Stone = 2500 kg/m³

65' Block
0.5 x 0.5 x 1 m
so 1/4 m³
so 625 kg = 1375 lb
Find out if $S_{\text{max}} \leq 15,000$?

Stress = \frac{\text{force}}{\text{area}}

\text{lbs/ in}^2

Counterweight

$S_{\text{max}} = 15,000$ lbs
Moment

\[ M = f \cdot l = 30,000 \text{ ft-lbs} \]

or

\[ 360,000 \text{ in-lbs} \]

Your beam: 30'' x 45 lbs = ___ in-lbs

Neutral:

20'

Stresses, s, need to balance M!
\( \sum \) \( M \) is balanced by \( \int dm \) in the beam

where \( dm = df \cdot y \)

\( df = f(x) \cdot w \cdot dy \)
\[ dm = y \cdot (\theta \cdot x) \cdot \text{Area} \, dy \]

so

\[ M = 2 \int_0^{h/2} y^2 \Theta \, W \, dy = \frac{\Theta \, wh^3}{12} \]

\[ = I \Theta \] or \[ \Theta = \frac{M}{I} \] \( I \) inertia
\[ S_{\text{max}} = \left( \frac{h}{2} \right) \cdot \theta = \frac{M_{\text{max}}}{I} \]

Now, we need

\[ S_{\text{max}} = \frac{m \cdot h}{2I} \leq 15,000 \text{ psi} \]

Yield Stress
\[ S_{\text{max}} = \frac{M_h}{2I} = \left( \frac{6}{Wh^2} \right) M \leq 15,000 \]

Try \( w = 6'' \)

\( h = 5'' \)

Works in \( \frac{Wh^2}{2} = 150 \)

Theory

\[ \sqrt{\text{stress}} \propto \frac{1}{h^2} \]

But load is \( \frac{1}{3} \) good as \( \frac{1}{2} \)
\(wh^2 \geq 144\)

In fact, reasonable

\(\text{Smax is like } 2'500 \text{ psi}\)

\(wh^2 \geq 1080\)

\(w = 10''\)

\(h = 12''\)