Ow 12 Designing LWB + Brackets.

Roaring

unloaded

$P_{Tot} = 0.2 * L_{MC} * h_{MC}$

$= 0.2 \times 40 * 3.6 = \boxed{28.8t}$

$P = \frac{28.8}{16} = 1.8t$

$P/2 = 0.9t$

$R = \frac{28.8}{2} = 14.4t$

R P/2

$F = \pm \frac{14.4 - 0.9}{2\cos\theta} = 7.55t$

$Lx = \frac{\sqrt{10^2 + 5^2}}{2} = 5.59m$

$Ly = 1.2 \times 5.59 = 6.71m.$

$\frac{L}{i})_x = \frac{559}{0.39a} \leq 140 \rightarrow a \geq 13.3cm$

$\frac{L}{i})_y = \frac{671}{0.45a} \leq 140 \rightarrow a \geq 10.65cm$

∴ use 2 ∠ 140 x 13 BTB

$\lambda_x = \frac{559}{0.3 \times 14} = 133.1 \quad \lambda_y = \frac{671}{0.45 \times 14} = 106.5$

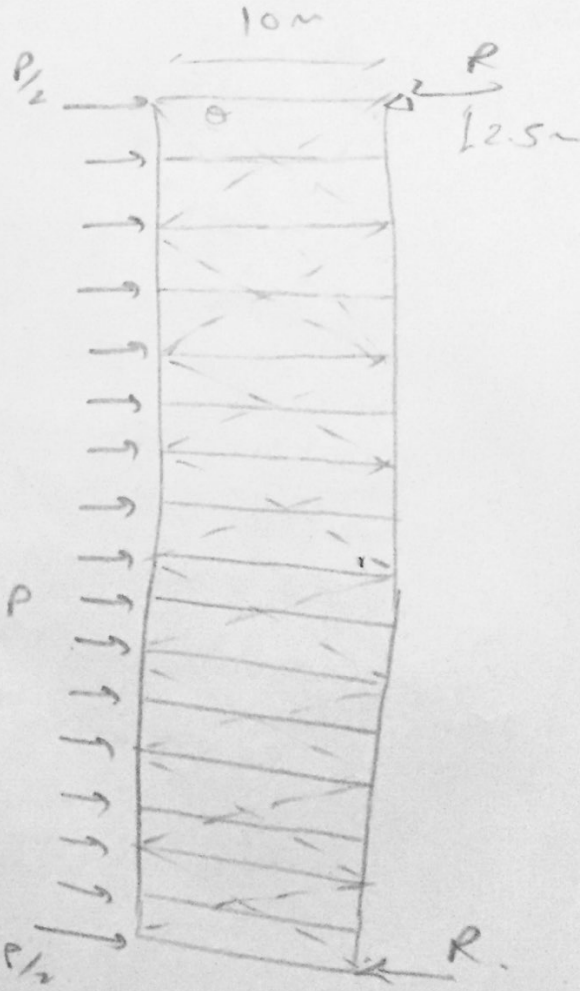
>100

$f_{all} = \frac{7500}{\lambda_x^2} = 0.42 t/cm^2$

$f_{act} = \frac{7.55}{2 \times 35} = 0.107 t/cm^2$

$< 0.42 \times 0.8 \times 0.85$

∴ safe compr.



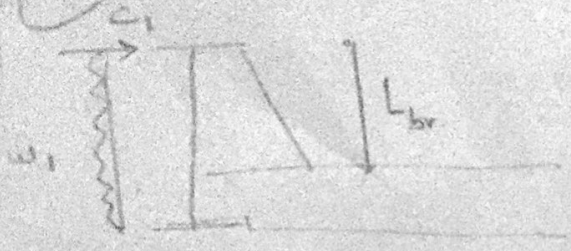
check tension

$f_{act} = \frac{7.55}{2[35 - 1.3 * (2+0.2)]} = 0.117 t/cm^2 < 1.4 \times 0.8 \times 0.85$

∴ safe tension

Bracket 15

loaded



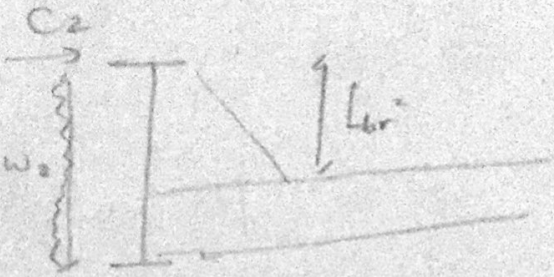
$L_{br} = h_{MG} - h_{xc}$
$= 3.6 - 1.08 = 2.52\ m$

$w_1 = 0.1 \times$ spacing bet bracket
$= 0.1 \times 2.5 = 0.25\ t/m'$

$C_1 = 2\% \frac{M_{tot}}{d_w + t_f}$
$= 0.02 \times \frac{4081.4 \times 100}{350 + 5} = 23\ t$

$M_1 = C \times L + \frac{wL^2}{2}$
$= 23 \times 2.52 + \frac{0.25 \times 2.52^2}{2}$
$= 58.75\ mt$

unloaded



$w_2 = 0.2 \times$ spacing
$= 0.2 \times 2.5 = 0.5\ t/m'$

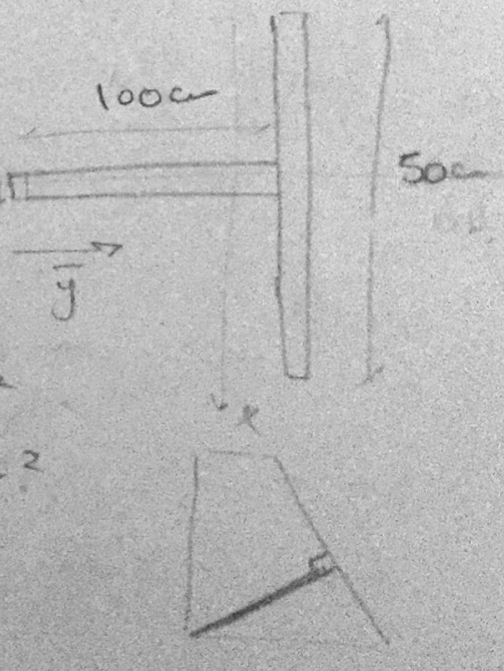
$C_2 = 2\% \frac{M_{DL}}{d_w + t_f}$
$= 0.02 \times \frac{1605 \times 100}{350 + 5} = 9.04\ t$

$M_2 = 9.04 \times 2.52 + \frac{0.5 \times 2.52^2}{2}$
$= 24.4\ mt$

$\bar{y} = \frac{50 \times 2.5 \times 101.25 + 100 \times 1.5 \times 50}{50 \times 2.5 + 100 \times 1.5} = 73.3\ cm$

$I_y = \frac{50(2.5)^3}{12} + 50 \times 2.5 \times (101.25 - 73.3)^2 + \frac{1.5(100)^3}{12} + 100 \times 1.5 (50 - 73.3)^2$
$= 304148.9\ cm^4$

$f_{act} = \frac{My}{I} = \frac{5875 \times 73.3}{304148.9} = 1.42\ t/cm^2$
$< 2.1\ t/cm^2$
$\therefore$ safe.



Qu 13

$\because L = 40m > 30m$

$\therefore$ # of cycles = 500,000

assume continous weld $\Rightarrow$ class B

assume design f_y = 50 ksi

$\therefore m = 1$

$\Longrightarrow \therefore f_{sr_{all}} = 2 t/cm^2$

$$f_{sr_{act}} = \frac{M_{u+I} * m}{Z_x} = \frac{(2251.3 * 100) * 1.1 * 1}{210775.5} = 1.17 \, t/cm^2$$

$< 2 \, t/cm^2$

$\therefore$ safe

Qu 14.

$V = 416.03\ t \cdot = 0.117 D L$

Let $L = b_f - 10c = 100c - 10c = \boxed{90c}$

$416.03 = 0.117 * D * 90 \rightarrow D = 39.5c$

Let $\boxed{D = 40c}$

$b > \frac{D}{3} \rightarrow b > \frac{40}{3} \rightarrow \boxed{b \simeq 15c}$

Check of Compr. Stress

$f_c = \frac{V}{bL} = \frac{416.03}{15 * 90} = 0.31\ t/c^2 < 2\ t/c^2$

∴ safe

⟹ Base plate Design;

$A_P = \frac{V}{\text{all. bearg}} = \frac{416.03}{110/1000} = 3782.1\ c^2$

↳ all bearg stress of concrete C350

Let $L_{PL} \geq L_{roller}$ take $\boxed{L_{PL} = 95c}$

$\therefore b_{PL} = \frac{A_{PL}}{L_{PL}} = \frac{3782.1}{95} \simeq \boxed{40c}$

$P = \frac{V}{A_{PL\,used}} = \frac{416.03}{40 \times 95} = 0.109 * 1000 = 109\ kg/c^2$

< 110

$M = \frac{109 * 20^2}{2} / 1000 = 21.8\ t\,c/c.$

$t_p = \sqrt{\frac{6M}{f_{all} * 1c}} = \sqrt{\frac{6 * 21.8}{(0.72 \times 3.6) * 1}} = 7.104c.$

$\simeq \boxed{7.2c}$

↑ compact about y axis