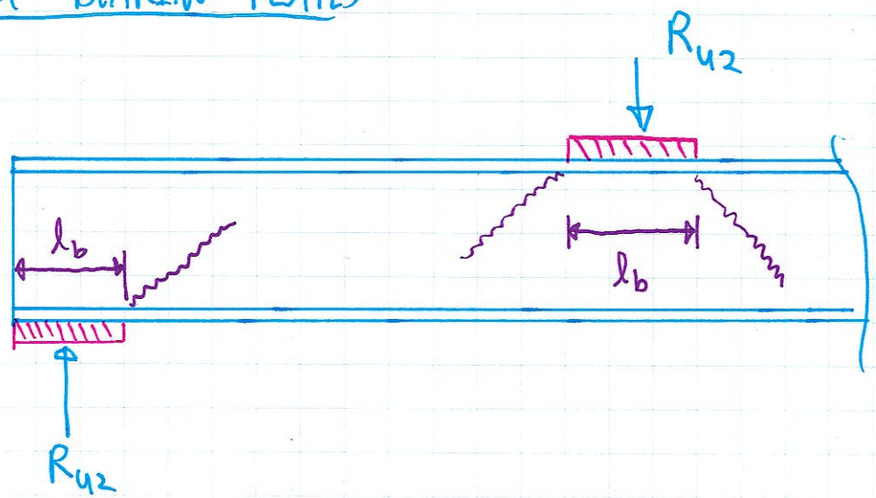
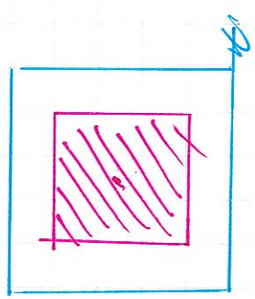
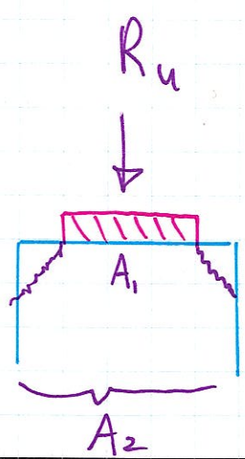
# BEAM BEARING PLATES




AISC J10 (p16.1-142)

- Web Local Yielding (WLY)
  (J10-2) or (J10-3)
- Web Local Crippling (WLC)
  (J10-4), (J10-5a), or (J10-5b)






(J8-1) & (J8-2)

## COLUMN BASE PLATES

AISC Part 14 & J8

(AISC 14-7a)

(Segui 5.15)

$$t_{req'd} \geq \ell \sqrt{\frac{2P_u}{0.9BNF_y}}$$

(t in $\frac{1}{8}$" increments through $1\frac{1}{4}$", $\frac{1}{4}$" increments thereafter)

where: $\ell = \max(m, n, \lambda n')$

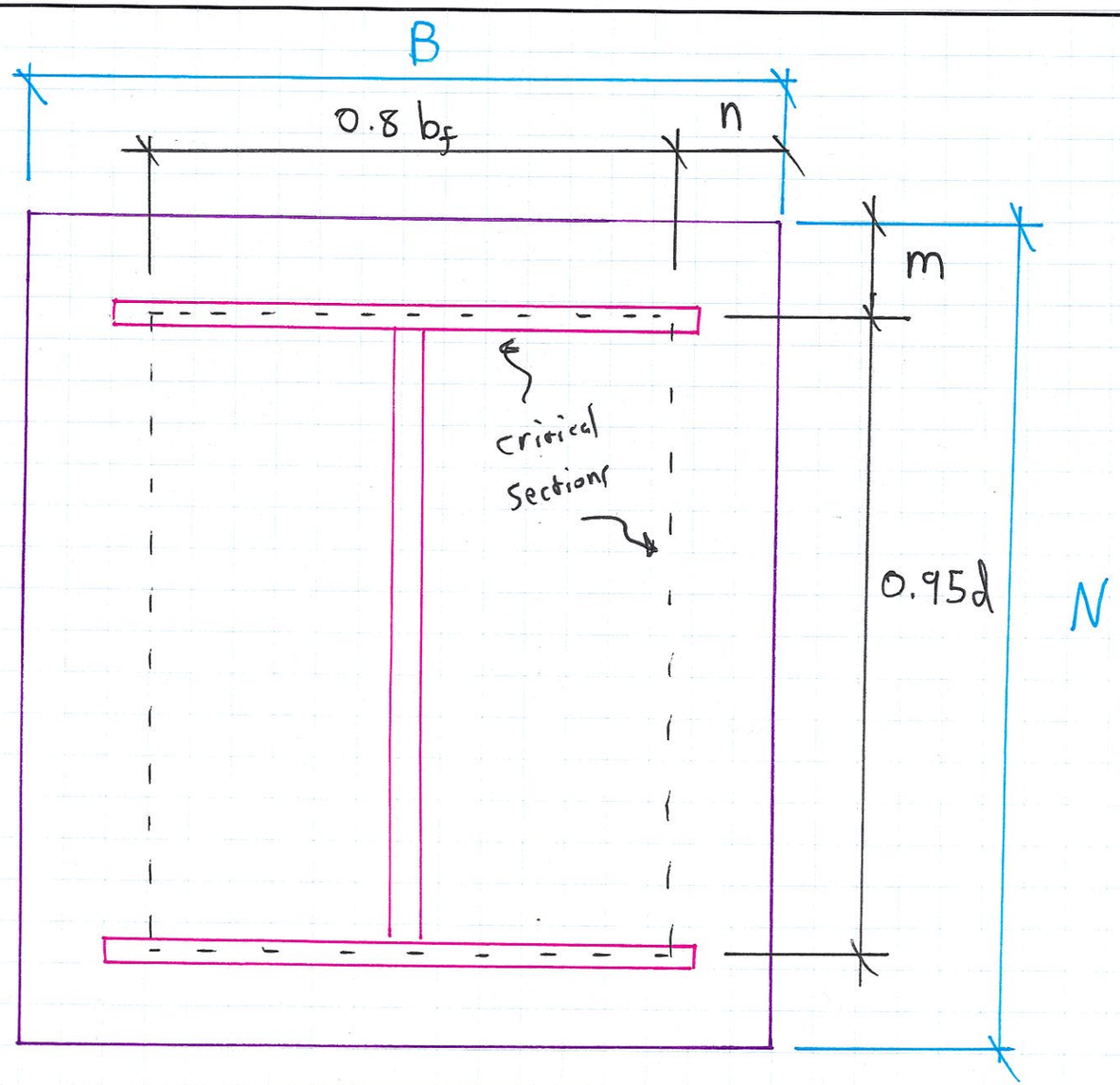
$$m = \frac{N - 0.95d}{2}$$

$$n = \frac{B - 0.8b_f}{2}$$

$$\lambda = \sim\sim \leq 1.0$$ $f(P_u, P_p)$ (eqn 14-6a)

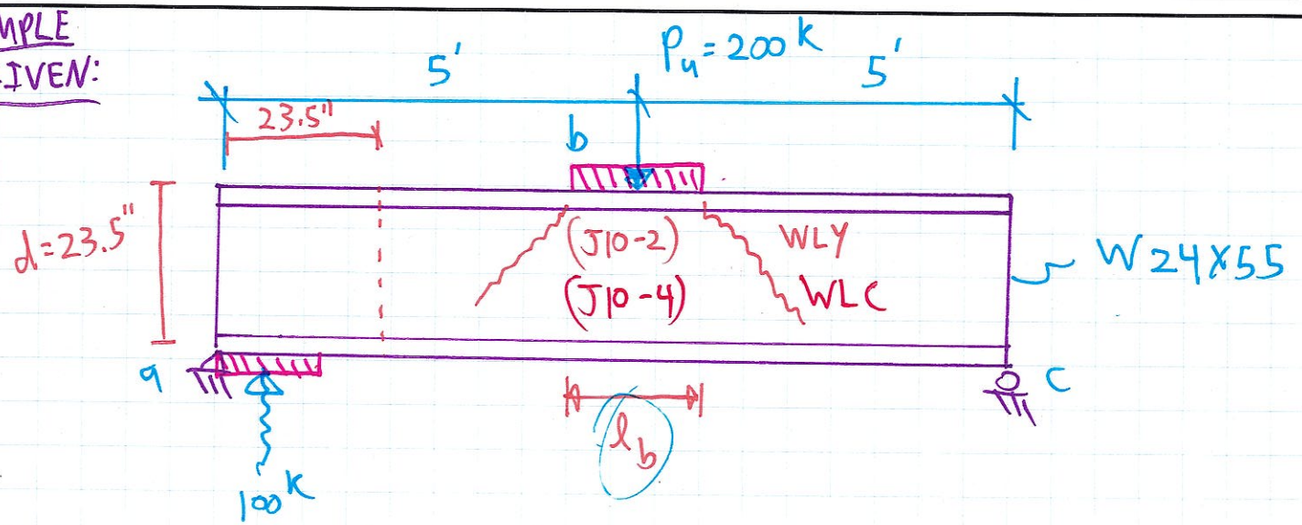
conservative to assume $\lambda = 1.0$

$$n' = \frac{1}{4}\sqrt{db_f}$$



**EXAMPLE**

**GIVEN:**




$f_c' = 3500$ PSI

**REQ'D:** Design @ bearing plates

**SOLN:** W24X55: $d = 23.5"$ $t_w = 0.395"$ $t_f = 0.505"$ $b_f = 7.01"$ $k_{des} = 1.01"$

**BEARING @ "b":** WLY: $5' > d = 23.5" \Rightarrow$ Interior Load (Eqn J10-2)

$$\phi R_n = \phi F_{yw} t_w (5k + l_b) \overset{?}{:}$$

$$200^k = 1.0(50^{ksi})(0.395")(5(1.01") + l_b) \Rightarrow l_b \geq 5.08"$$

(WLC) $\phi R_n = \phi\, 0.80\, t_w^2 \left[1 + 3\left(\frac{l_b}{d}\right)\left(\frac{t_w}{t_f}\right)^{1.5}\right] \sqrt{\frac{E F_{yw} t_f}{t_w}}\, Q_f$ ($Q_f = 1.0$)

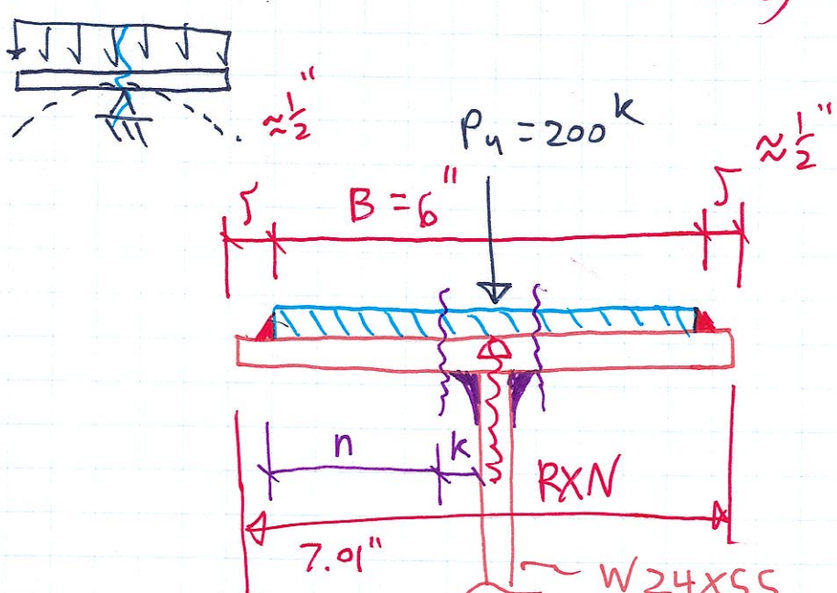
$$200^k = 0.75(0.8)(0.395")^2\left[1 + 3\left(\frac{l_b}{23.5"}\right)\left(\frac{0.395"}{0.505"}\right)^{1.5}\right]\sqrt{\frac{(29000\ ksi)(50\ ksi)(0.505")}{0.395"}}\,(1.0)$$

$l_b \geq 6.44" \Rightarrow$ $l_b = \underline{6.5"}$ ← control (maximum of WLY & WLC)

$$t \geq \sqrt{\frac{2.2 P_u n^2}{B l_b f_y}} = \frac{2.2(200^k)(1.99")}{(6")(6.5")(36\ ksi)} = 1.11"$$

$n = \frac{6"}{2} - 1.01" = 1.99"$ $\quad t = 1\frac{1}{8}"$

∴ @ "b" Use $6\frac{1}{2}" \times 6" \times 1\frac{1}{8}"$ PL, A36 Steel



## BEARING @ a & c

(WLY) J10-3

$$\phi R_n = 1.0\left[f_{yw} t_w (2.5k + l_b)\right]$$

$$100^k = 1.0\left[(50^{ksi})(0.395")(2.5(1.01") + l_b)\right]$$

$l_b \geq 2.54"$ cc $d = 23.5"$ we picked the correct eqn.

(WLC) $\frac{l_b}{d}$ ← we are solving for $l_b$ ∴ assume $\frac{l_b}{d} > 0.2$, check later

$100^k$

$$\phi R_n = 0.75\left[0.40 t_w^2\left[1 + \left(\frac{4 l_b}{d} - 0.2\right)\left(\frac{t_w}{t_f}\right)^{1.5}\right]\sqrt{\frac{E f_{yw} t_f}{t_w}}\right]$$

$l_b \geq 6.03"$ max, controls

check $\frac{l_b}{d} = \frac{6.03"}{23.5"} = 0.26 > 0.20$ ✓ → use $l_b = 6.25"$

## CHECK CONC. STRENGTH

Assume that bearing pl covers all of the concrete area, this is conservative
(AISC J8-1, p16.1-141)

$$\phi_c P_p = 0.65\left[0.85 f'_c A_1\right]$$

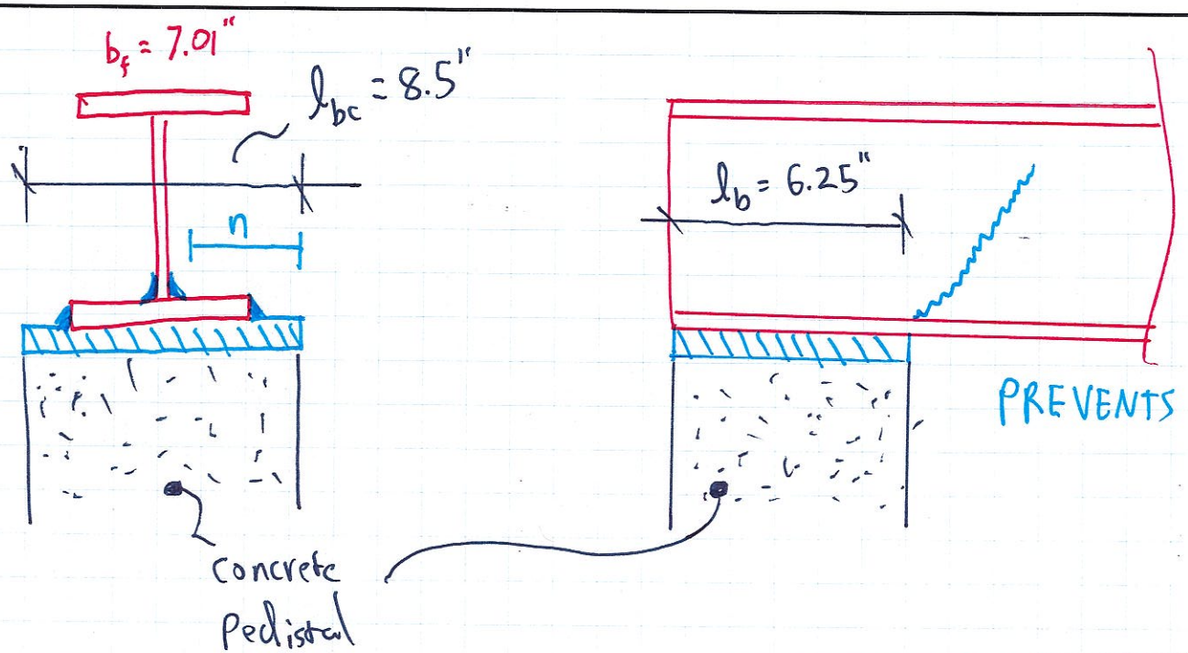
$f'_c$ in KSI

this is the width of bearing needed for the concrete

$$100^k = 0.65\left[0.85\left(3.5^{ksi}\right)\left(6.25''\right)\left(\ell_{bc}\right)\right] \Rightarrow \ell_{bc} \geq 8.27''$$

$\ell_b$ = 6.25" (width of $A_1$)

Use 8.5"




PREVENTS WLC & WLY

THICKNESS

$$t \geq \sqrt{\frac{2.2 R_y n^2}{B l_b f_y}} = \sqrt{\frac{2.2 (100^k)(3.24")^2}{8.5"(6.25")(36^{ksi})}} \geq 1.1" \Rightarrow 1\tfrac{1}{8}" \text{ PL}$$

$$n = \frac{8.5"}{2} - (1.01") = 3.24"$$

USE 8.5" X 6.25" X 1.125" PL, A36 STEEL @ "a" & "c"