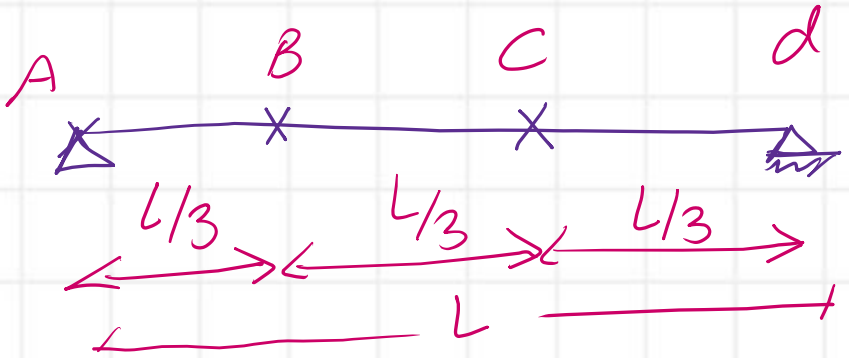
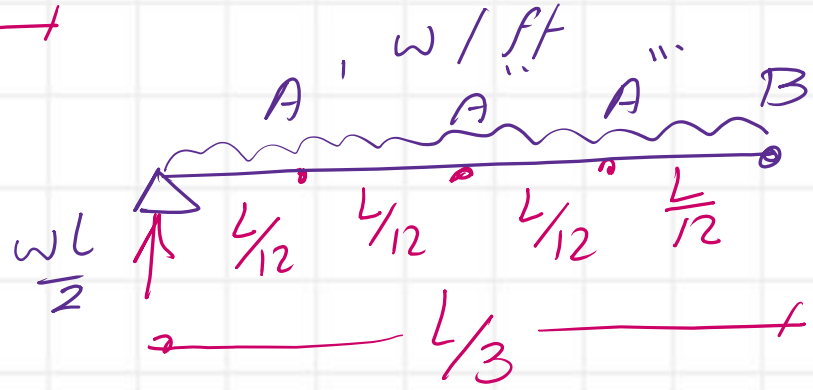
Summary of Past-28 Content

1. Find Cb value for middle part BC
2. Select Final Cb value for minimum Cb values of part AB & part BC
   CE
3. Find the Nominal moment due to L.T.B
4. Select the min - M_n → FLB, WLB, LTB
5. Find Final L.L as required



For Left part A-B

L = 45'

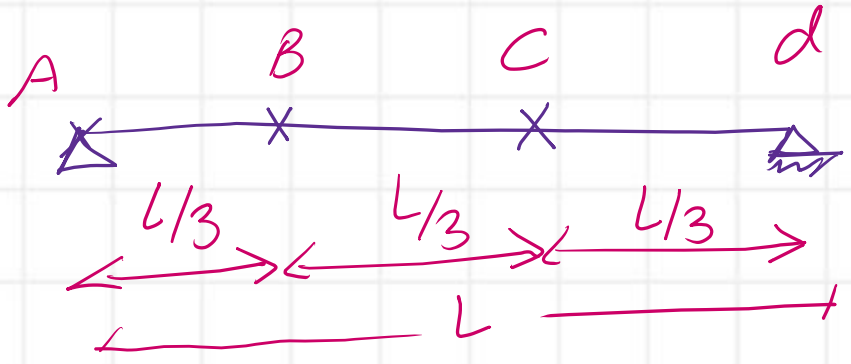


Divide to Four parts

This a reminder

For Cb value For part A B C D

Cb = 1.46



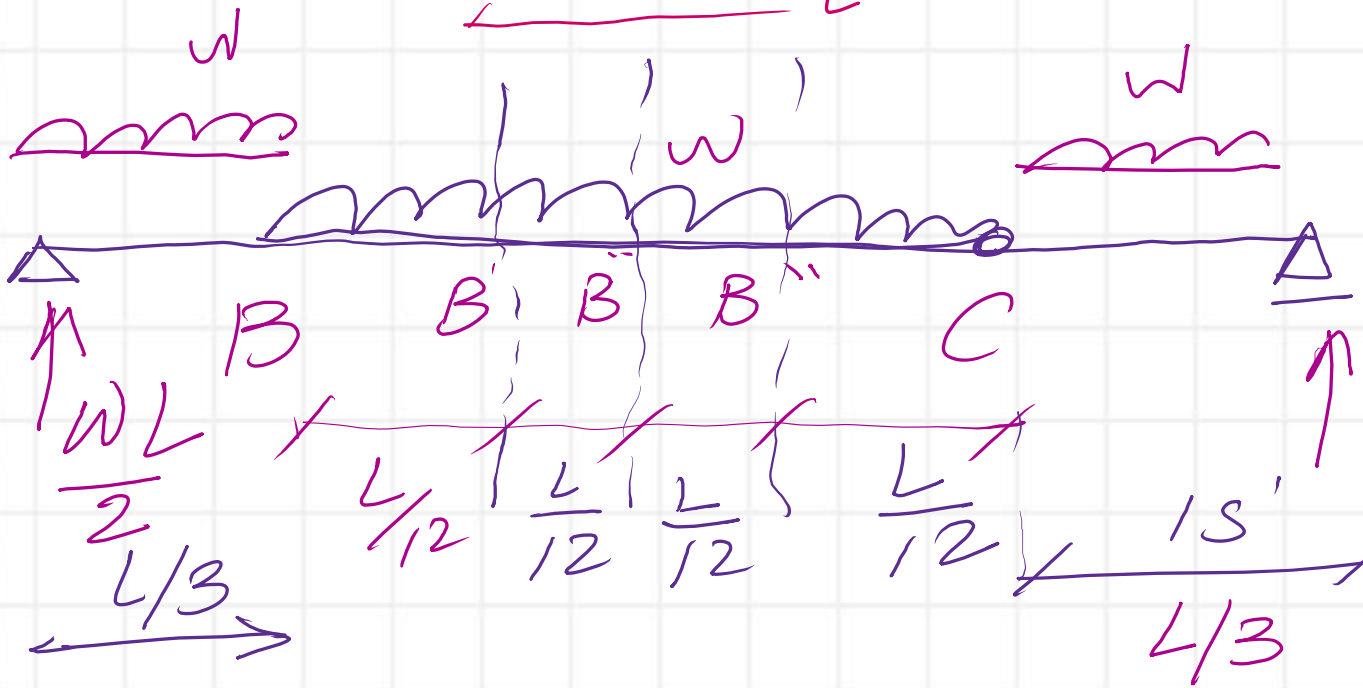
Cb For part B-C

$L = 4S$

$BC = 1S' = L/3$

Divide to Four parts

$\frac{L}{3}\left(\frac{1}{4}\right) = \frac{L}{12}$



$M_{B'} = M_{B''}$ From symmetry

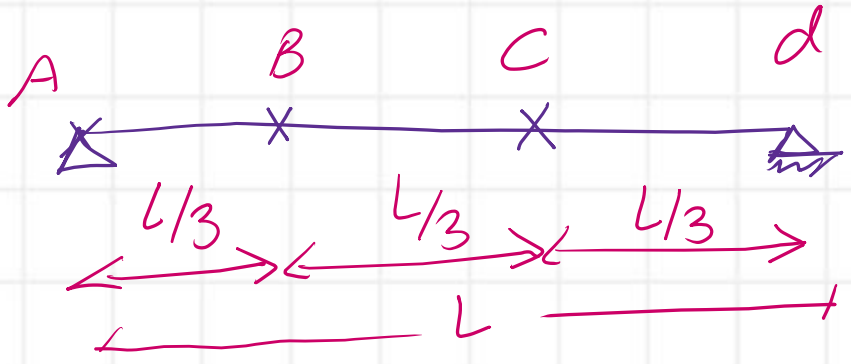
$$M_{B'} = \frac{wL}{2}\left(\frac{L}{3}+\frac{L}{12}\right) - w\left(\frac{L}{3}+\frac{L}{2}\right)^2\left(\frac{1}{2}\right)$$

$$M_B' = \frac{wL}{2}\left(\frac{L}{3}+\frac{L}{12}\right) - w\left(\frac{L}{3}+\frac{L}{12}\right)^2\left(\frac{1}{2}\right)$$

$$M_{B'} = wL^2\left(\frac{5}{2(12)} - \frac{25}{144}\left(\frac{1}{2}\right)\right) = \frac{wL^2(60-25)}{144(2)}$$

$$M_{B'} = \frac{35}{2(144)}\,wL^2$$

↳ Same as $M_B''' = \frac{35}{2(144)}\,wL^2$



Cb For part B-C

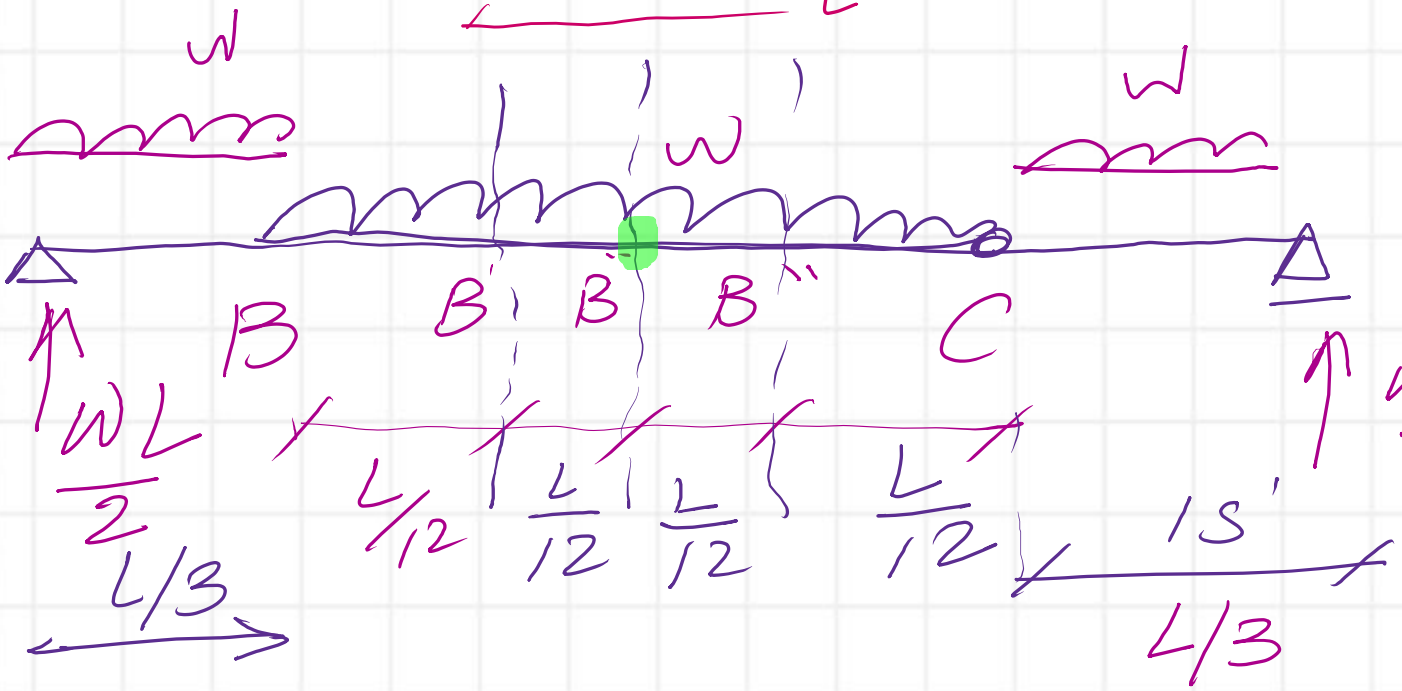
$L = 4S$

$BC = 1S$

$= L/3$

Divide to Four parts

$\frac{L}{3}\left(\frac{1}{4}\right) = \frac{L}{12}$



$$M_{B'} = \frac{WL}{2}\left(\frac{L}{3}+\frac{2L}{12}\right) - W\left(\frac{L}{3}+\frac{2L}{2}\right)^2\left(\frac{1}{2}\right)$$

at the middle

$$M_{B''} = \frac{wL}{2}\left(\frac{L}{3}+\frac{2L}{12}\right) - w\left(\frac{L}{3}+\frac{2L}{12}\right)^2\left(\frac{1}{2}\right)$$

$$M_{B''} = wL^2\left(\frac{6}{2(12)} - \frac{36}{144}\left(\frac{1}{2}\right)\right) = \frac{wL^2(72-36)}{144(2)}$$

$$M_{B''} = \frac{36}{2(144)}wL^2 = \frac{wL^2}{8} \Rightarrow$$ know M_{+ve} at mid span

Find Cb For part B-C $\ell = 15'$

$$C_b = \frac{12.5\, M_{max}}{2.5 M_{max} + 3M_{B'} + 4M_{B''} + 3M_{B'''}}$$

$$M_{B'} = M_{B^{M1}} = \frac{35}{2(144)} wL^2$$

$$M_{B''} = \frac{wL^2}{8} \Rightarrow M_{max} \quad \text{remove } wL^2$$

$$C_b = \frac{12.5(1/8)}{2.5\left(\frac{1}{2}\right) + \frac{6(35)}{2(144} + 4\left(\frac{1}{8}\right)}$$

B-C

$$C_{b_{B-C}} = \frac{12.5(1/8)}{2.5\left(\frac{1}{2}\right) + \frac{6(35)}{2(144} + 4\left(\frac{1}{8}\right)}$$

$$C_{b_{B-C}} = \left(\frac{12.5}{8}\right)\left(\frac{1}{\frac{90 + 210 + 144}{2(144)}}\right)$$

$$= \frac{12.5}{8}(2)\left(\frac{144}{444}\right)$$

$$C_{b_{B-C}} = 1.014$$

$\Rightarrow$ Use $\min(1.46, 1.014)$

$C_{b_{final}} = 1.00$

M_n from F.L.B = 1355.7 FT.kips & $F_y = 65$ ksi

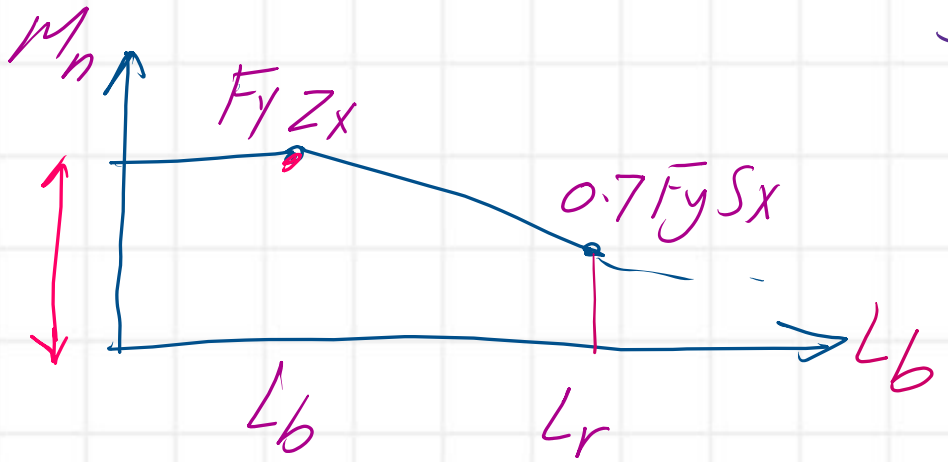
M_n from W.L.B = 1672.0 FT.kips $Z_x = 319.06$ inch^3

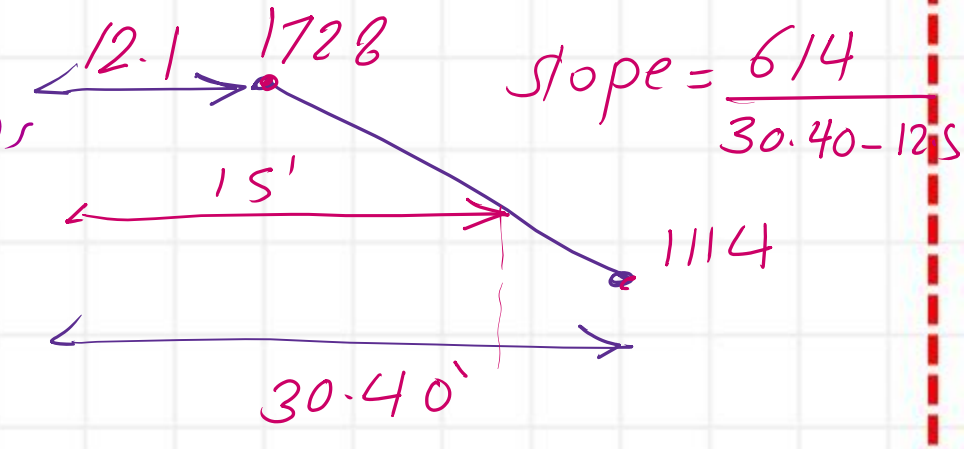
$L_b = 12.1'$ $\Rightarrow$ $S_x = 293.80$ inch^3

$L_r = 30.40$

$L_b = 15'$ $C_b = 1.013$

$C_b \Downarrow = 1.0$





$F_y Z_x = \frac{65}{12}(319.06) = 1728.24 \simeq 1728$ FT.kips

$0.7 F_y S_x = 0.7\left(\frac{65}{12}\right)(293.80) = 1114$ FT.kips

Slope $= \frac{614}{30.40 - 12.5}$

Value $M_n = \left(1728 - \left(\frac{15 - 12.1}{30.40 - 12.5}\right) 614\right) 1$

$= 1628.59 \Rightarrow 1630$ FT.kips by Author

$M_{nF} = 1355.70$ FT. kips FLB

$M_{nw} = 1672$ FT. kips WLB

$M_{n\,L.T.B} = 1630$ FT. kips LTB

M_n Minimum $= \min(1355.7, 1672, 1630) = 1355.70$ FT. kips

$\phi = 0.90$

$\phi M_n = 0.90\,(1355.70) = 1220$ FT. kips

LRFD = 1.2D + 1.6LL ? Span = L = 45'

$M_{ULT} = (1.20(0.15) + 1.6(L.L))\left(\frac{45}{8}\right)^2 \leq \phi M_n =$

$(0.18 + 1.6\,L.L)(253.125) \leq 1220$ Ft.kips

$1.6LL = \frac{1220}{253.125} - 0.18 = 4.639$ kips/FT

$W_{L.L} = 2.899 \Rightarrow 2.90$ FT.kips

Final service L.L