Concrete Reinforcing Steel Institute
933 North Plum Grove Road
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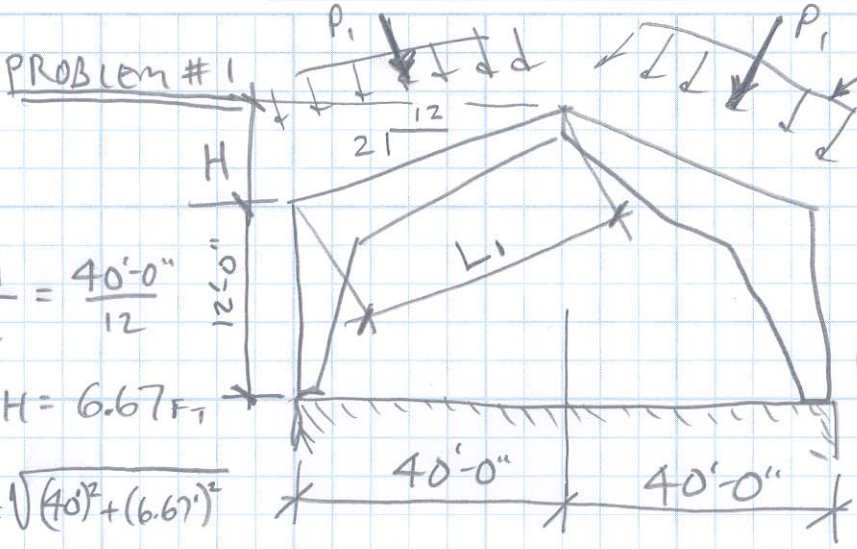
Project		Sheet No. 1 of
Made By	Checked By	Date
Subject		Project No.

PROBLEM #1



32 psf D.L.

$\frac{H}{2} = \frac{40'-0"}{12}$

$H = 6.67 F_T$

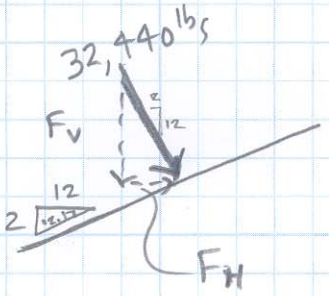
$L_1 = \sqrt{(40')^2 + (6.67')^2}$

$= 40.55 F_T.$

$P_1 = (\text{SPACING})(L_1)(\text{psf})$

$= (25'-0")(40.55')(32 \text{ psf})$

$P_1 = 32,440 \text{ lbs}$

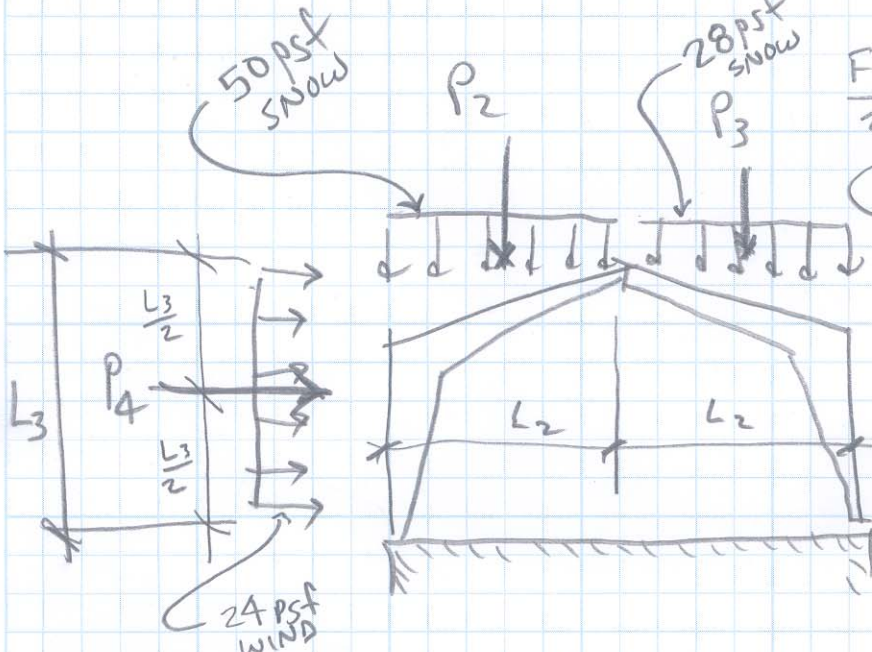


$\frac{F_V}{12} = \frac{32,440 \text{ lbs}}{12.17}$

$F_V = 31,986 \text{ lbs}$

$\frac{F_H}{2} = \frac{32440 \text{ lbs}}{12.17}$

$F_H = 5330 \text{ lbs}$



$P_2 = (\text{SPACING})(L_2)(\text{psf})$

$= (25'-0")(40'-0")(50 \text{ psf})$

$P_2 = 50,000 \text{ lbs}$

$P_3 = (25'-0")(40'-0")(28 \text{ psf})$

$P_3 = 28,000 \text{ lbs}$

$P_4 = \text{SPACING}(L_3)(\text{psf})$

$= (25'-0")(12'+6.67')(24 \text{ psf})$

$P_4 = 11,200 \text{ lbs}$

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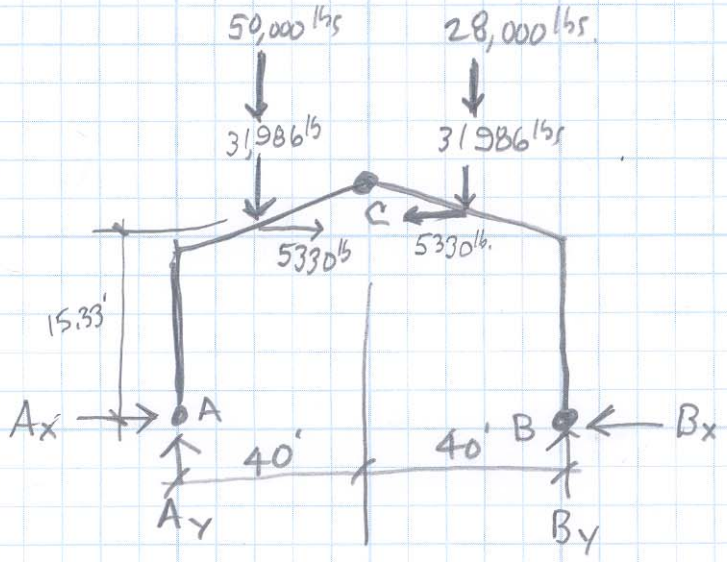
Project		Sheet No. 2 of
Made By	Checked By	Date
Subject		Project No.

ANALYSIS 1 – DL + SNOW



$\Sigma M_A = 0$

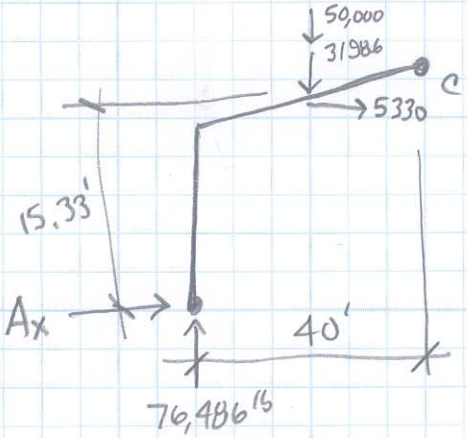
$= (50{,}000^{lb} + 31{,}986^{lb})(20') + (28{,}000^{lb} + 31{,}986^{lb})(60') + (5330^{lb})(15.33') - (5330^{lb})(15.33') - B_y(80') = 0$

$B_y = 65{,}486^{lbs}$

$\Sigma F_{vert.} = 0$

$A_y = 50{,}000^{lb} + 31{,}986^{lb} + 28{,}000^{lb} + 31{,}986^{lb} - 65{,}486^{lbs}$

$A_y = 76{,}486^{lb}$



$\Sigma M_c = 0$

$(50{,}000^{lb} + 31{,}986^{lb})(20') + (5330^{lb})(3.33') - 76{,}486^{lb}(40') + A_x(18.67') = 0$

$A_x = 75{,}752^{lbs}$

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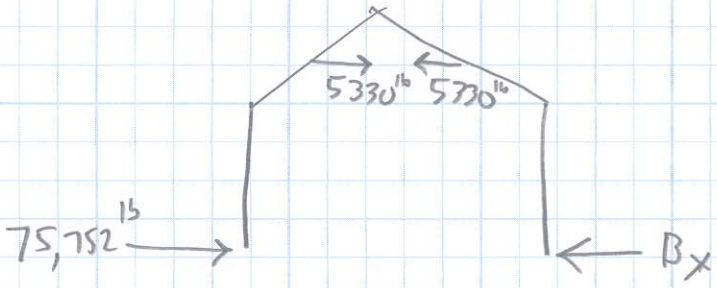
Project		Sheet No. 3 of
Made By	Checked By	Date
Subject		Project No.

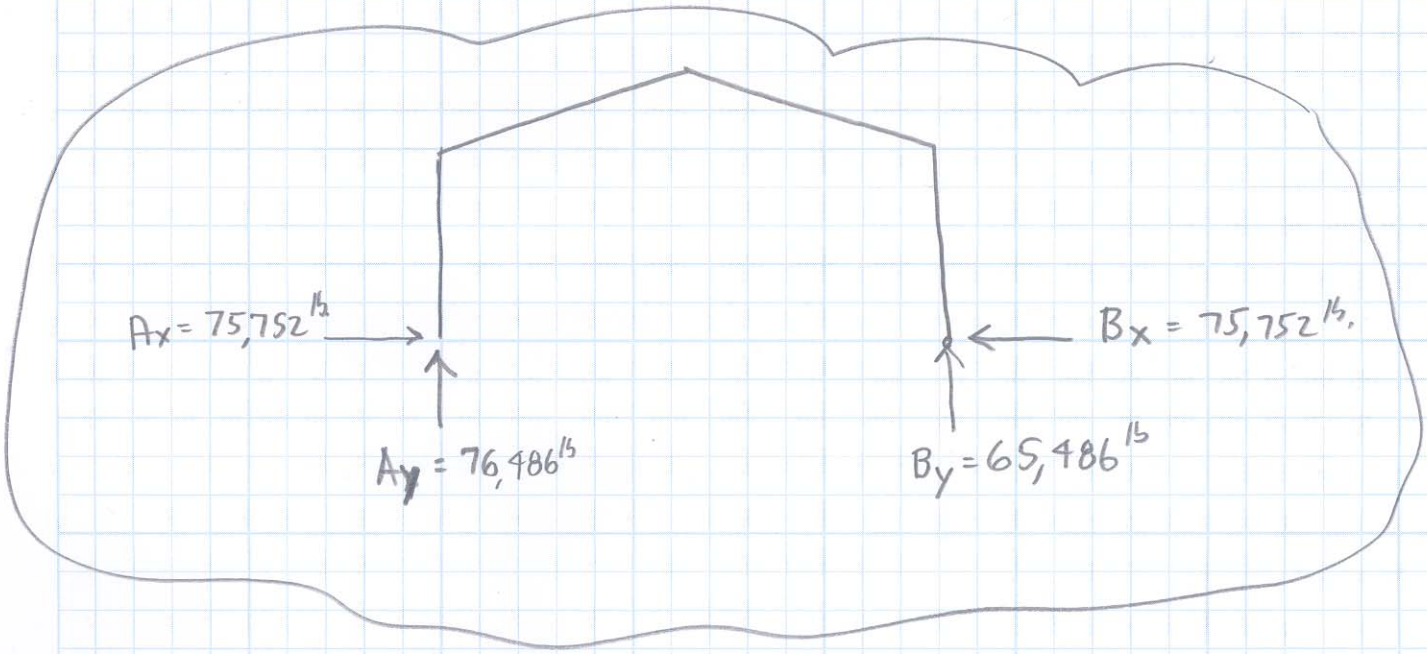


$$\Sigma F_{HORIZ} = 0$$

$$75752^{\#} + 5330^{\#} - 5330^{\#} = B_x$$

$$B_x = 75{,}752^{\#}$$

SUMMARY - DL + SNOW:



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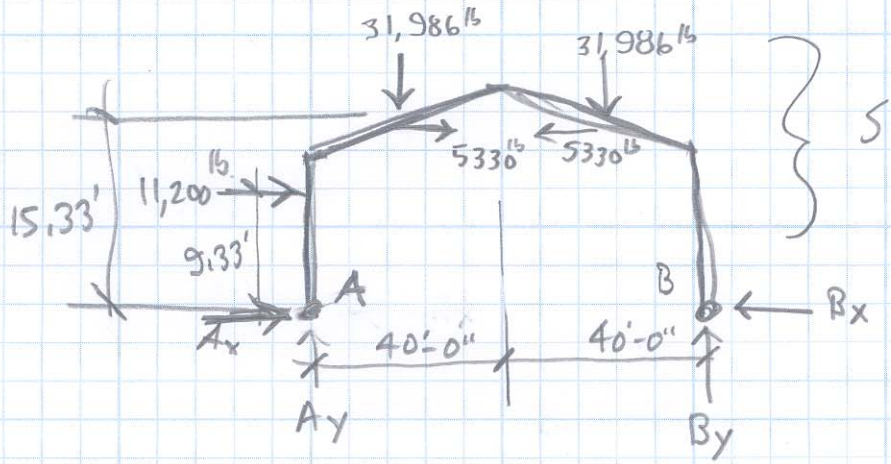
Project		Sheet No. 4 of
Made By	Checked By	Date
Subject		Project No.

ANALYSIS 2 – DL + WIND LOAD



SEE P. 1 FOR LOADS!

$\Sigma M_A = 0$

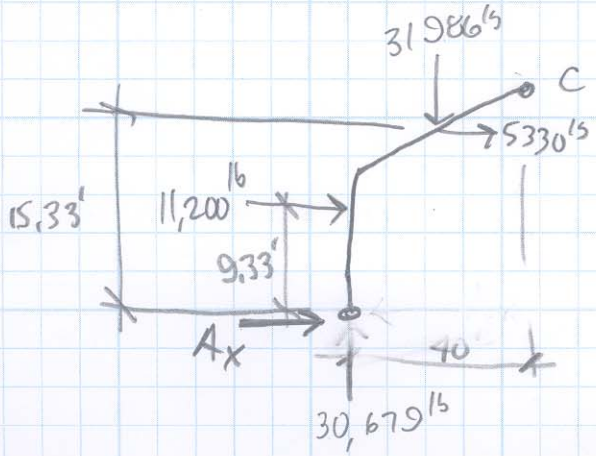
$= 11{,}200^{lb}(9.33') + 31986^{lb}(20') + 5330^{lb}(15.33') + 31{,}986^{lb}(60') - 5330^{lb}(15.33') - B_y(80') = 0$

$B_y = 33293^{lb}$

$\Sigma F_{VERT} = 0$

$31{,}986^{lb} + 31{,}986^{lb} - 33293^{lb} = A_y$

$A_y = 30{,}679^{lb}$



$\Sigma M_C = 0$

$31986^{lb}(20') + 5330^{lb}(3.33') + (11{,}200^{lb})(9.33') - 30{,}679^{lb}(40') + A_x(18.67') = 0$

$A_x = 24{,}919^{lb}$

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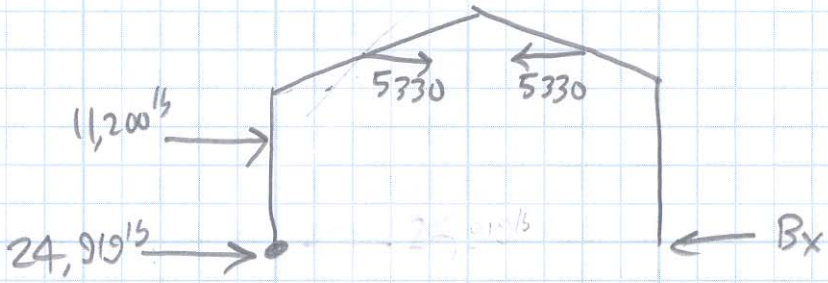
Project		Sheet No. 5 of
Made By	Checked By	Date
Subject		Project No.

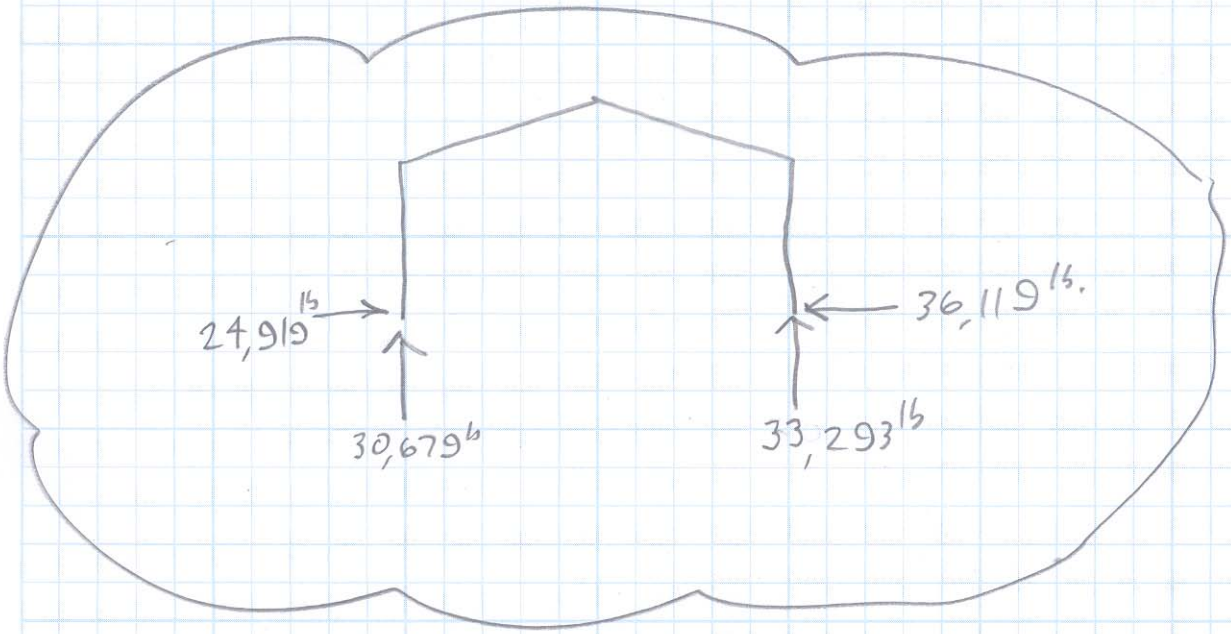


$\Sigma F_{HORIZ} = 0$

$11{,}200^{lb} + 24{,}919^{lb} + 5330^{lb} = 5330^{lb} + Bx$

$Bx = 36{,}119^{lbs}$

SUMMARY - DL + WIND:



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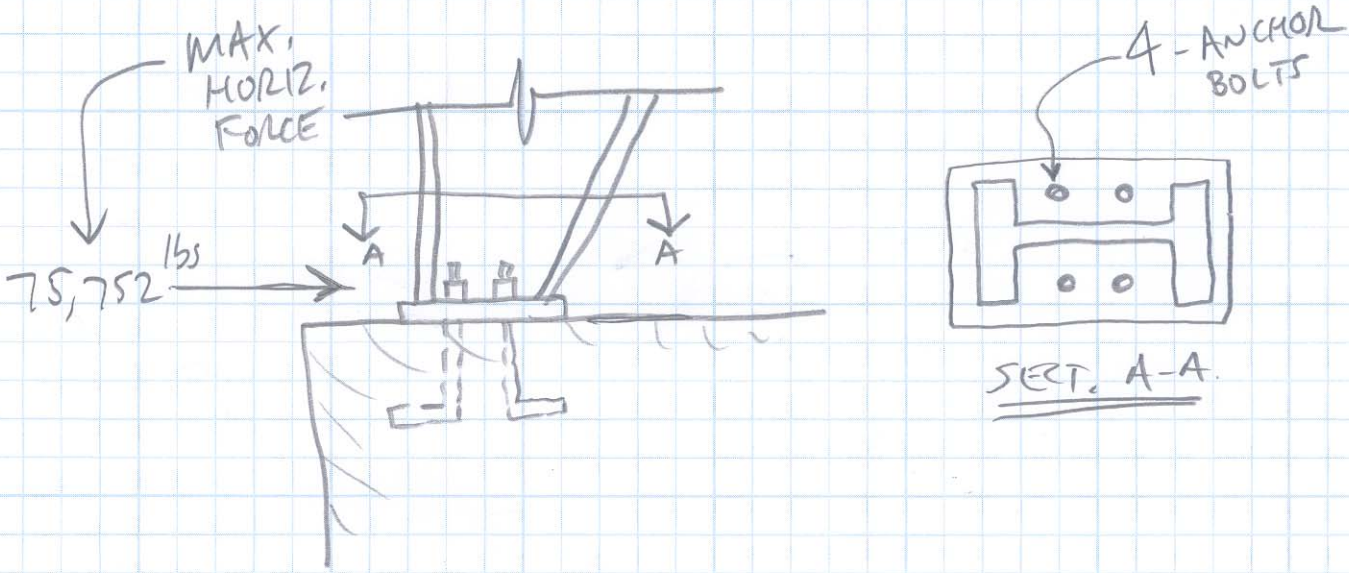
Project		Sheet No. 6 of
Made By	Checked By	Date
Subject		Project No.

ANCHOR BOLT DESIGN



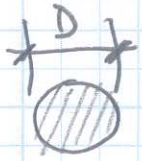
$$\text{SHEAR STRESS} = \frac{\text{LOAD PER BOLT}}{\text{AREA}}$$

$$\text{ALLOW. SHEAR STRESS} = 21\ \tfrac{K}{IN^2} = \frac{75.752^K \div 4\ \text{BOLTS}}{\text{AREA}}$$

SOLVE FOR AREA:

$$\text{AREA} \geq \frac{18.94\ ^K/\text{BOLT}}{21\ ^K/IN^2}$$

$$\geq 0.902\ IN^2$$



$$\Rightarrow \frac{\pi}{4} D^2 \geq 0.902\ IN^2$$

$$D \geq 1.15"$$

USE $1\frac{3}{16}"$ DIA. BOLT

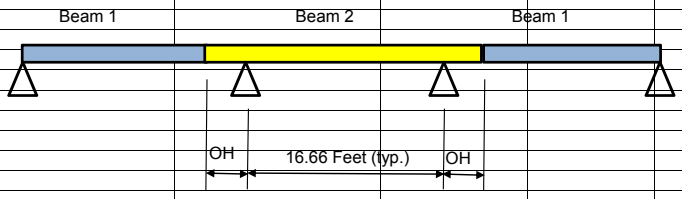
			BEAM 1		**BEAM 2**			
feet	feet	Lbs.	Ft-Lb	Lbs.	Ft-Lb	Ft-Lb		
Overhang "OH" Length:	**Beam 1 Span:**	**Beam 1 Support Reaction:**	**Beam 1 Max. Moment:**	**Beam 2 Support Reaction:**	**Beam 2 - M_{neg}:**	**Beam 2 M_{pos}:**		
1	15.6666	7308.4689	28624.71472	16016.46579	-7774.9689	24620.85018		
2	14.6666	6841.9689	25087.10527	16482.96579	-15549.9378	16845.88128		
3	13.6666	6375.4689	21782.74582	16949.46579	-23324.9067	9070.912379		
4	12.6666	5908.9689	18711.63637	17415.96579	-31099.8756	1295.943479		
5	11.6666	5442.4689	15873.77692	17882.46579	-38874.8445	-6479.025421		
6	10.6666	4975.9689	13269.16747	18348.96579	-46649.8134	-14253.99432		
7	9.6666	4509.4689	10897.80802	18815.46579	-54424.7823	-22028.96322		
8	8.6666	4042.9689	8759.698567	19281.96579	-62199.7512	-29803.93212		

W8x13 → S_x = 9.91 in^3

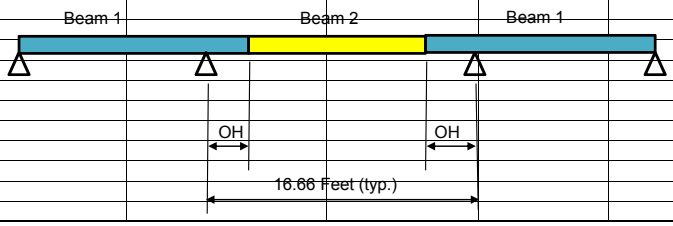
$$Allow.Moment = \frac{Allow.Stress(S_x)}{12in/ft}$$

$$Allow.Moment = \frac{24KSI(9.91in^3)}{12in/ft}$$

= 19.82 Kip-Feet
= 19,820 Lb-Feet



			BEAM 1		BEAM 2
feet	feet	Lbs.	Ft-Lbs.	Ft-Lbs.	Ft-Lbs.
Overhang "OH":	**Beam 2 Length:**	**Beam 2 - Support Reaction:**	**Beam 1 - M_{pos}:**	**Beam 1 - M_{neg}:**	**Beam 2 - M_{pos}:**
1	14.66666	6841.99689	28844.62951	-7308.49689	25087.31053
2	12.66666	5908.99689	25915.08645	-13683.99378	18711.81364
3	10.66666	4975.99689	23538.34611	-19126.49067	13269.31675
4	8.66666	4042.99689	21655.62946	-23635.98756	8759.819857
5	6.66666	3109.99689	20218.23385	-27212.48445	5183.322967
6	4.66666	2176.99689	19187.53306	-29855.98134	2539.826077



W8x13 → S_x = 9.91 in^3

$$Allow.Moment = \frac{Allow.Stress(S_x)}{12in/ft}$$

$$Allow.Moment = \frac{24KSI(9.91in^3)}{12in/ft}$$

= 19.82 Kip-Feet
= 19,820 Lb-Feet