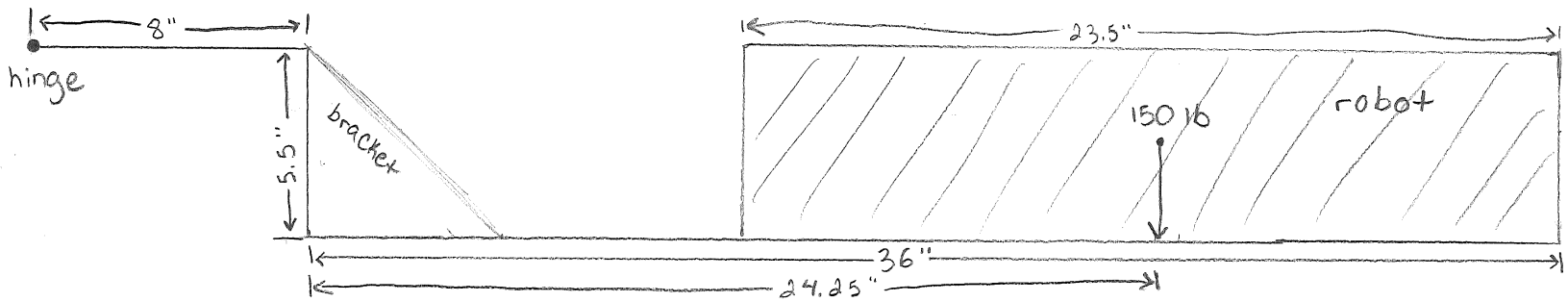

5.5" = height floor to top of chassis
8" = space available from chassis to scissor lift
36" = estimated max platform length
Andy Mark Chassis: long = 23.5" x 32.3"
square = 27.5" x 28.3"
wide = 24.3" x 31.5"

estimate robot weight as 150 lb
assume long chassis driven on from side
CG at center of long chassis

$\Sigma M_{hinge} = (75\ lb)(24.25" + 8") = 2418.75\ in\text{-}lb$ ← 75 lb because 2 forklift arms

* If load at end of beam, $M = (75\ lb)(36+8") = 3300\ in\text{-}lb$

Factor of Safety = 3

σ_y aluminum = 33 Ksi (yield stress)
with factor of safety, σ_y = 11 Ksi ($\sigma_y/3$) = 11000 psi

stress $\sigma = \frac{M}{S}$ → S (section modulus) $= \frac{M}{\sigma}$

$S = \frac{2418.75\ in\text{-}lb}{11000\ psi} = 0.2199\ in^3$ (minimum)

$S = 3300/11000 \rightarrow S = 0.3\ in^3$

max deflection if loaded @ end: $\delta = \frac{FL^3}{3EI}$

E = 10200000 psi (alum)
F = load
L = 36" + 8" = 44"
a = dist. to load = 8 + 24.25"

tube size	S (in³)		I (in⁴)	δ (in) at end	δ (in) at point
1½ x 1½ x ⅛	0.291	▣	0.218	0.958	0.583
1½ x 1½ x 0.095	0.235	▣	0.176	1.19	0.722
1 x 2 x ⅛	0.332	▭	0.332	0.629	0.383

δ at point $= \frac{Fa^2}{6EI}(3L - a)$