

Structural Analysis 6th edition Kassimali Solutions Manual

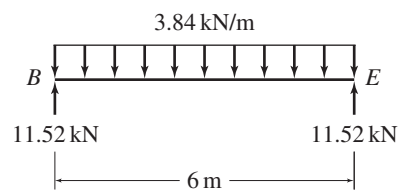
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Chapter 2

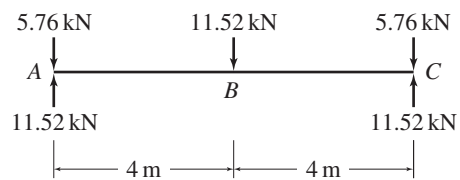
2.1

Beam BE

Uniformly distributed load = $0.96(4)(1) = \underline{3.84 \text{ kN}}$



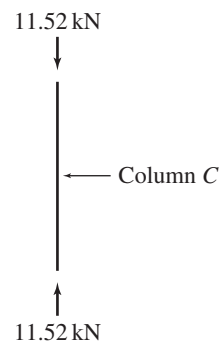
Girder AC



2.2

Column C

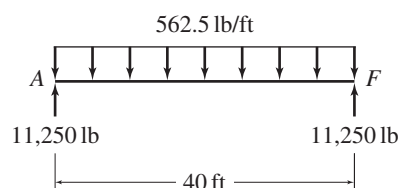
Axial load = $0.96(3)4 = 11.52 \text{ kN}$



2.3

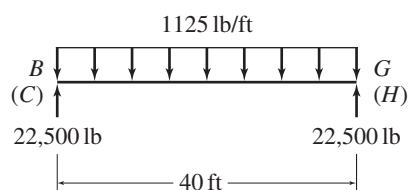
Beam AF

$$\text{Uniformly distributed load} = 45 \left(\frac{25}{2} \right) (1) = \underline{562.5 \text{ lb}}$$

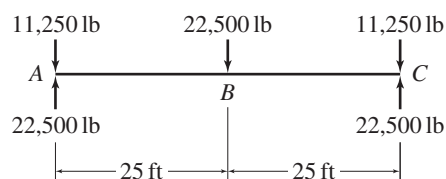


Beams BG and CH

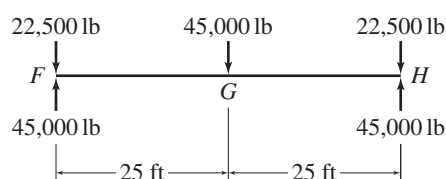
$$\text{Uniformly distributed load} = 45(25)(1) = \underline{1125 \text{ lb}}$$



Girder AC



Girder FH



2.4

Column A

$$\text{Axial load} = 45(20)25 = \underline{22,500 \text{ lb}}$$

Column F

$$\text{Axial load} = 45(40)25 = \underline{45,000 \text{ lb}}$$

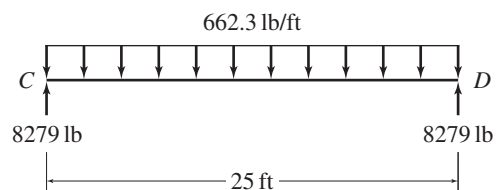
Column H

$$\text{Axial load} = 45(40)50 = \underline{90,000 \text{ lb}}$$

2.5

Beam CD

$$\begin{aligned}\text{Uniformly distributed load} &= 150(12) \left(\frac{4}{12} \right) + 490 \left(\frac{18.3}{144} \right) \\ &= \underline{662.3 \text{ lb/ft}}\end{aligned}$$



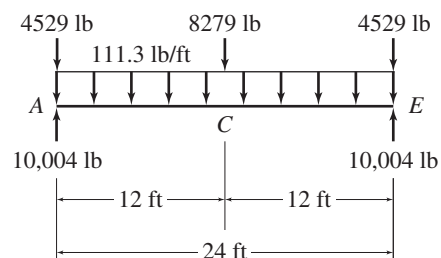
Girder AE

$$\text{Uniformly distributed load} = 490 \left(\frac{32.7}{144} \right) = \underline{111.3 \text{ lb/ft}}$$

$$\text{Concentrated load at C} = \underline{8279 \text{ lb}}$$

Concentrated loads at A and E

$$= \left[150(6) \left(\frac{4}{12} \right) + 490 \left(\frac{18.3}{144} \right) \right] \left(\frac{25}{2} \right) = \underline{4529 \text{ lb}}$$



2.6

See Solution of Problem 2.5

Beam CD

$$\text{Uniformly distributed load} = 662.3 + 120 \left(\frac{6}{12} \right) (7) = 662.3 + 420 = \underline{1082.3 \text{ lb/ft}}$$

Girder AE

$$\text{Uniformly distributed load} = \underline{111.3 \text{ lb/ft}}$$

$$\text{Concentrated load at C} = 8279 + 420 \left(\frac{25}{2} \right) = \underline{13,529 \text{ lb}}$$

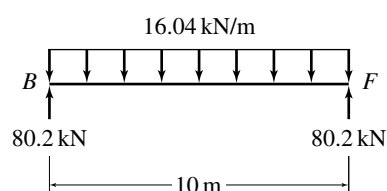
$$\text{Concentrated loads at A and E} = \underline{4529 \text{ lb}}$$

2.7

Beam BF

Uniformly distributed load

$$= 23.6(5) \left(\frac{130}{1000} \right) + 77 \left(\frac{9100}{10^6} \right) = \underline{16.04 \text{ kN/m}}$$



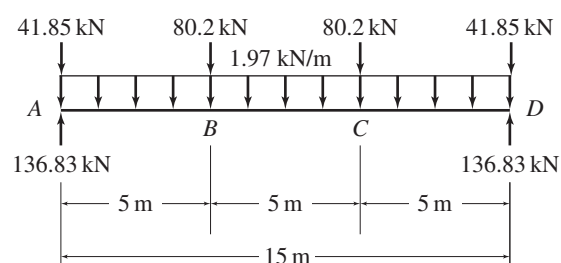
Girder AD

Uniformly distributed load = $77 \left(\frac{25,600}{10^6} \right) = \underline{1.97 \text{ kN/m}}$

Concentrated loads at B and C = 80.2 kN

Concentrated loads at A and D

$$= \left[23.6(2.5) \left(\frac{130}{1000} \right) + 77 \left(\frac{9100}{10^6} \right) \right] \frac{10}{2} = \underline{41.85 \text{ kN}}$$



2.8

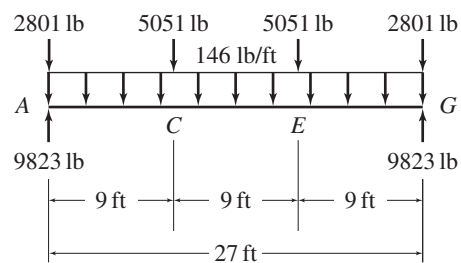
$$\text{Uniformly distributed load} = 490 \left(\frac{42.9}{144} \right) = \underline{146 \text{ lb/ft}}$$

Concentrated loads at A and G

$$= \left[150(4.5) \left(\frac{4}{12} \right) + 490 \left(\frac{16.2}{144} \right) \right] \left(\frac{20}{2} \right) = \underline{2801 \text{ lb}}$$

Concentrated loads at C and E

$$= \left[150(9) \left(\frac{4}{12} \right) + 490 \left(\frac{16.2}{144} \right) \right] \left(\frac{20}{2} \right) = \underline{5051 \text{ lb}}$$

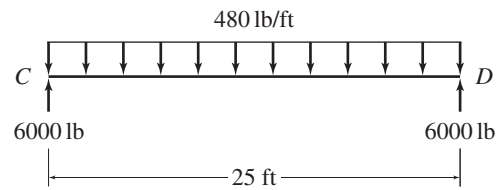


2.9

Live load = 40 psf

Beam CD

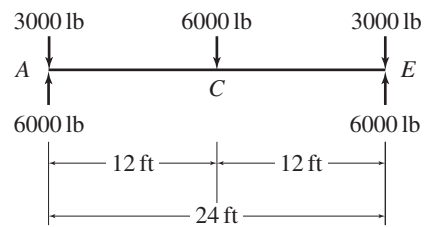
Uniformly distributed load = $40(12) = \underline{480 \text{ lb/ft}}$



Girder AE

Concentrated load at C = 6000 lb

Concentrated loads at A and E = $40(6) \left(\frac{25}{2} \right)$
 $= \underline{3000 \text{ lb}}$

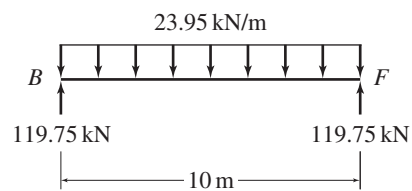


2.10

Live load = 4.79 kPa = 4.79 kN/m²

Beam BF

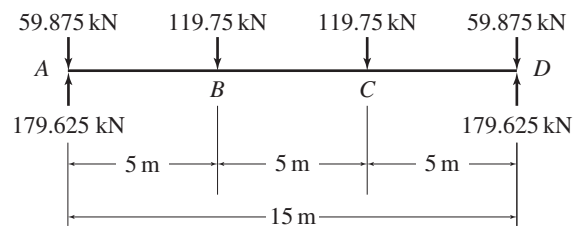
Uniformly distributed load = $4.79(5) = \underline{23.95 \text{ kN/m}}$



Girder AD

Concentrated loads at B and C = 119.75 kN

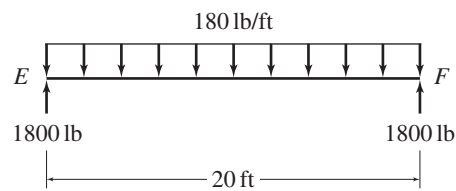
Concentrated loads at A and D = $4.79(2.5) \frac{10}{2}$
 $= \underline{59.875 \text{ kN}}$



2.11

Beam EF

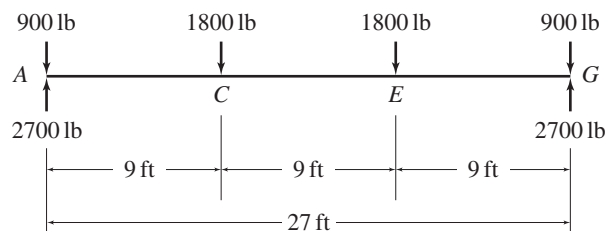
Uniformly distributed load = $20(9) = \underline{180 \text{ lb/ft}}$



Girder AG

Concentrated loads at C and E = 1800 lb

Concentrated loads at A and G = $1800/2 = \underline{900 \text{ lb}}$



Column A

Concentrated load = 2700 lb

2.12

$V = 95 \text{ mph}$, $h = 40 + (15/2) = 47.5 \text{ ft}$, $z_g = 1200 \text{ ft}$, $\alpha = 7.0$, $K_{zt} = 1$, $K_d = 0.85$, and $K_e = 1$.

$$K_h = 2.01 \left(\frac{47.5}{1200} \right)^{2/7} = 0.8$$

$$q_h = 0.00256(0.8)(1)(0.85)(1)(95)^2 = 15.71 \text{ psf}$$

$$G = 0.85$$

For $\theta = 45^\circ$ and $h/L = 47.5/30 = 1.58$:

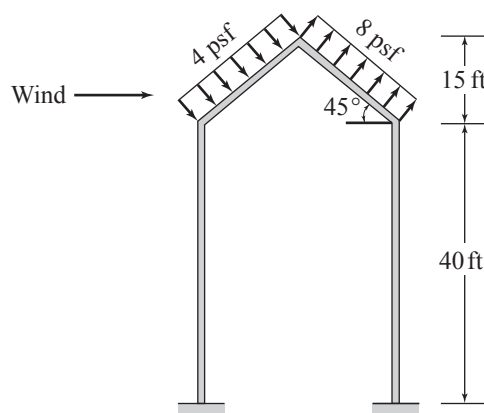
$$C_p = 0.3 \quad \text{for windward side}$$

$$C_p = -0.6 \quad \text{for leeward side}$$

Thus, the wind pressures are:

$$p_h = 15.71 (0.85)(0.3) = \underline{4.0 \text{ psf}} \quad \text{for windward side}$$

$$p_h = 15.71 (0.85)(-0.6) = \underline{-8.0 \text{ psf}} \quad \text{for leeward side}$$



2.13

$$V = 51 \text{ m/s}, h = 12 + \frac{5}{2} = 14.5 \text{ m}, z_g = 365.76 \text{ m}, \alpha = 7.0, K_{zt} = 1, K_d = 0.85, \text{ and } K_e = 1.$$

$$K_h = 2.01 \left(\frac{14.5}{365.76} \right)^{2/7} = 0.8$$

$$q_h = 0.613(0.8)(1)(0.85)(1)(51)^2 = 1084.2 \text{ N/m}^2$$

$$G = 0.85$$

$$\text{Roof slope: } \theta = \tan^{-1} (5/6) = 39.8^\circ$$

$$\frac{h}{L} = \frac{14.5}{12} = 1.21$$

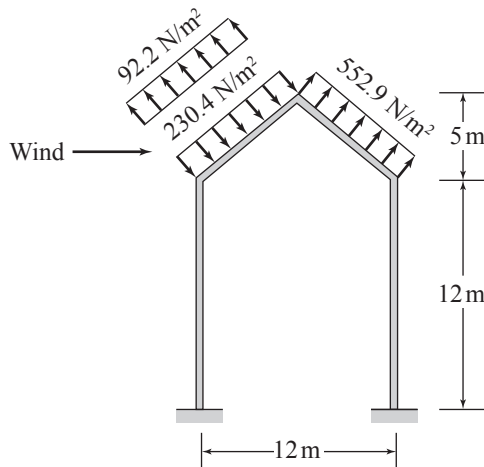
$$C_p = -0.1 \text{ and } 0.25 \text{ for windward side}$$

$$C_p = -0.6 \text{ for leeward side}$$

Thus, the wind pressures are:

$$\left. \begin{aligned} p_h &= (1084.2)(0.85)(-0.1) = \underline{-92.2 \text{ N/m}^2} \\ p_h &= (1084.2)(0.85)(0.25) = \underline{230.4 \text{ N/m}^2} \end{aligned} \right\} \text{ for windward side}$$

$$p_h = (1084.2)(0.85)(-0.6) = \underline{-552.9 \text{ N/m}^2} \text{ for leeward side}$$



2.14

$$V = 120 \text{ mph}, h = 30 + \frac{11}{2} = 35.5 \text{ ft}, z_g = 900 \text{ ft}, \alpha = 9.5, K_{zt} = 1, K_d = 0.85, \text{ and } K_e = 1.$$

$$K_h = 2.01 \left(\frac{35.5}{900} \right)^{2/9.5} = 1.02$$

$$q_h = 0.00256(1.02)(1)(0.85)(1)(120)^2 = 32 \text{ psf}$$

$$G = 0.85$$

$$\text{Roof slope: } \theta = \tan^{-1} (11/20) = 28.8^\circ$$

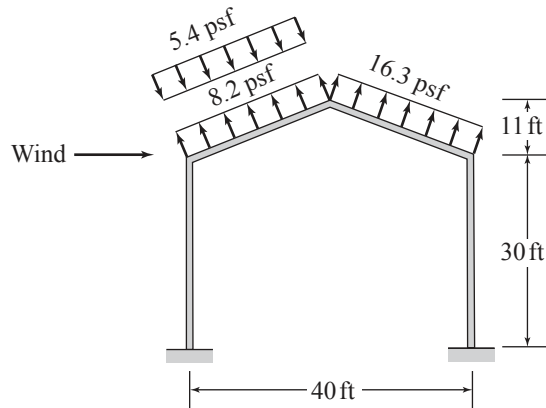
$$\frac{h}{L} = \frac{35.5}{40} = 0.89$$

$$C_p = -0.3 \text{ and } 0.2 \text{ for windward side}$$

$$C_p = -0.6 \text{ for leeward side}$$

Thus, the wind pressures are:

$$\begin{aligned} p_h &= 32(0.85)(-0.3) = \underline{-8.2 \text{ psf}} \\ p_h &= 32(0.85)(0.2) = \underline{5.4 \text{ psf}} \end{aligned} \quad \left. \begin{array}{l} \text{for windward side} \\ \text{for leeward side} \end{array} \right\}$$



2.15

$V = 120$ mph, $z_g = 900$ ft, $\alpha = 9.5$

From the solution of Problem 2.14:

$q_h = 32$ psf and $G = 0.85$

Leeward wall:

For $L/B = 40/30 = 1.33$, $C_p = -0.45$

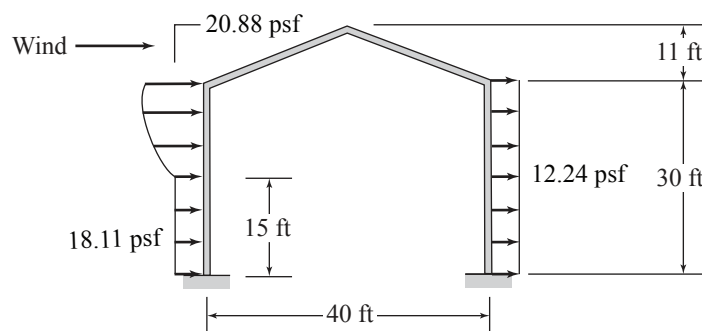
Thus, the wind pressure, $p_h = 32 (0.85) (-0.45)$

$$= \underline{-12.24 \text{ psf}}$$

Windward wall:

$C_p = 0.8$

z (ft)	K_z	q_z (psf)	p_z (psf)
30	0.98	30.71	20.88
25	0.95	29.77	20.24
20	0.90	28.20	19.18
15	0.85	26.63	18.11



2.16

$$p_g = 20 \text{ psf}, C_e = 1, C_t = 1, I_s = 1.2$$

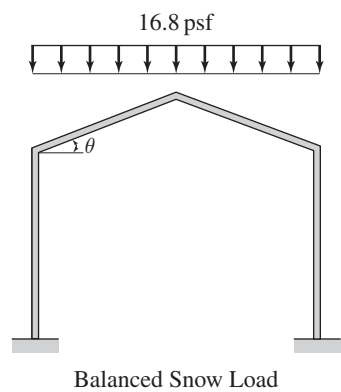
$$p_f = 0.7 C_e C_t I_s p_g = 0.7(1)(1)(1.2)(20) = 16.8 \text{ psf}$$

$$\theta = \tan^{-1}(11/20) = 28.8^\circ > 15^\circ$$

Therefore, the minimum values of p_f need not be considered.

$$C_s = 1$$

$$\text{Balanced load} = p_s = C_s p_f = 1(16.8) = \underline{16.8 \text{ psf}}$$



2.17

$$p_g = 1.2 \text{ kN/m}^2, C_e = 1, C_t = 1, I_s = 1.1$$

$$p_f = 0.7 C_e C_t I_s p_g = 0.7(1)(1)(1.1)(1.2) = 0.92 \text{ kN/m}^2$$

$$\theta = \tan^{-1}(5/6) = 39.8^\circ > 15^\circ$$

Therefore, the minimum values of p_f need not be considered.

$$C_s = 1 - \frac{\theta - 30^\circ}{40^\circ} = 0.76$$

$$\text{Balanced Load} = p_s = C_s p_f = 0.76(0.92) = \underline{0.7 \text{ kN/m}^2}$$

