

**MECH 353 Assignment 11**  
Due: Friday 2 May 2025 @ start of class

Reading assignment

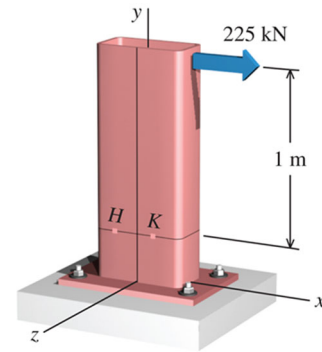
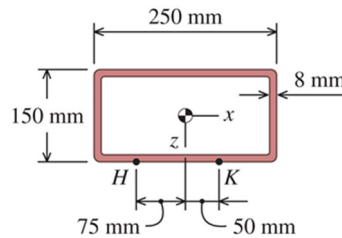
- Read textbook sections 10.5-10.6 (Failure theory); 10.1-10.3 (Strain Energy);

Problems

- Failure Theories (§10.6): **42, P2**
- Strain Energy (§10.1-10.3): **P3, 4**

**P2.** The structural steel member has the hollow cross-section shown ( $I_z = 52.24 (10^6) \text{ mm}^4$ ). The yield strength of the steel is  $\sigma_{yd} = 320 \text{ MPa}$ . Determine:

- The von Mises equivalent stresses at points  $H$  and  $K$ .
- The factors of safety at points  $H$  and  $K$  predicted by the maximum-distortion-energy (von Mises) theory.



**P3.** Aluminum ( $E = 70 \text{ GPa}$ ) members  $AD$  and  $CE$  support rigid bar  $ABC$ .  $AD$  has a cross-sectional area of  $300 \text{ mm}^2$  and  $CE$  has a cross-sectional area of  $450 \text{ mm}^2$ . The system is originally stress free with  $ABC$  horizontal.

If a load  $F = 55 \text{ kN}$  is then applied as shown:

- Compute the strain energy in the system.
- Determine the deflection of  $B$  using work and energy.
- Determine the deflection of  $B$  using equilibrium and the appropriate deformation equation (compatibility).

