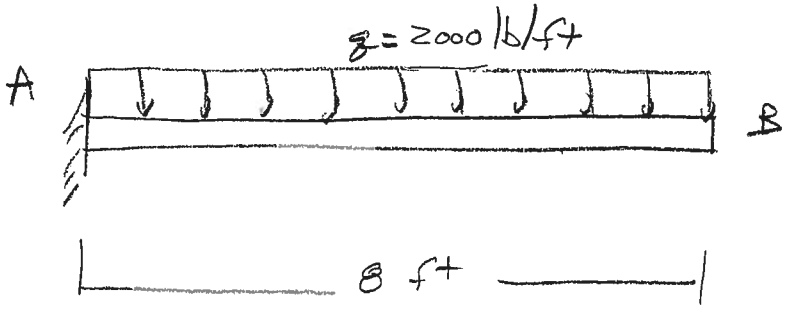
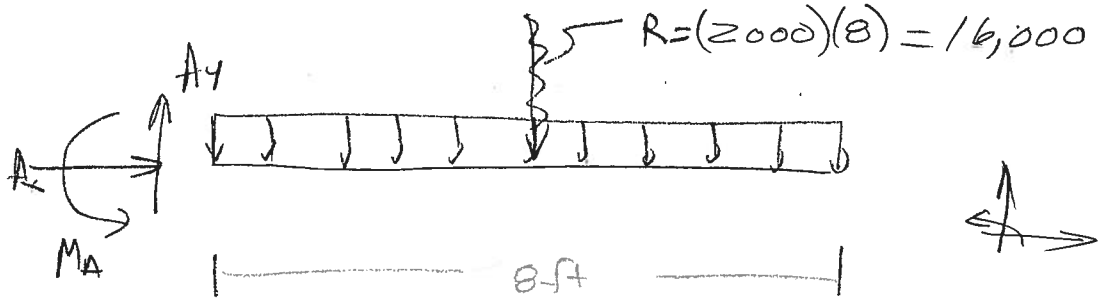
An 8 ft long cantilever beam is loaded as shown. Calculate the required section modulus S if the allowable flexural stress is 14,000 psi. Then select the lightest wide flange beam that can safely support the load from the table of beams provided.



First calculate the reactions at A and Draw V & M



$$\Sigma M_A = 0$$

(1) $$M_A - 16{,}000\,(4) = 0$$

(2) $$M_A = 64000 \text{ ft-lb} \circlearrowleft \text{ as shown}$$

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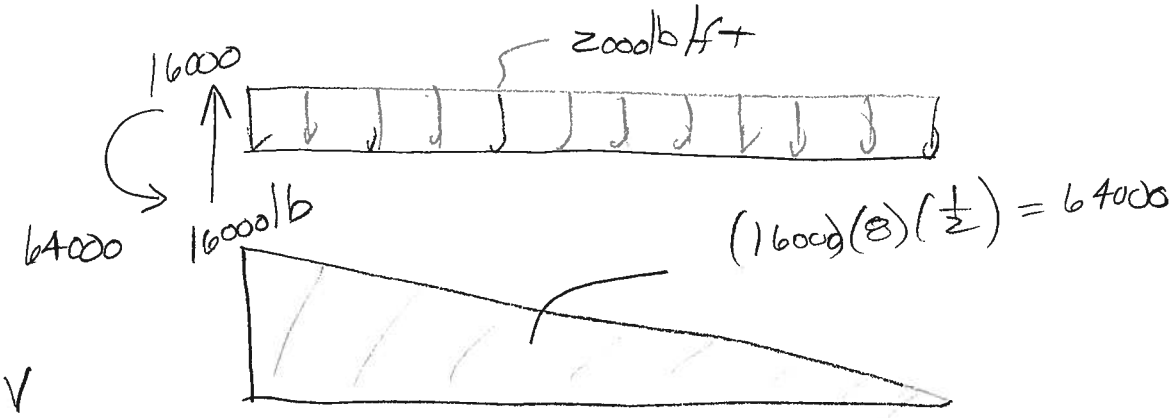
$$\Sigma F_y = 0$$

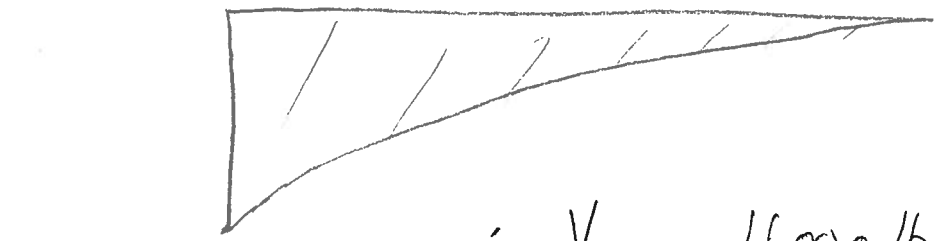
(3) $$A_y - 16000 = 0$$

(4) $A_y = 16000\ lb \uparrow$ as shown

$$\Sigma F_x = 0$$

(5) $$A_x = 0$$





$\therefore V_{max} = 16000\ lb$ (6)

$M_{max} = 64{,}000\ ft\text{-}lb$ or $768{,}000\ in\text{-}lb$ (7)

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(8) $$S_{Req} = \frac{M}{\sigma_{Allow}}$$

(9) $$S_{Req} = \frac{768000 \text{ in-lb}}{14{,}000 \frac{\text{lb}}{\text{in}^2}}$$

(10) $$S_{Req} = 54.86 \text{ in}^3$$

From Table the following W sections will work

	W 10 X60	$S_{1-1} = 66.7$
Lightest →	W12 X50	$S_{1-1} = 64.7$
	W14 X53	$S_{1-1} = 77.8$
	W16 X57	$S_{1-1} = 92.2$

Use W12X50

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