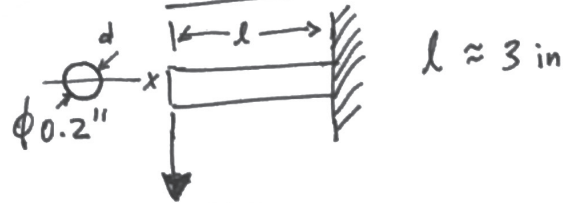




Flexural stress
on this fastener?

SIMPLE CANTILEVER BENDING



- $F = \text{Weight of guitar} \approx 8 \text{ lbs}$
- Fastener looks like a 10-24 screw, which is about 0.2" in diameter.
- FLEXURAL STRESS = $\sigma_f = \frac{M y}{I_x}$

where $M = \text{MOMENT} = F \cdot l = 8 \text{ lb} \cdot 3 \text{ in} = 24 \text{ lb} \cdot \text{in}$

$y = \frac{1}{2} \text{ diameter} = 0.1 \text{ in.}$

$I_x = \text{Second moment of area about x-axis} = \frac{\pi}{4} r^4 = \frac{\pi}{64} d^4$
(area moment of inertia)

$$\sigma_f \approx \frac{24 \text{ lb} \cdot \text{in} (0.1 \text{ in})}{\frac{\pi}{64} (0.2 \text{ in})^4} = 30,500 \text{ psi or about } \underline{\underline{30 \text{ ksi}}}$$

This seems a bit high — actual stress is likely lower due to the black collar, which would re-distribute the force over more area. Still, 30 ksi is less than the yield strength of mild steel.

cross section in bending

