

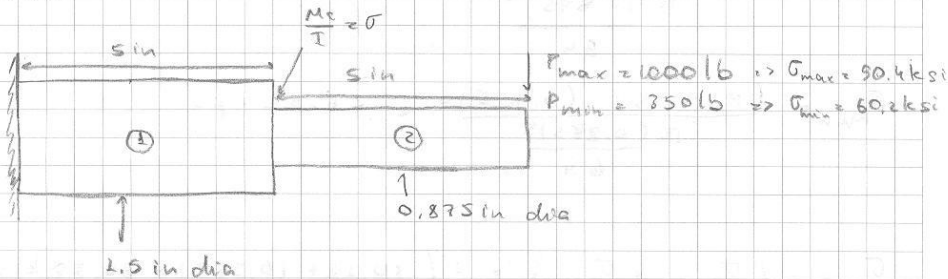
Material UNS
G41200 Steel

Notch sensitivity
 $q=0.3$

Will the beam have infinite life?

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Given



UNS G41200 steel.

notch sensitivity $q = 0.3$

Find:

Will the beam have infinity life?

1 Analysis:

Calculate the Material Prop.

$$S_e = k_a k_b k_c k_d S_e'$$

$$S_e' = 0.5 \cdot S_{ut} \quad S_{ut} = 216 \text{ ksi}$$

$$S_e = S_e' = 0.5 \cdot 216 \text{ ksi} = 108 \text{ ksi} //$$

Goodman line

$$K_t = 1.62$$

$$K_f = 1 + p(K_t - 1)$$

$$K_f = 1.18 //$$

at 1

$$\sigma_{max} = \frac{(P_{max} \cdot 10) \cdot (1.5) / z}{\frac{\pi (1.5)^4}{64}} = 30.18 \text{ ksi}$$

$$\sigma_{min} = \frac{(P_{min} \cdot 10) \cdot (1.5) / z}{\frac{\pi (1.5)^4}{64}} = 10.563 \text{ ksi}$$

at ②

$$\sigma_{max} = \frac{(P_{max} \cdot S) - (0,875)/2}{\pi \cdot (0,895)^4} = 76,023 \text{ kpsi}$$

$$\sigma_{min} = \frac{(P_{min} \cdot S) - (0,875)/2}{\pi \cdot (0,895)^4} = 26,61 \text{ kpsi}$$

$$\sigma_{m1} = \frac{1}{2} (\sigma_{max1} + \sigma_{min1}) = \frac{1}{2} (30,18 + 10,563) = 20,35 \text{ kpsi}$$

$$\sigma_{a1} = \frac{1}{2} (\sigma_{max1} - \sigma_{min1}) = \frac{1}{2} (30,18 - 10,563) = 9,81 \text{ kpsi}$$

$$\sigma_{m2} = \frac{1}{2} (\sigma_{max2} + \sigma_{min2}) = \frac{1}{2} (76,023 + 26,61) = 51,32 \text{ kpsi}$$

$$\sigma_{a2} = \frac{1}{2} (\sigma_{max2} - \sigma_{min2}) = \frac{1}{2} (76,023 - 26,61) = 24,7065 \text{ kpsi}$$

$$N_{f1} = \frac{1}{\frac{K_f \sigma_{a1}}{S_e} + \frac{\sigma_{m1}}{S_{ut}}} = \frac{1}{\frac{1,18 \cdot 9,81}{58} + \frac{20,35}{116}} = 2,68 \text{ 4}$$

$$N_{f2} = \frac{1}{\frac{K_f \sigma_{a2}}{S_e} + \frac{\sigma_{m2}}{S_{ut}}} = \frac{1}{\frac{1,18 \cdot 24,71}{58} + \frac{51,32}{116}} = 1,05 \text{ 4}$$