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 $V$ & $M$.

1. $M_A = 0$
2. $M_A = 16,000 \text{ ft} \cdot \text{lb} \cdot \text{in}$ as shown
\[ F_y = 0 \]

(3) \[ A_y - 16000 = 0 \]

(4) \[ f_y = 16000 \text{ lb} \]

\[ F_x = 0 \]

(5) \[ A_x = 0 \]

\[ 16000 \]

\[ 2000 \text{ lb/ft} \]

\[ 16000 \text{ lb} \]

\[ 16400 \]

\[ (16000)(8)(\frac{1}{2}) = 64000 \]

\[ -64000 \text{ ft-lb} \]

\[ V_{max} = \frac{16000 \text{ lb}}{\cdot} \]

\[ M_{max} = 64000 \text{ ft-lb} \]

\[ 768000 \text{ in-lb} \]
\[
S_{\text{req}} = \frac{M}{\sqrt{I}}
\]

(9)

\[
S_{\text{req}} = \frac{768,000}{14,000} \text{ in}^{-1/2}
\]

(10)

\[
S_{\text{req}} = 54.86 \text{ in}^{3}
\]

From Table the following W sections will work:

- W 10 x 60 \( S_{1-1} = 66.7 \)
- W 12 x 50 \( S_{1-1} = 64.7 \)
- W 14 x 53 \( S_{1-1} = 77.8 \)
- W 16 x 57 \( S_{1-1} = 92.2 \)

Use W 12 x 50