ij}\right) + \alpha\left(T - T_0\right)\delta_{ij}$$

to obtain the thermos-elastic relation of stresses in terms of strains,

$$\sigma_{ij} = \lambda\varepsilon_{kk}\delta_{ij} + 2\mu\varepsilon_{ij} - (3\lambda+2\mu)\alpha\left(T - T_0\right)\delta_{ij}$$

Exercise 2: Use the stress in terms of strain relations in Exercise 1 to express the strain energy density

$$W = \frac{1}{2}\varepsilon_{ij}\sigma_{ij}$$

in terms of strains for a thermoelastic solid.

Exercise 3: Calculate the stresses in the cupper (*Cu*) and steel (Ac) stress as well as the changes in the height Δh of the two rigid plates when the temperature of the assembly in the Figure is increased by ΔT.
During the thermal loading:
(a) there is no friction along the interface between the two materials. (b) two rigid plates remain parallel. (c) we consider $h >> d$ and the horizontal stresses negligible.

The sections and the material properties are known:
$Cu\ (\alpha_1, E_1, F_1)$, $Ac\ (\alpha_2, E_2, F_2)$ with $\alpha_1 > \alpha_2$.