CIV1000 Bending

The Lab

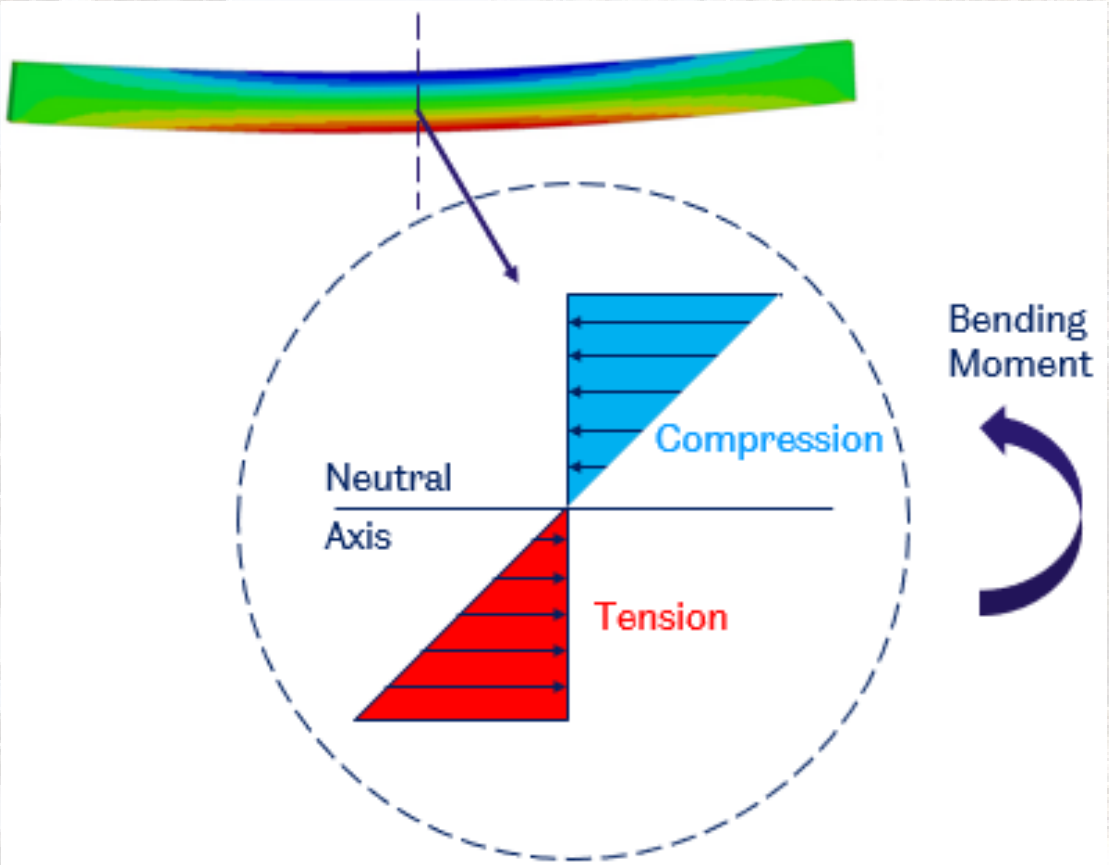
- Learning outcomes:
  - Conduct mechanical tests to inform your understanding of bending theory
  - Understand experimental design to select the most appropriate solution
  - Analyse data and compare it to theoretical models

Context

- Beam bending theory is fundamental in Civil Eng.
- A solid understanding will serve you well in future!

Background

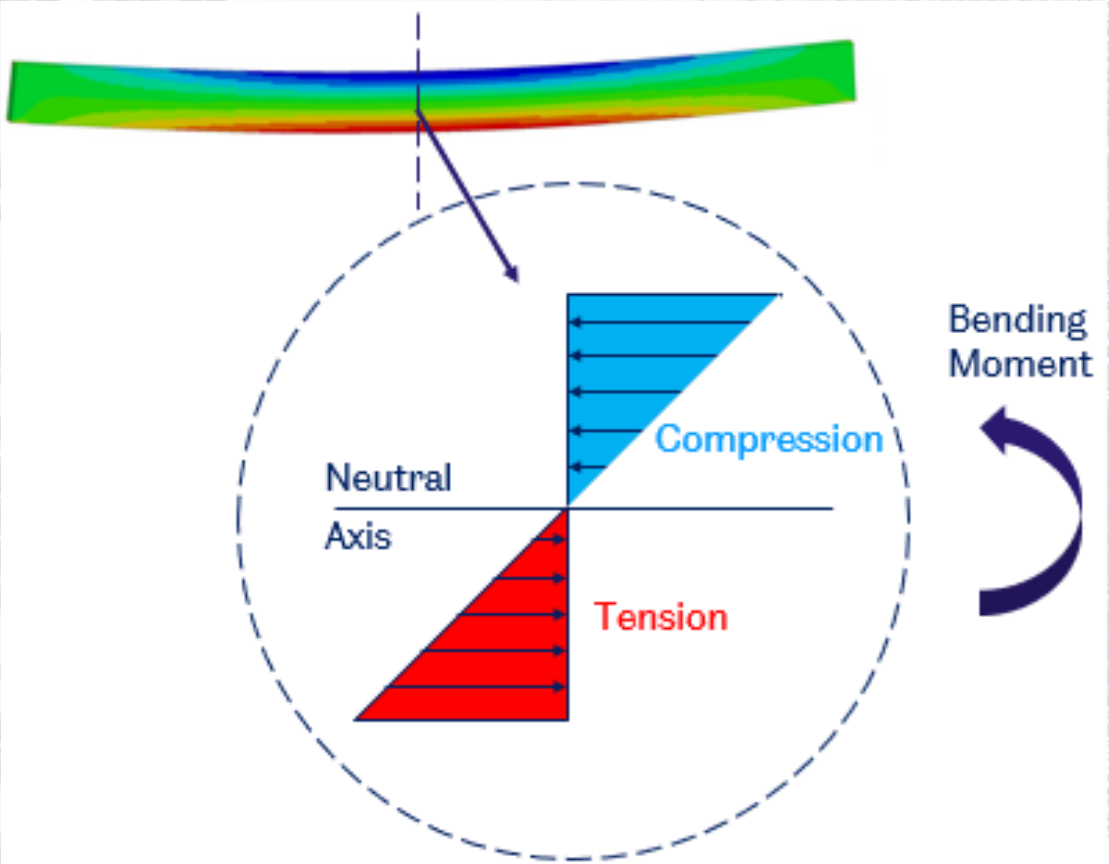
- Elastic bending stresses form when a moment is applied



Background

- Bending stress reduces for larger Second Moment of Area, I

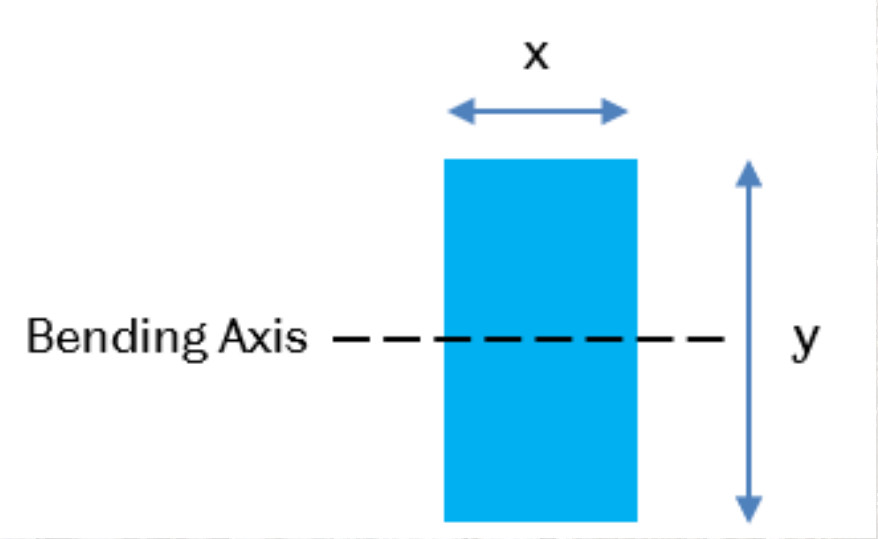
$$\sigma_{bend} = \frac{My}{I}$$



Background

- Second Moment of Area, I

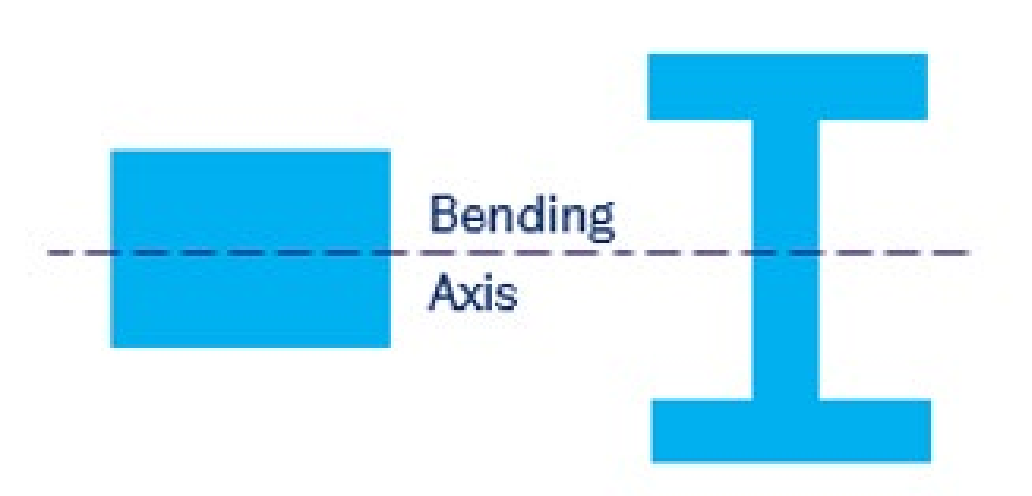
$$I = \iint y^2 . dx . dy$$



Background

- Second Moment of Area, I

$$I = \iint y^2 . dx . dy$$



$$I_{Rectangle} = \frac{x . y^3}{12}$$

Background

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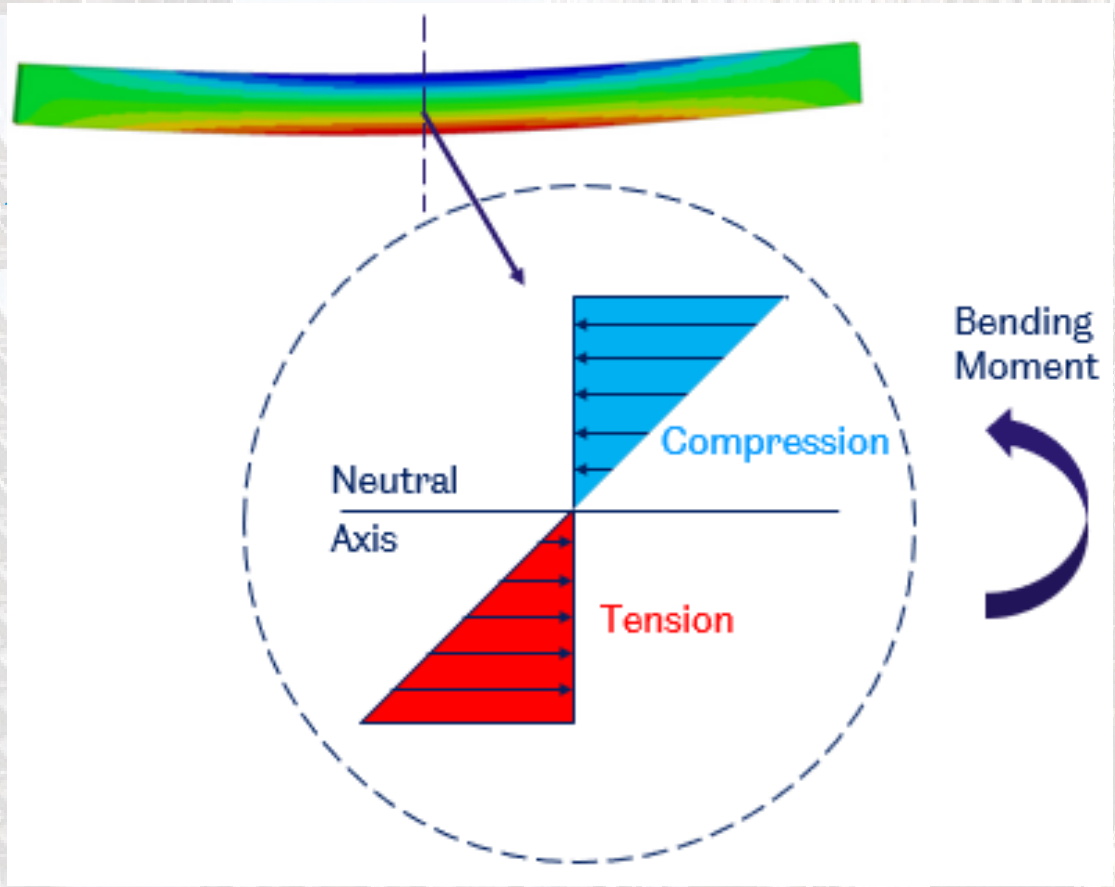
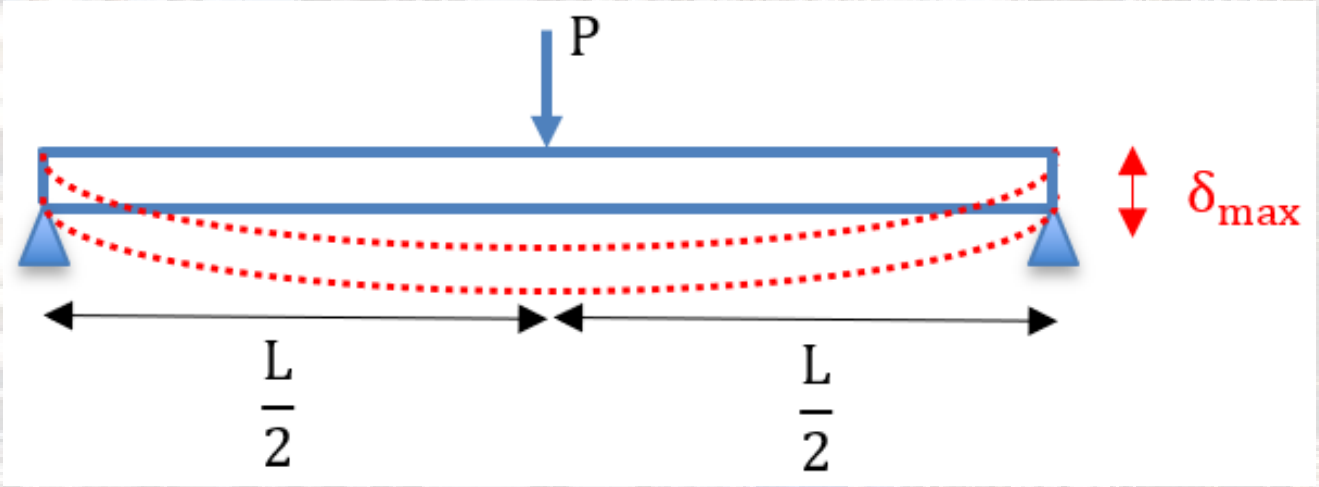
$$\sigma_{bend} = \frac{My}{I}$$



Background

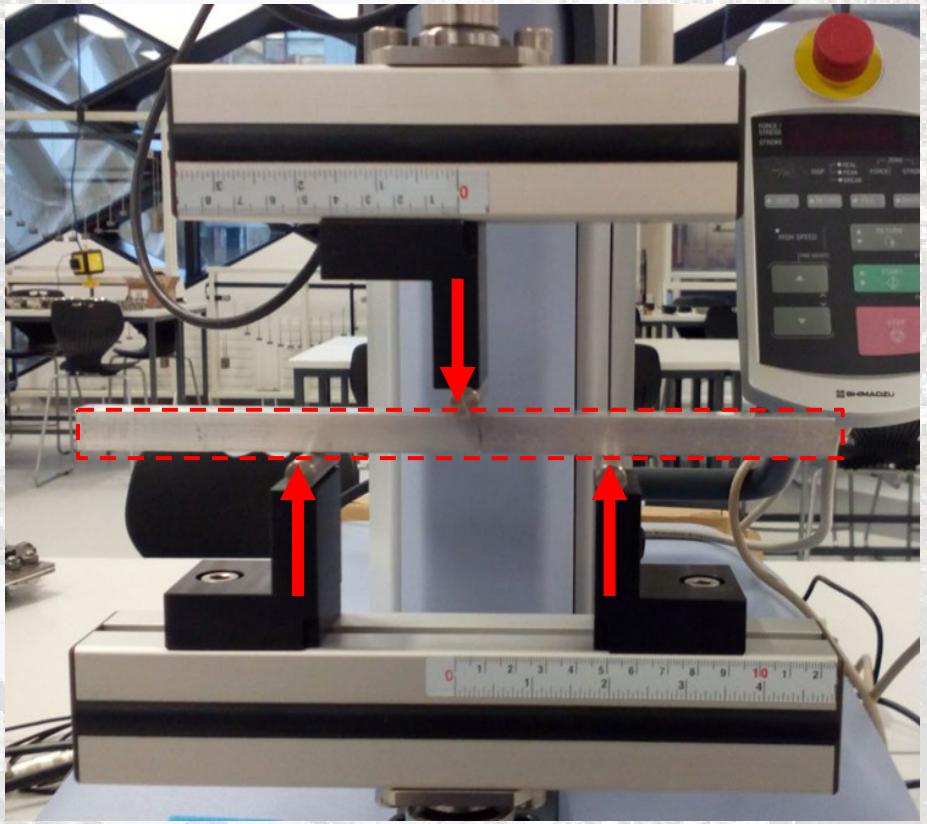
- Bending deflections also reduce for larger Second Moment of Area, I

$$\delta = \frac{P.L^3}{48.E.I}$$



The Lab

- Plan:
  - **Step 1 – Calculate predictions**
    (xlsx file > I, deflection)
  - **Step 2 – Load tests**
    (and comparison)
  - **Step 3 – Discussion Questions**



The Lab

- Plan:
  - **Step 1 – Calculate predictions**
    (xlsx file > I, deflection)
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- Keep it safe! > Goggles