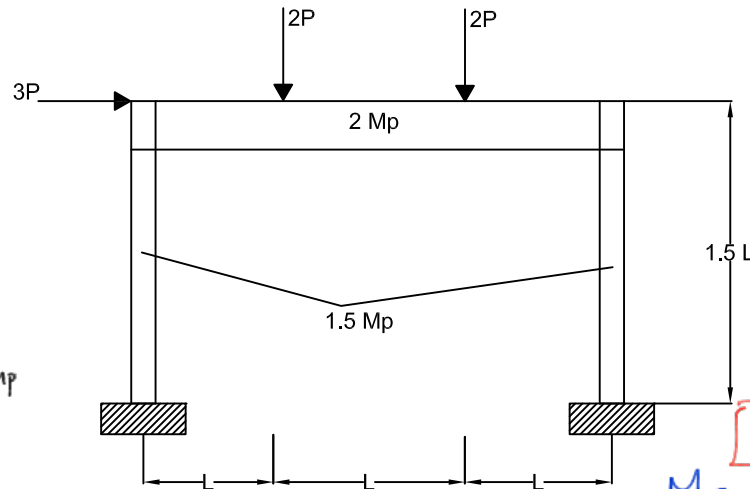


PROBLEMA 3. (35 pts)

Para el marco rígido mostrado, determine la carga última, escoja un perfil más económico que puede soportar las cargas si $P = 8 \text{ k}$ y $L = 10 \text{ ft}$

$\sigma_y = 50 \text{ ksi}$, $f = 1.14$



Para la columna

$$1.5 M_p = 1.5 (872.73 \text{ k-in})$$

$$S = \frac{1309.1 \text{ k-in}}{(50 \text{ ksi})(1.14)} = 22.96 \text{ in}^3$$

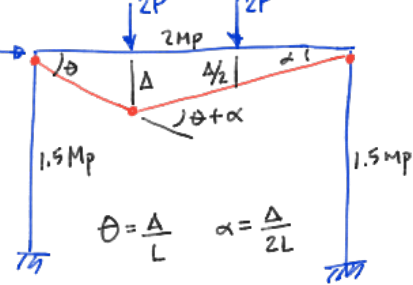
Para la Viga

$$2 M_p = 2 (872.73 \text{ k-in})$$

$$S = \frac{1745.45}{(50)(1.14)} = 30.62 \text{ in}^3$$

W14X26 cols y VIGA

Mecanismo de viga



$$W_{ext} = W_{int}$$

$$2P\Delta + 2P(\frac{\Delta}{2}) = 1.5M_p\theta + 2M_p(\theta + \alpha) + 1.5M_p\alpha$$

$$2P\Delta + P\Delta = 1.5M_p(\frac{\Delta}{L}) + 2M_p(\frac{\Delta}{L} + \frac{\Delta}{2L}) + 1.5M_p(\frac{\Delta}{2L})$$

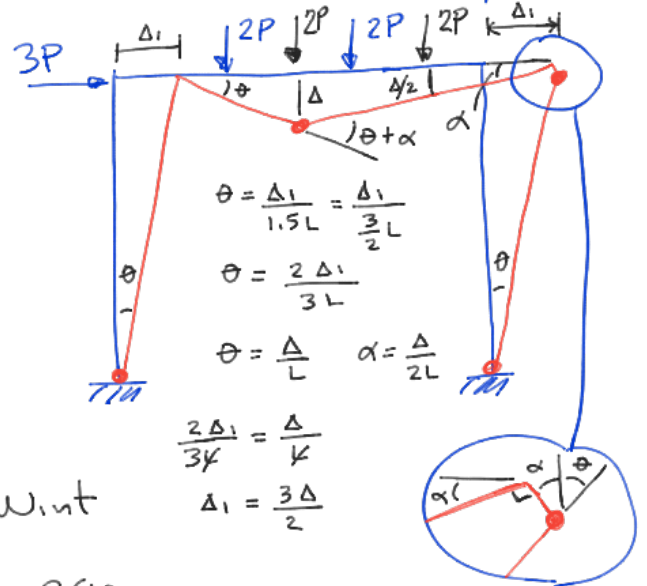
$$3P\Delta = 3.5M_p(\frac{\Delta}{L}) + 3.5M_p(\frac{\Delta}{2L})$$

$$3P = 3.5M_p(\frac{1}{L} + \frac{1}{2L})$$

$$3P = 3.5M_p(\frac{2+1}{2L})$$

$$P = 1.75 \frac{M_p}{L} \quad \text{ó} \quad P = \frac{7 M_p}{4 L}$$

Mecanismo Combinado



$$\theta = \frac{\Delta_1}{1.5L} = \frac{\Delta_1}{\frac{3}{2}L}$$

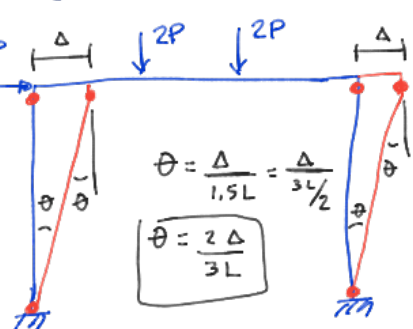
$$\theta = \frac{2\Delta_1}{3L}$$

$$\theta = \frac{\Delta}{L} \quad \alpha = \frac{\Delta}{2L}$$

$$\frac{2\Delta_1}{3L} = \frac{\Delta}{L}$$

$$\Delta_1 = \frac{3\Delta}{2}$$

Mecanismo de Panel



$$W_{ext} = W_{int}$$

$$3P \cdot \Delta = [1.5M_p\theta] 4$$

$$3P\Delta = \frac{6}{2}M_p(\frac{\Delta}{L}) 4$$

$$P = \frac{4 M_p}{3 L} = 1.33 \frac{M_p}{L}$$

$$W_{ext} = W_{int}$$

$$3P\Delta_1 + 2P\Delta + 2P(\frac{\Delta}{2}) = 1.5M_p\theta + 2M_p(\theta + \alpha) + 1.5M_p(\theta + \alpha) + 1.5M_p\theta$$

$$3P(\frac{3}{2}\Delta) + 2P\Delta + P\Delta = \frac{3}{2}M_p(\frac{\Delta}{L}) + 2M_p(\frac{\Delta}{L} + \frac{\Delta}{2L}) + \frac{3}{2}M_p(\frac{\Delta}{L} + \frac{\Delta}{2L}) + \frac{3}{2}M_p(\frac{\Delta}{L})$$

$$\frac{9P\Delta}{2} + 2P\Delta + P\Delta = 3M_p\frac{\Delta}{L} + 4M_p(\frac{3\Delta}{2L}) + \frac{3}{2}M_p(\frac{3\Delta}{2L})$$

$$\frac{15}{2}P\Delta = 6M_p\frac{\Delta}{L} + \frac{9}{4}M_p\frac{\Delta}{L}$$

$$\frac{15}{2}P = \frac{(24+9)M_p}{2L}$$

$$P = \frac{33 M_p}{30 L} = 1.1 \frac{M_p}{L}$$

carga última

$$M_p = \frac{30 PL}{33}$$

$$M_p = 72.73 \text{ k-ft}$$

$$M_p = 872.73 \text{ k-in}$$