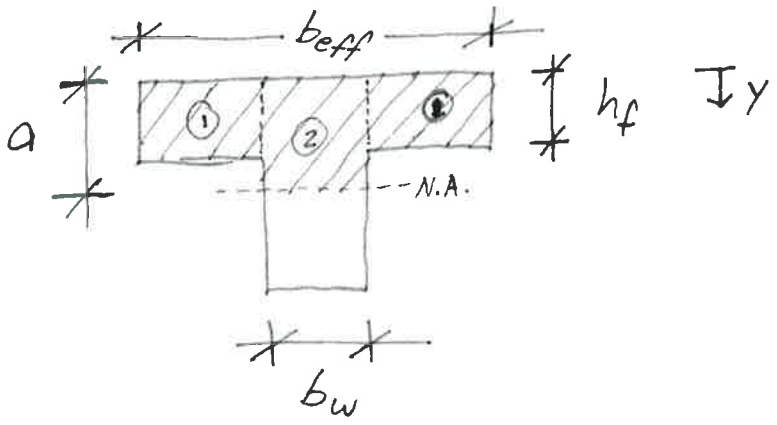
Alternative Method for T-beam Analysis when $c > h_f$



This approach is used only if $c > h_f$.

This page derives the alternate way of doing T-beams when $c > h_f$.

- Find Centroid Location of Shaded area (break up into region ① & ②)

Region	A	y	Ay
①	$(b_{eff}-b_w)h_f$	$h_f/2$	$(b_{eff}-b_w)h_f^2/2$
②	$b_w a$	$a/2$	$b_w a^2/2$

$\Sigma A = (b_{eff}-b_w)h_f + b_w a$ $\quad \Sigma A_y = (b_{eff}-b_w)h_f^2/2 + b_w a^2/2$

$$\bar{y} = \frac{\Sigma A_y}{\Sigma A} = \frac{(b_{eff}-b_w)h_f^2/2 + b_w a^2/2}{(b_{eff}-b_w)h_f + b_w a}$$

- Horizontal Equilibrium

$\Sigma F_x = 0; \quad -C + T = 0 \Rightarrow C = T$

$$T = A_s f_y = 0.85 f_c' \left[(b_{eff}-b_w)h_f + b_w a\right]$$

- Solve for a

$$\Rightarrow a = \left[\frac{A_s f_y}{0.85 f_c'} - (b_{eff}-b_w)h_f\right]\frac{1}{b_w}$$

of course you could just use the beam program we used in class.

- Find M_n

$$M_n = A_s f_y (d - \bar{y})$$

To get M_n

- calculate "a" per boxed formula
- calculate "$\bar{y}$" per boxed formula
- calculate M_n per boxed formula