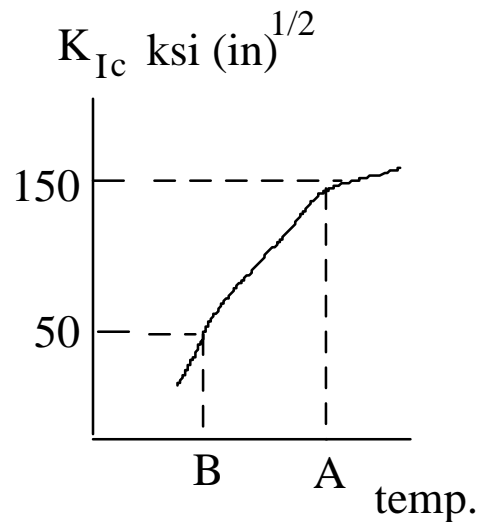
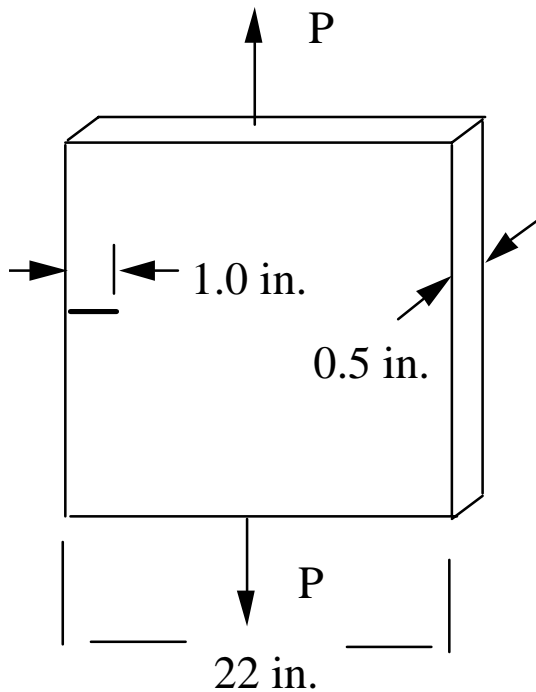


Fracture Mechanics Problems

- Do problem 3.5.5 in the text
- A thin-walled cylindrical pressure vessel with closed ends carries an internal pressure, p . The radius of the vessel is 300 mm and the wall thickness is 20 mm. The plane strain fracture toughness of the vessel is $K_{Ic} = 77 \text{ MPa}\sqrt{\text{m}}$. Determine the pressure at which the vessel will fracture if
 - a 25 mm long through-thickness crack exists in the vessel along the longitudinal axis of the vessel
 - a 25 mm long through-thickness crack exists in the vessel in the circumference (hoop) direction
- A structural steel having a yield stress $\sigma_y = 60 \text{ ksi}$ is used at temperature A in the summer and temperature B in the winter. A large plate of this material is loaded by an axial load P . Determine the maximum load the plate can carry if a) it is uncracked and we consider fail by slip, and b) it is cracked and we consider failure by brittle fracture at temperatures A and B.



4. Determine the maximum load the plate shown can carry without failure by fracture given that the plane strain fracture toughness is $K_{Ic} = 185 \text{ ksi} \sqrt{\text{in}}$.

