Name:

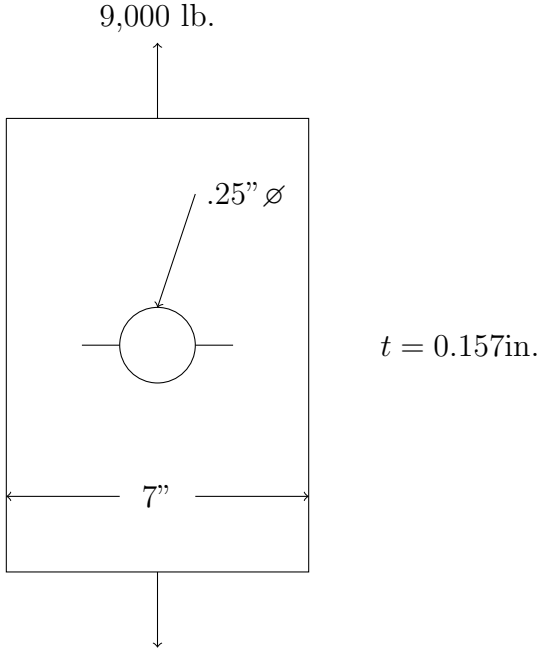
Homework 1

Due 28 Jan 2022

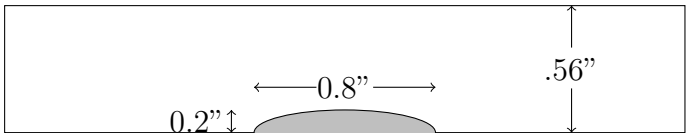
1. Define *stress intensity*

2. (a) Determine the value of K_I for a center-cracked panel with $W/2a = 4$ and a uniformly applied remote stress, σ.
   (b) Determine the value of K_I for an edge-cracked panel with $W/a = 4$ and a uniformly applied remote stress, σ.
   (c) Compare these two results. Note that in both cases the panel width to crack length ratio is the same. Why do you think these results are different?

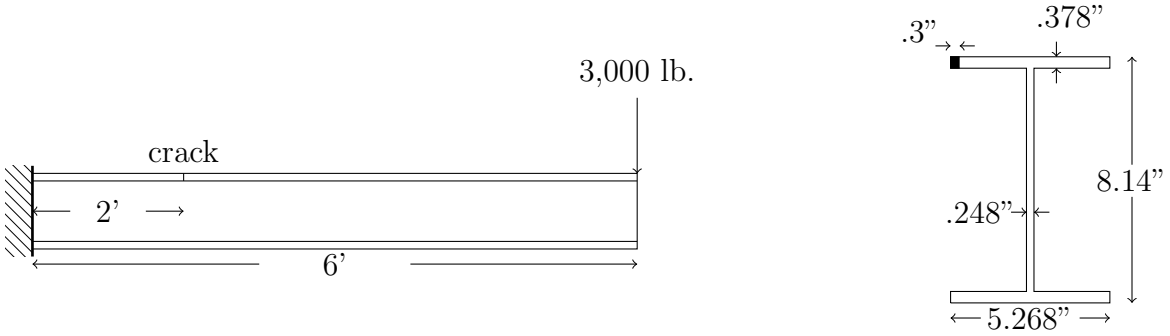
3. For the plate shown below, determine K_I for the following conditions
   (a) There is a .125" thru crack on one side of the hole.
   (b) There are .125" thru cracks on both sides of the hole.
   (c) There is a quarter circular crack of .125" radius on one side of the hole.



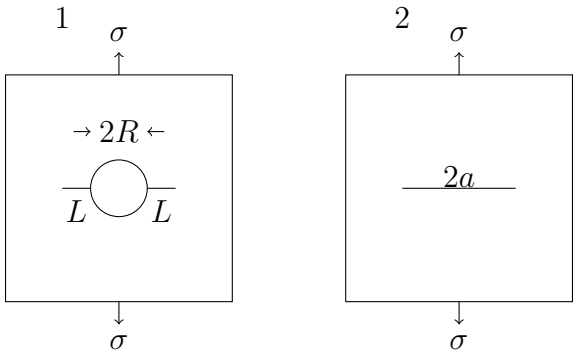
4. The panel shown below has a semi-elliptical surface flaw. Determine the maximum value for K_I if the normal stress in the crack opening direction is 20 kpsi.



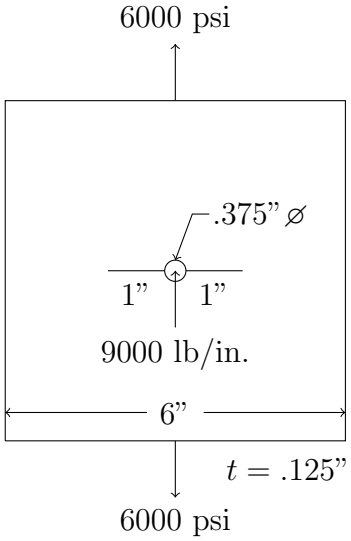
5. An aluminum beam has a 0.3” crack in the upper flange as shown. Estimate the stress intensity.



6. Compare the stress intensities of the two cases where $2a = 2L + 2R$.



7. The panel shown has a remote bypass stress of 6000 psi and a fastener load of 9000 lb/in. of thickness. Determine the stress intensity.



8. Quite often, and sometimes in poor judgment, the expression

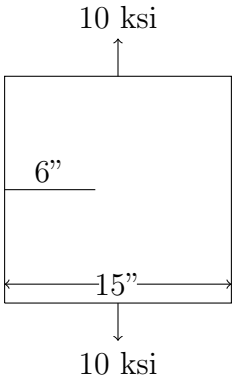
$$K_I = 1.12\sigma\sqrt{\pi a}$$

is used for the configuration shown, where 1.12 is called the back surface correction. Determine the stress intensity for

(a) $K_I = 1.12\sigma\sqrt{\pi a}$

(b) $K_I = \sigma\sqrt{\pi a}\beta$

and compare results.



9. Determine the stress intensity if:
   (a) The crack is a thru crack
   (b) The crack is a quarter circular corner crack