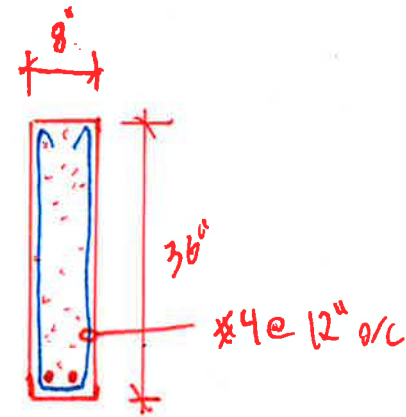
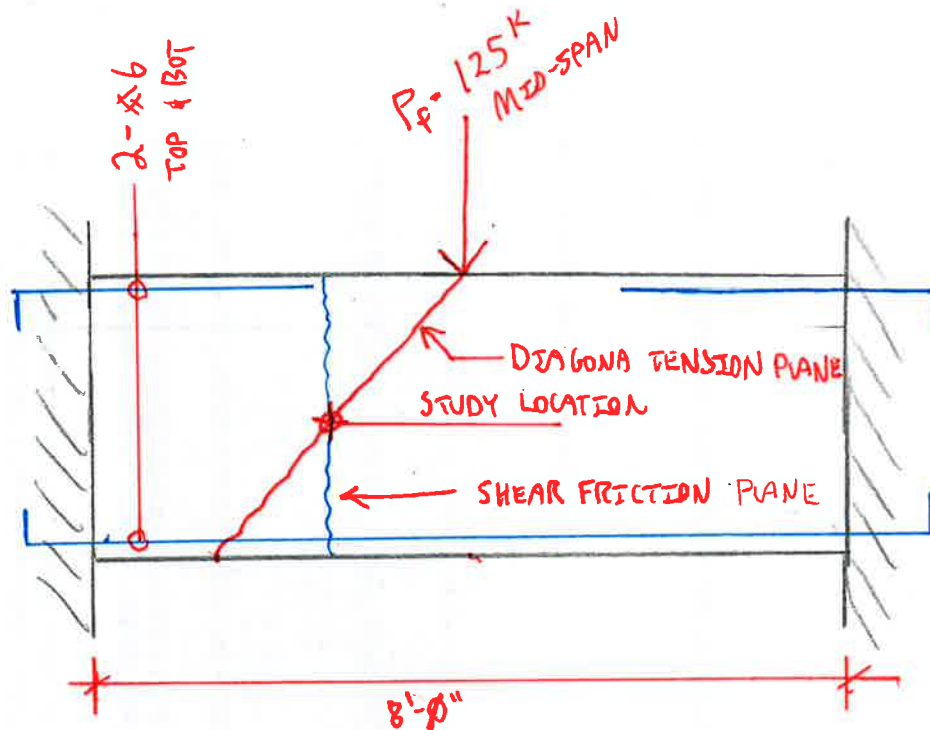




$$M_f = 125 \text{ K}\cdot\text{ft}$$

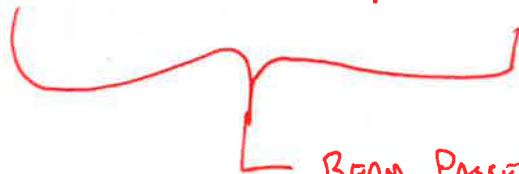
$$\phi M_n = 129 \text{ K}\cdot\text{ft}$$

$$V_f = 62.5 \text{ K}$$

$$\phi V_c + \phi V_s = \phi V_{n\text{-DIAGONAL TENSION}} = 73.1 \text{ K}$$

$$\phi V_{n\text{-SHEAR FRICTION}} = 55.7 \text{ K}$$

$$\therefore \phi V_{n\text{-SF}} < V_f < \phi V_{n\text{-DT}}$$



BEAM PASSED CONVENTIONAL
SHEAR CHECK BUT FAILS
SHEAR FRICTION

$$f'_c := 3500 \text{psi} \quad s_s := 12 \text{in}$$

$$b := 8 \text{in} \quad n := 2 \quad \phi_v := 0.75$$

$$b_f := 8 \text{in}$$

$$h := 36 \text{in} \quad \phi_s := 0.9$$

$$d := h - 2.5 \text{in} = 33.5 \text{in} \quad f_y := 60 \text{ksi} \quad \phi_c := 0.65$$

$$A_{\text{stirrup}} := \frac{\pi}{4} \cdot \left(\frac{4}{8} \text{in} \right)^2 = 0.196 \text{in}^2 \quad A_v := 2 \cdot A_{\text{stirrup}}$$

$$A_{\text{bot_bar}} := \frac{\pi}{4} \cdot \left(\frac{6}{8} \text{in} \right)^2 = 0.442 \text{in}^2$$

$$V_c := 2 \cdot \sqrt{\frac{f'_c}{\text{psi}}} \cdot \text{psi} \cdot b \cdot d = 31.71 \text{kip}$$

$$V_s := \frac{A_v \cdot f_y \cdot d}{s} = 65.777 \text{kip}$$

$$\phi V_{n_dt} := \phi_v \cdot (V_c + V_s) = 73.115 \text{kip}$$

$$A_{vf} := n \cdot A_{\text{bot_bar}} = 0.884 \text{in}^2$$

$$\mu := 1.4$$

$$\phi V_{n_sf} := \phi_v \cdot A_{vf} \cdot f_y \cdot \mu = 55.665 \text{kip}$$

$$A_s := n \cdot A_{\text{bot_bar}} = 0.884 \text{in}^2$$

$$\phi M_n := \phi_s \cdot A_s \cdot f_y \cdot \left(d - \frac{A_s \cdot f_y}{0.85 f'_c \cdot b_f} \cdot \frac{1}{2} \right) = 128.77 \text{kip} \cdot \text{ft}$$