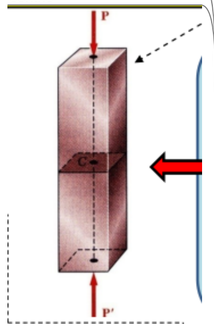
Intro to Stress

Stress types

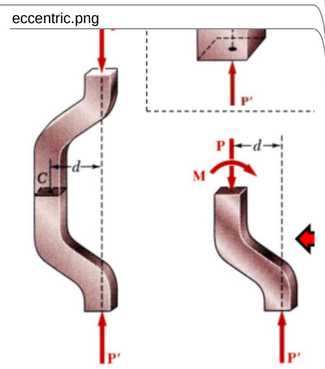
- Normal
  - Force normal to cross section
- Shear
  - Force parallel to cross section
  - Single
  - Double
- Bearing

Normal Load

- Centric
  - line of action of the resultant internal forces passes through the centroid
  - Uniform distribution of stress is possbile in this case, where the concetrated loads on the end sections of the two force memers are applied at the section centroids
  - centric

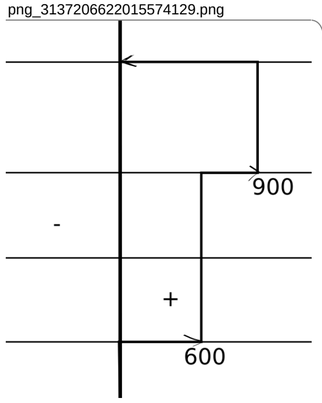


- when it doesn't
  - so the stress distribution in a section yields an axial force and a moment
- Eccentric
  - eccentrically loaded members' stress cannot be uniform or symmetric
  - eccentric.png

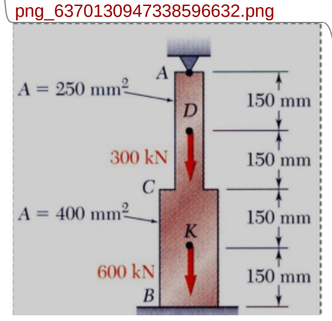


Normal Force Diagram

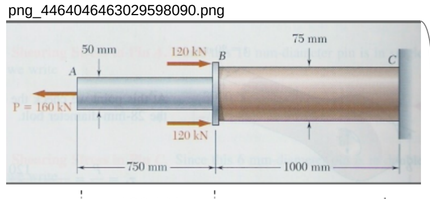
- Vertical
  - png_3137206622015574129.png

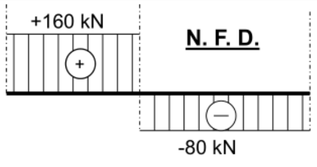


  - png_6370130947338596632.png



- Horizontal
  - png_4464046463029598090.png





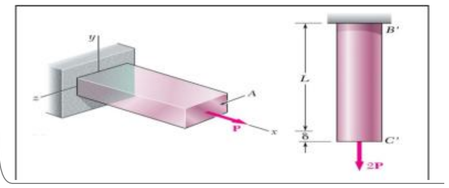
Strength of Materials

The branch of applied mechanics that deals with the behavior of elastic bodies subjected to various types of loading

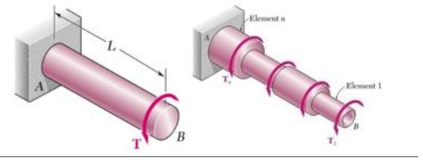
- Bodies are components of a
  - machine
  - or a structure

Types of loading

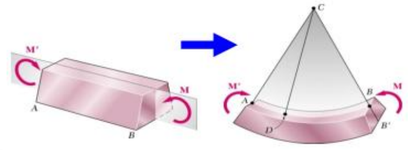
- Axial **in Bars**



- Torsion **in Shafts**



- Bending **in Beams**



Design Vs Analysis

- Design
  - to take a load and design/create a structure that can hold that load, so the structure does not exist yet
- Analyze
  - to check if the dimensions and the material that already exist is able to handle that load ?

Stress

$$\sigma = \lim_{\Delta A \to 0} \frac{\Delta F}{\Delta A} = N/m^2$$

$$\sigma_{ave} = \frac{P}{A}$$

normal stress at a point may not be equal to **average** stress but the **resultant** of the stress ditribution

$$P = \sigma_{ave} \cdot A = \int_A \sigma \, dA$$