

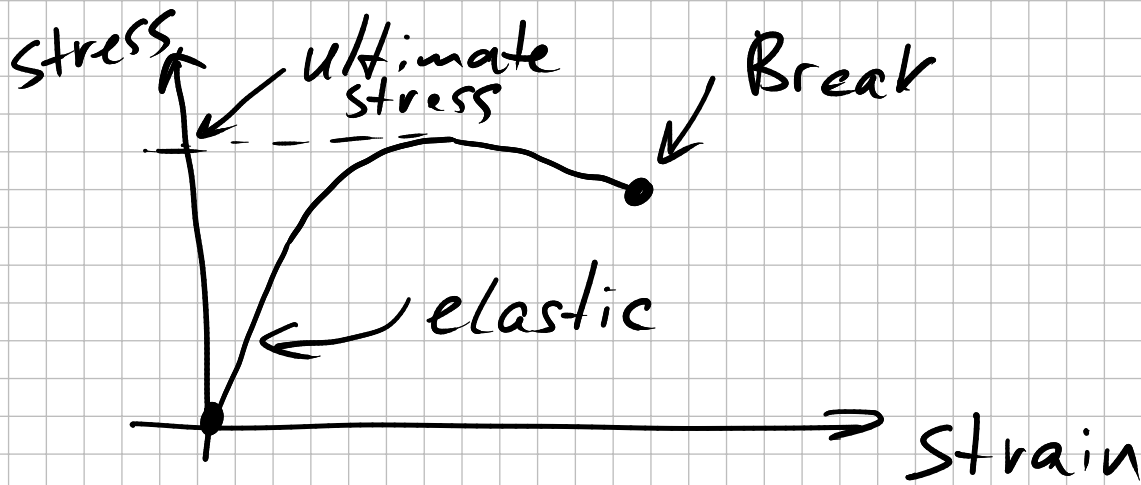
Strength of material

$$\text{Strain} = \frac{\Delta L}{L}, \frac{\Delta V}{V}, \frac{\Delta A}{A}$$

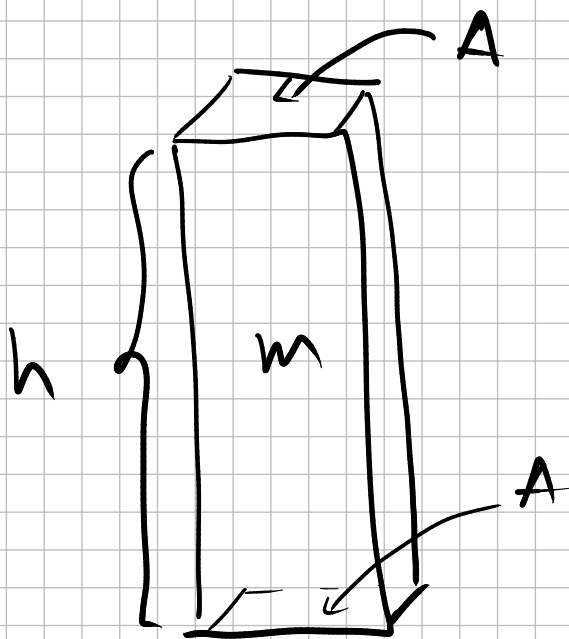
Unitless

↑ change of an object
measure

$$\text{Stress} = \frac{\text{Force}}{\text{Area}} = \left[\frac{\text{N}}{\text{m}^2} \right] = [\text{Pa}]_{\text{scale}}$$



Tallest object



$$F = mg$$

$$\text{density} = \frac{m}{V} = \rho$$

$$\text{Stress}_{\text{ult}} = \frac{F}{A}$$

$$S_{\text{ult}} = \frac{F}{A} = \frac{mg}{A} = \frac{\rho \cdot V \cdot g}{A}$$

$$= \frac{\cancel{\rho} \cdot \cancel{A} \cdot h \cdot g}{\cancel{A}}$$

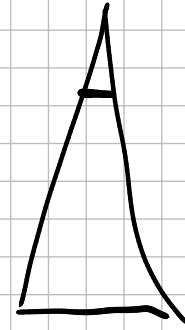
$$h_{\text{max}} = \frac{S_{\text{ult}}}{\rho \cdot g} = \frac{200 \cdot 10^6}{2400 \cdot 10} \approx$$

$$S_{\text{granite}} = 200 \cdot 10^6 \text{ Pa}$$
$$\rho = 2400 \frac{\text{kg}}{\text{m}^3}$$

$$\approx \frac{20 \cdot 10^7}{24 \cdot 10^3}$$
$$\approx 0.8 \cdot 10^4 \text{ m} \approx 8 \text{ km}$$

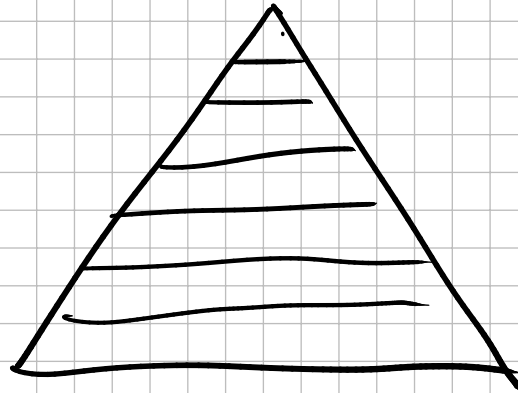
$$S_{\text{concrete}} \approx 20 \cdot 10^6 \text{ Pa}$$

$$\Rightarrow h_{\text{concrete}} \approx 800 \text{ m}$$

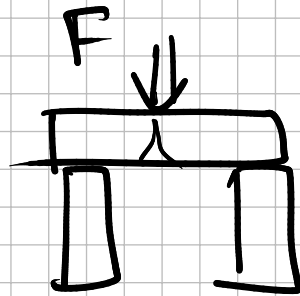


History of buildings

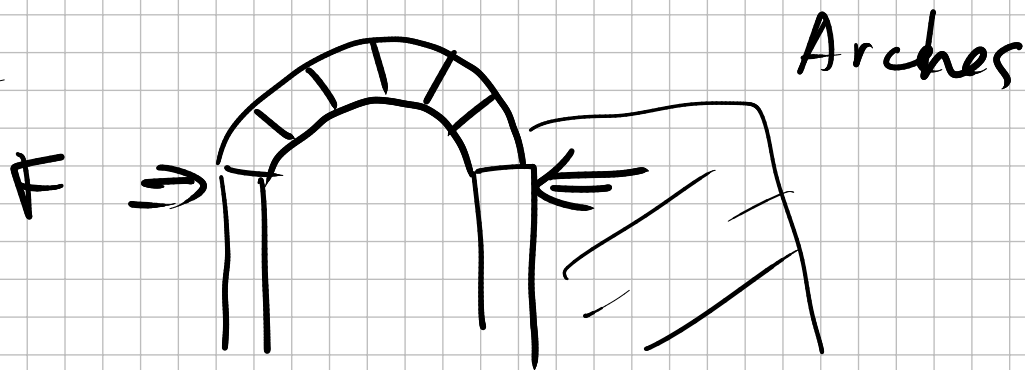
Ancient Egypt



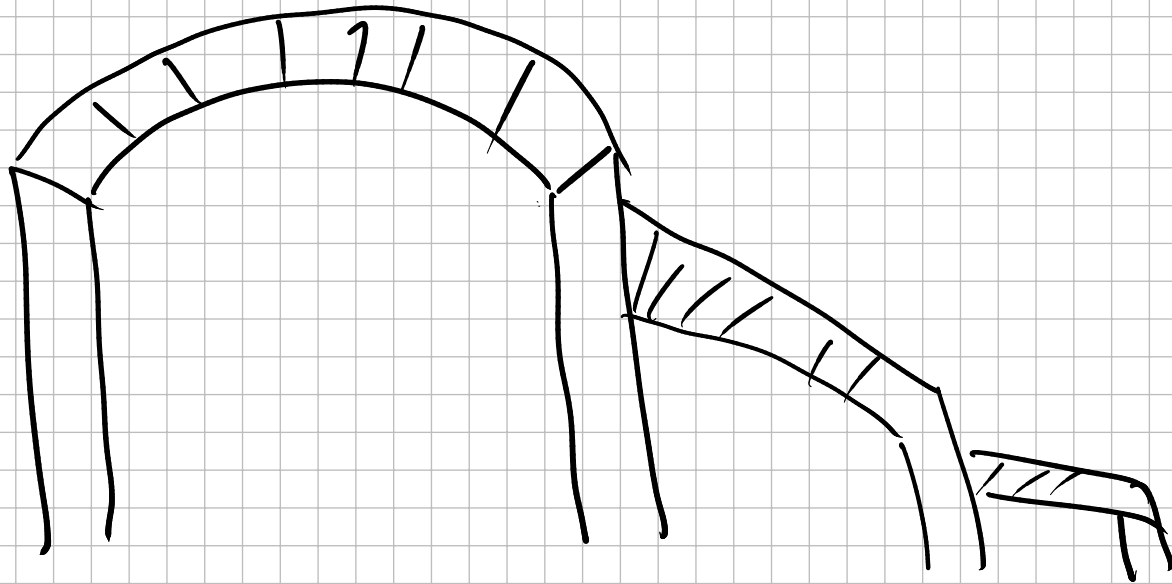
Greeks



Rome

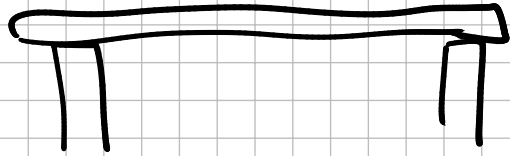


Gothic invention

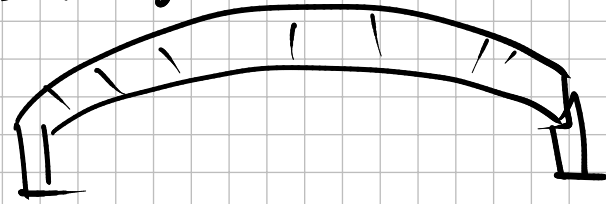


Bridges

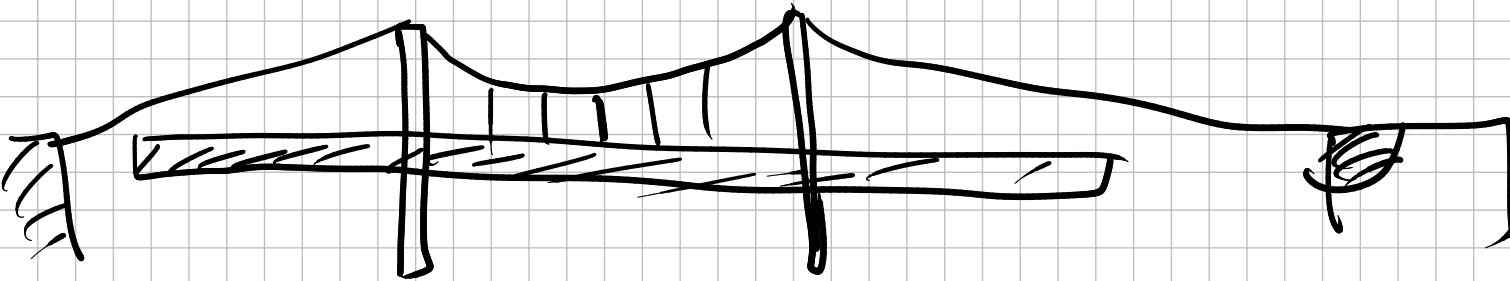
Compressive strength



=>



Suspension bridges



Truss

