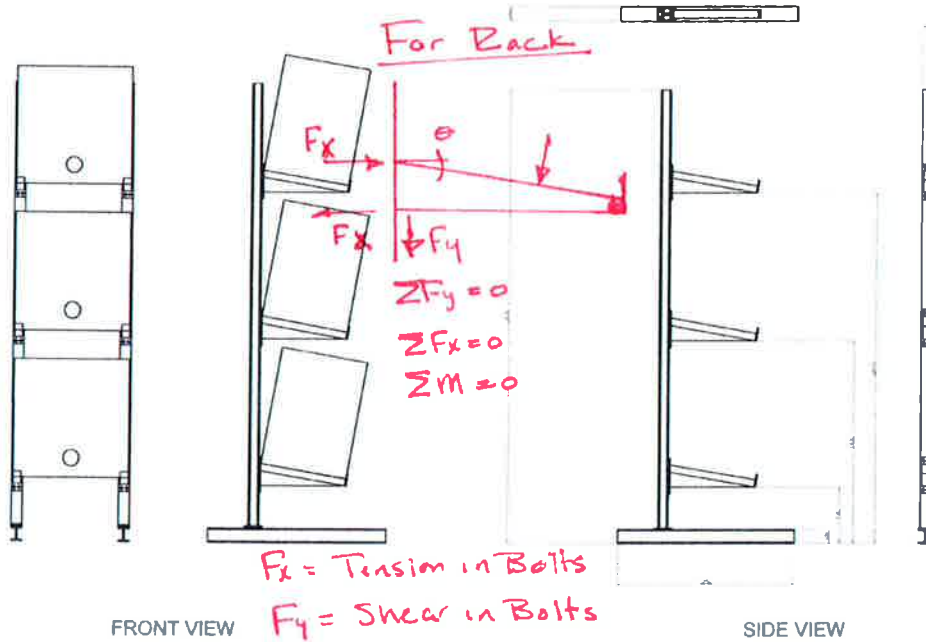


This a complex F.B.D.

review:

① http://www.roymech.co.uk/Useful_Tables/Mechanics/Statics.html

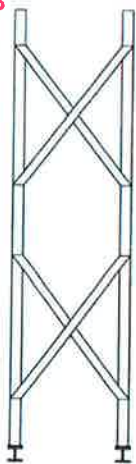
② <http://pages.uoregon.edu/struct/courseware/461/461-lectures/461-lecture14.html>



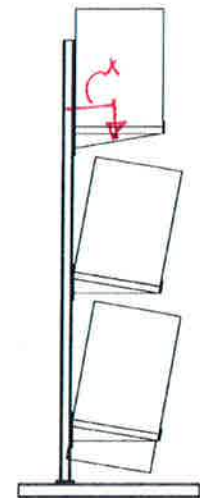
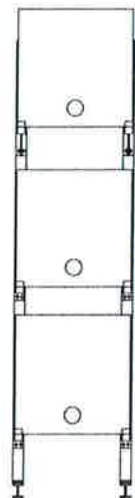
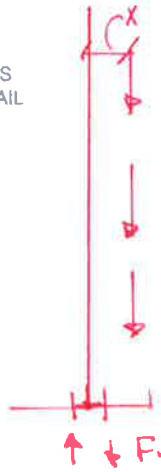
F_x = Tension in Bolts
 F_y = Shear in Bolts

• Maximum moment will determine member size

Also need to consider: Lateral Loads:
 Seismic?
 Wind?
 Safety?



REAR CROSS BRACE DETAIL



TOP BOX STORAGE ONLY

View Column as Cantilevered I beam - max moment will determine size
 Reactions will determine bolts size & Base plate thickness.

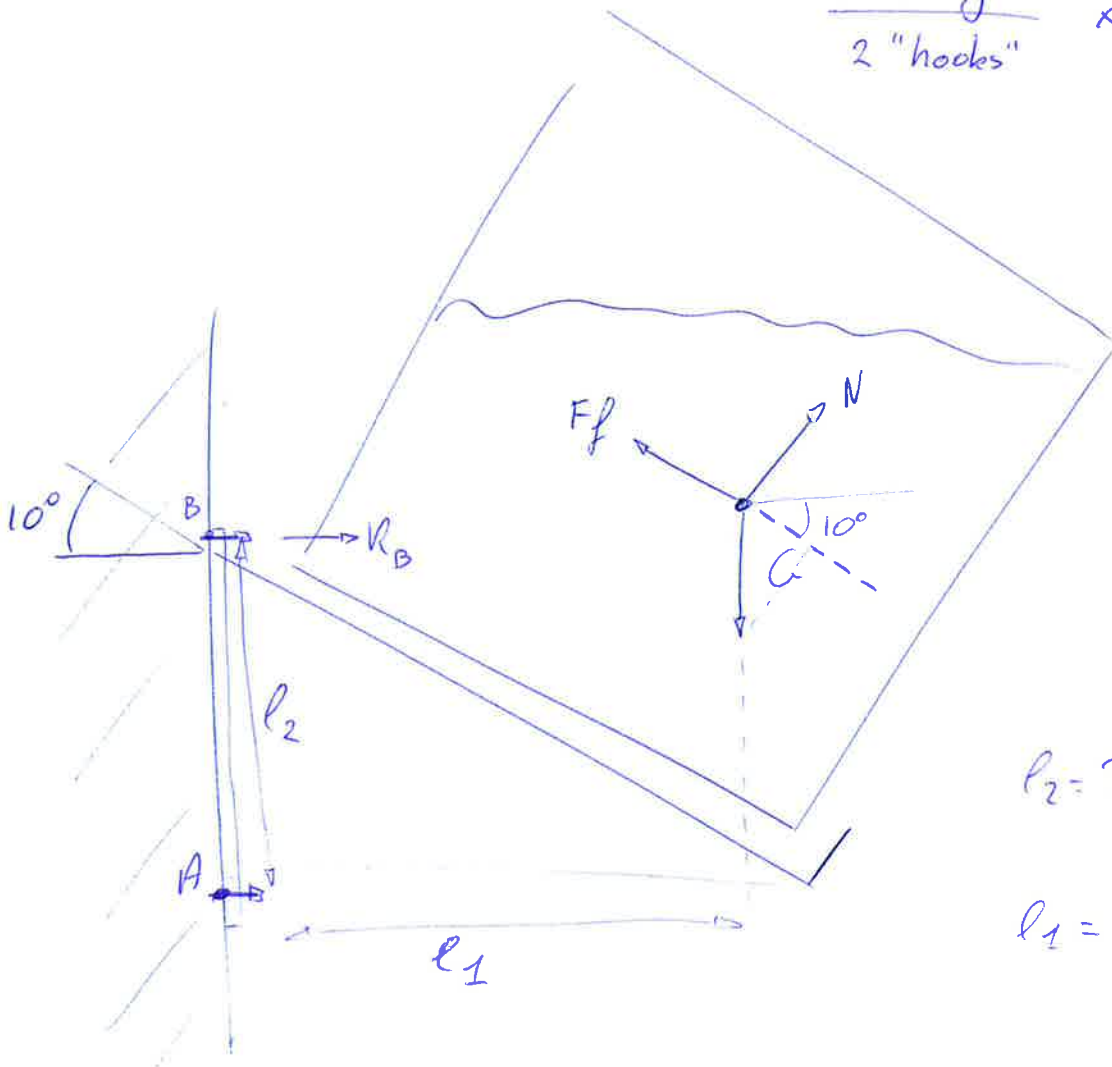
CANTILEVERED 'I' BEAM FRAME

assume

$$G = 2500 \text{ N}$$

$$L \rightarrow \frac{250 \text{ kg}}{2 \text{ "hooks"}}$$

? depends on application
x 2
Safety Factor



$$l_2 = ? \quad 125 \text{ mm}$$

$$l_1 = ? \quad \frac{4}{5} = 600 \text{ mm} \\ = 480 \text{ mm}$$

$$F_f = G \cdot \sin 10^\circ = 434 \text{ N}$$

$$N = G \cdot \cos 10^\circ = 2462 \text{ N}$$

$$\sum M_A = 0 = l_1 \cdot G - l_2 \cdot R_B$$

$$\Rightarrow R_B = \frac{480 \text{ mm} \cdot 2500 \text{ N}}{125 \text{ mm}} = 9600 \text{ N}$$

$$1 \text{ bolt} \rightarrow \frac{R_B}{2} = 4800 \text{ N}$$

Tension: top 2 bolts

$$\sigma = \frac{F}{A} \leq \bar{\sigma}$$

\downarrow
max. allowable

$\bar{\sigma}$ for a 5.6 class bolt: $75\% \cdot 0,60 \cdot 500 \text{ MPa}$

\hookrightarrow you define this

$$\bar{\sigma} = 225 \text{ MPa} = 225 \frac{\text{N}}{\text{mm}^2}$$

$$A \geq \frac{4800}{225} \text{ mm}^2 = 21,3 \text{ mm}^2$$

Rolled threads,	M6	<u>A tension</u> 20,1 mm ²	so M8
	M8	36,6 mm ²	

Shear: All 4 bolts

$$\tau = \frac{F}{A} \leq \bar{\tau}$$

\downarrow
max. allowable

$$\bar{\tau} = \sim 62\% \text{ of } F_u$$

$$5.6 \text{ class bolt: } 0,62 \cdot 600 \text{ MPa} = 372 \text{ MPa}$$

$$1 \text{ bolt: } \frac{2500 \text{ N}}{4} = 625 \text{ N}$$

! Shear plane will be in threaded part, probably (?)

$$A \geq \frac{625 \text{ N}}{372 \frac{\text{N}}{\text{mm}^2}} [\text{mm}^2] = 1,70 \text{ mm}^2 \quad \Rightarrow \text{M8} = \text{OK}$$