

8.5 This problem asks us to determine whether or not the 4340 steel alloy specimen will fracture when exposed to a stress of 1030 MPa, given the values of  $K_{Ic}$ ,  $Y$ , and the largest value of  $a$  in the material. This requires that we solve for  $\sigma_c$  from Equation 8.6. Thus

$$\sigma_c = \frac{K_{Ic}}{Y\sqrt{\pi a}} = \frac{54.8 \text{ MPa}\sqrt{\text{m}}}{(1.0)\sqrt{(\pi)(0.5 \times 10^{-3} \text{ m})}} = 1380 \text{ MPa} \quad (199,500 \text{ psi})$$

Therefore, fracture will *not* occur because this specimen will tolerate a stress of 1380 MPa (199,500 psi) before fracture, which is greater than the applied stress of 1030 MPa (150,000 psi).