PROB # 9-16

Assume beam wt = 100 lbs/ft

LRFD	ASD
$w_u = (1.2)(2.3) + (1.6)(3.0) = 7.56$ k/ft	$w_a = 2.3 + 3.0 = 5.3$ k/ft
$M_u = \frac{(7.56)(25)^2}{8} = 590.6$ ft-k	$M_a = \frac{(5.3)(25)^2}{8} = 414.1$ ft-k
$C_b = 1.14$ (Figure 9-10 in text)	$C_b = 1.14$ (Figure 9-10 in text)
Enter AISC Table 3-10 with	Enter AISC Table 3-10 with
M_u effective $= \frac{590.6}{1.14} = 518$ ft-k	M_a effective $= \frac{414.1}{1.14} = 363.2$ ft-k
Try W18X97	Try W18X97
$\phi_b M_{mp} = 791 > 590.6$ ok	$\frac{M_{ox}}{\Omega_b} = 526 > 414.1$
USE W18X97	USE W18X97

✓ gcmc

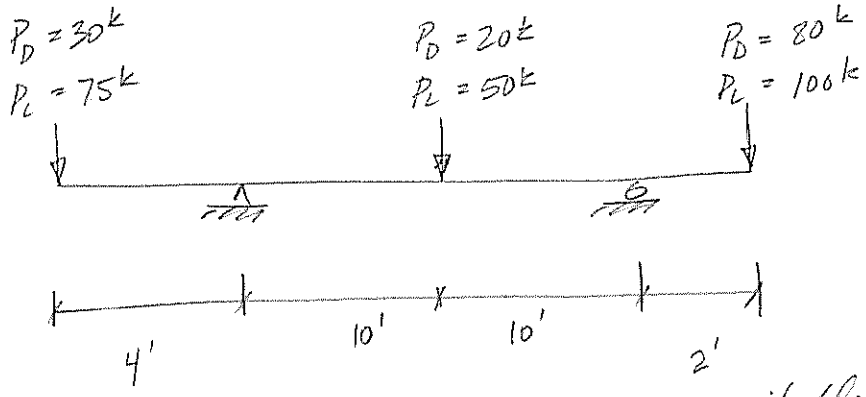
PROB # 9-18

Assume beam wt = 84 lbs/ft

LRFD	ASD
$w_u = (1.2)(1.084) = 1.30$ k/ft	$w_a = 1.084$ k/ft
$P_u = (1.6)(40) = 64$ k	$P_a = 40$ k
$M_u = \frac{(1.30)(30)^2}{8} + (64)(10) = 786.25$ ft-k	$M_a = \frac{(1.084)(30)^2}{8} + (40)(10) = 522$ ft-k
Note $C_b = 1.0$ for middle section	Note $C_b = 1.0$ for middle section
using AISC Table 3-10	using AISC Table 3-10
USE W27X84	USE W24X84

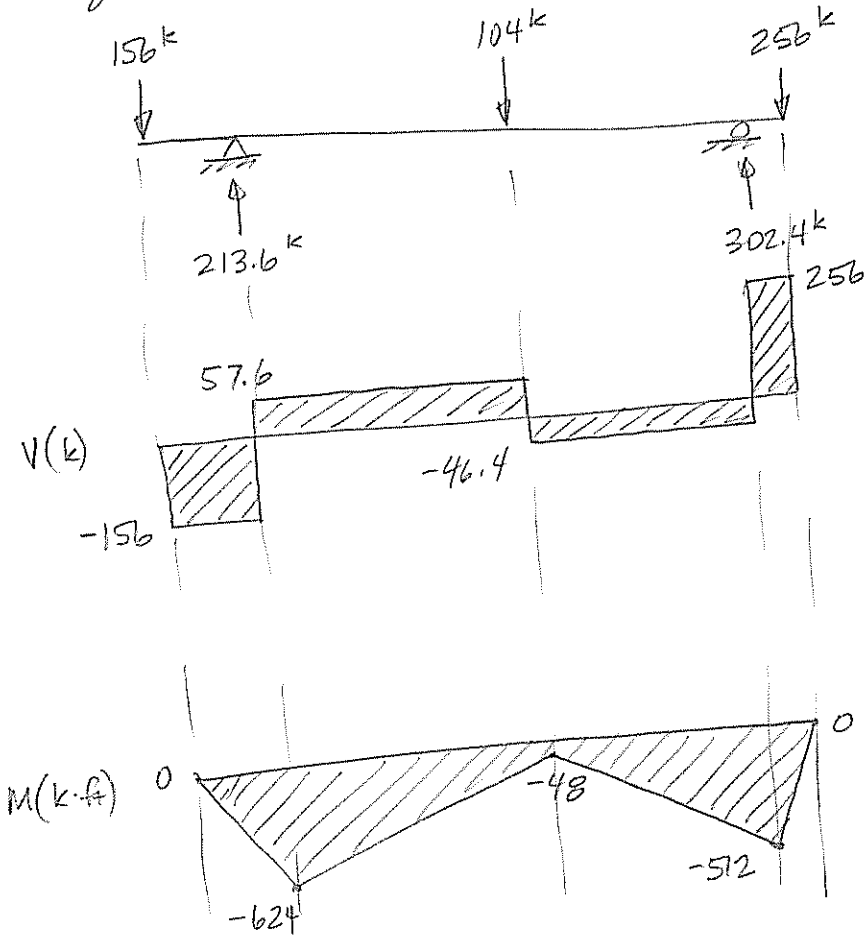
✓ gcmc

10-12



Use $F_y = 50$ ksi to find the lightest available section. Beam is continuously braced. Design for moment and shear only.

1) Apply load factors and find shear and moment diagram (use 1.2D + 1.6L)



10-12 continued

$\therefore \quad M_u = 624 \text{ k·ft}$

$V_u = 256^k$

enter Z_x tables with $M_u = 624 \text{ k·ft}$

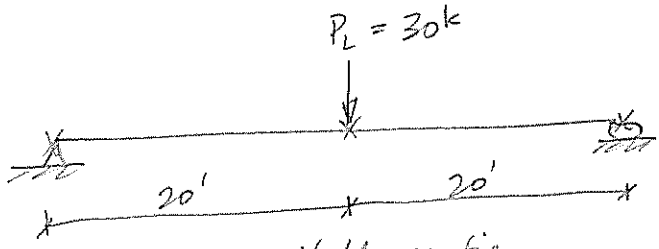
Choose **W24 x68**

$\phi M_p = 664 \text{ k·ft} > 624 \text{ k·ft}$ ✓

$\phi V_n = 295^k > 256^k$ ✓

section is compact ✓

10-18

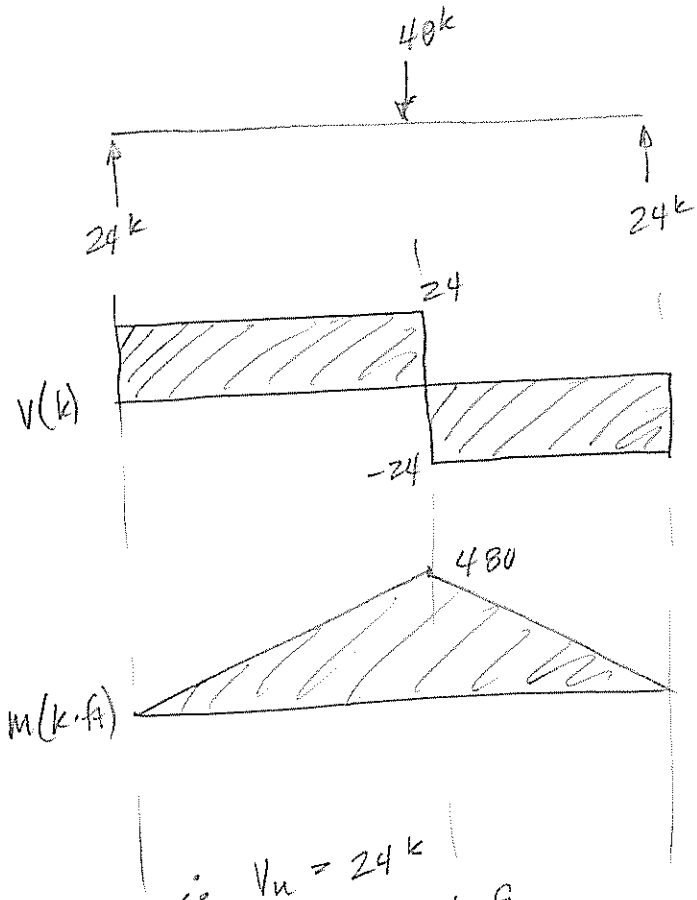


Choose the lightest available section

$F_y = 50$ ksi

$$\Delta_{max} = \frac{L}{1000} = \frac{40(12)}{1000} = 0.48"$$

Shear and moment diagrams



$\therefore V_u = 24^k$

$M_u = 480$ k·ft

I_x required:

$$\Delta_{max} = \frac{PL^3}{48EI}$$

(no load factors)

$$I \geq \frac{PL^3}{48E\Delta_{max}} = \frac{(30\,k)((40')(12''/ft))^3}{48(29{,}000\,ksi)(0.48'')}$$

$$\geq 4{,}965.5\ in^4$$

Enter beam charts with

$L_b = 20'$

$M_u = 480\ k\cdot ft$

Choose W24x84

$\phi M_n = 522\ k\cdot ft$ @ $L_b = 20'$

$\phi V_n = 340\ k$ ✓

$I_x = 2{,}370\ in^4 < 4{,}965.5\ in^4$ X

Choose section that satisfies all three

Choose **W33x118** $\phi V_n = 488\ k$

*need to check limit for shear as h/t_w is not met. It will check.