Thermal Strain:

Superposition:

$$δ\_{th}-δ\_{st}=0$$

$$δ\_{th}=\frac{PL}{AE}$$

$$α∆TL=\frac{PL}{AE}$$

$$⇒σ\_{th}=α∆TE$$

Solving when $∆T=470C$

$$⇒σ\_{th}=480.8MPa$$

Critical Crack Length:

$$σY\sqrt{πa}=K\_{IC}$$

$$480MPa\*1\*\sqrt{πa}=6.1MPa\sqrt{m}$$

$$⇒a=.05mm$$