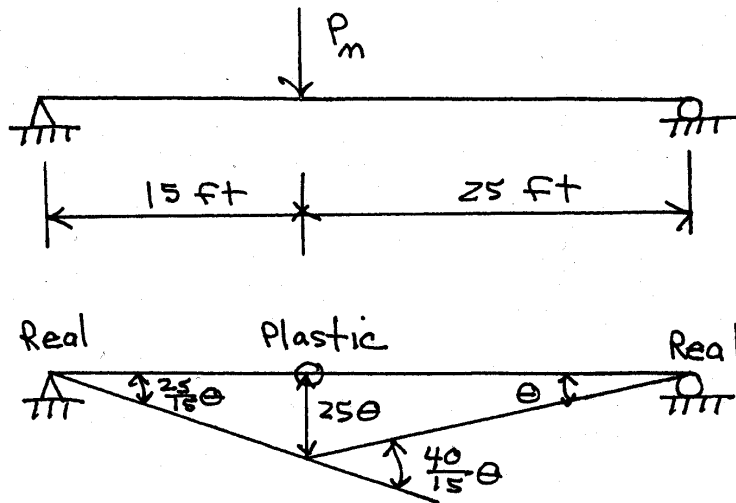


ENCE 355 – Introduction to Structural Design
SOLUTIONS to Homework Set No. 14
Fall 2002

PROB # 8-22

using a W18x143 ($Z_x = 322 \text{ in.}^3$)

$$M_m = F_y Z = \frac{(50)(322)}{12} = 1341.7 \text{ ft-k}$$



$$M_m \left(\frac{40}{15}\theta \right) = (P_m)(25\theta)$$

$$P_m = 0.10667 M_m$$

$$P_m = (0.10667)(1341.7)$$

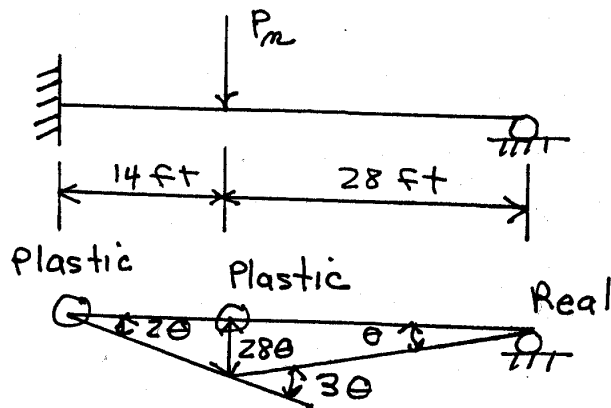
$$\boxed{P_m = 143.1 \text{ k}}$$

✓ g l m c

PROB #8-28

Using a W30 x 124 ($Z_x = 408 \text{ in}^3$)

$$M_m = F_y Z_x = \frac{(50)(408)}{12} = 1700 \text{ ft-k}$$



$$M_m (50) = (P_m)(280)$$

$$P_m = \left(\frac{5}{28}\right)(M_m) = \left(\frac{5}{28}\right)(1700)$$

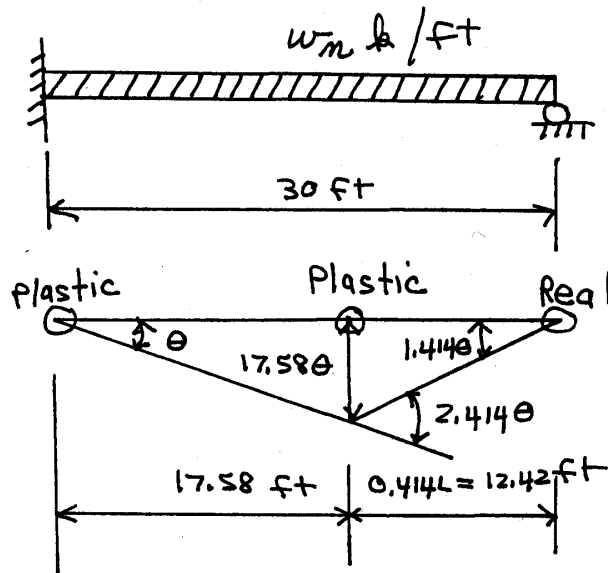
$$P_m = 303.6 \text{ k}$$

✓ JCMC

PROB # 8-31

Using a W 18 X 130 ($Z_x = 290 \text{ in.}^3$)

$$M_m = F_y Z_x = \frac{(50)(290)}{12} = 1208.3 \text{ ft-k}$$



$$M_m (3.414\theta) = (30w) \left(\frac{1}{2}\right) (17.58\theta)$$

$$w_m = 0.012946 M_m = (0.012946)(1208.3)$$

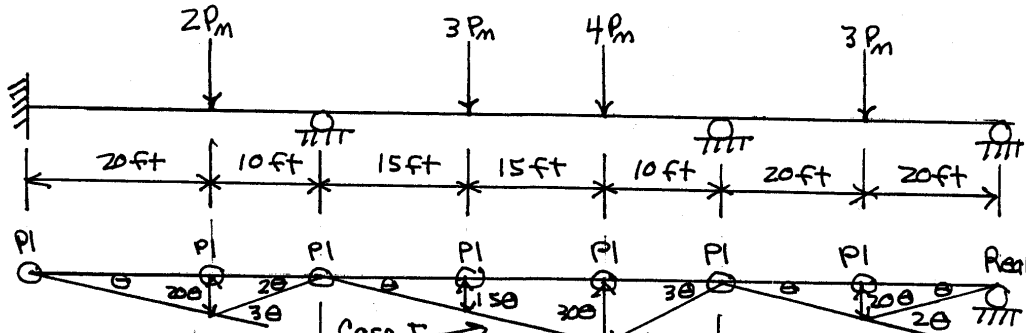
$$\boxed{w_m = 15.64 \text{ k/ft}}$$

✓ JCMC

PROB # 8-37

Using a W36X160 ($Z_x = 624 \text{ in.}^3$)

$$M_m = F_y Z_x = \frac{(50)(624)}{12} = 2600 \text{ ft-k}$$



$$M_m(60) = (2P_m)(200)$$

$$P_m = 0.15M_m$$

Case I

$$M_m(80) = (3P_m)(150) + (4P_m)(200)$$

$$P_m = 0.0485P_m$$

$$M_m(30) = (3P_m)(200)$$

$$P_m = 0.05M_m$$

Case II

$$M_m(160) = (3P_m)(250) + (4P_m)(100)$$

$$P_m = 0.0464M_m$$

$$P_m = (0.0464)(2600)$$

$$= 120.6 \text{ k}$$

Case III

$$M_m(40) = (3P_m)(150)$$

$$P_m = 0.0889P_m$$

Case IV

$$M_m(50) = (4P_m)(150)$$

$$P_m = 0.0833P_m$$

Case V

$$M_m(50) = (3P_m)(150) + (4P_m)(150)$$

$$P_m = 0.0476P_m$$

✓ $\phi C M_c$

CHAPTER 9

PROB #9-1

Assume beam $w_t = 90 \text{ lbs/ft}$

$$w_u = (1.2)(1.29) + (1.6)(30) = 6.348 \text{ k/ft}$$

$$M_u = \frac{(6.348)(36)^2}{8} = 1028.4 \text{ ft-k}$$

$$Z_{\text{Reqd}} = \frac{(12)(1028.4)}{(0.9)(50)} = 274.2 \text{ in.}^3$$

USE W30X90

✓ g c m c

PROB #9-4

Assume beam $w_t = 84 \text{ lbs/ft}$

$$w_u = (1.2)(1.584) = 1.90 \text{ k/ft}$$

$$P_u = (1.6)(24) = 38.4 \text{ k/ft}$$

$$M_u = (1.90)(16)(8) + (38.4)(8) + \left(\frac{38.4}{2}\right)(16) \\ = 857.6 \text{ ft-k}$$

$$Z_{\text{Reqd}} = \frac{M_u}{\phi_b F_y} = \frac{(12)(857.6)}{(0.9)(50)} \\ = 228.7 \text{ in.}^3$$

USE W27X84

✓ g c m c