Structural Analysis 6th edition Kassimali Solutions Manual

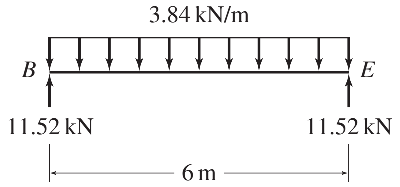
SKU: 9781337630931-SOLUTIONS

Chapter 2

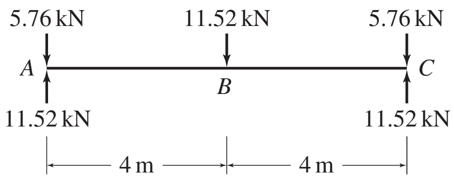
2.1

Beam BE

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



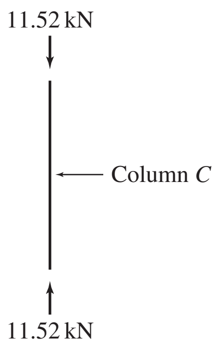
Girder AC



2.2

Column C

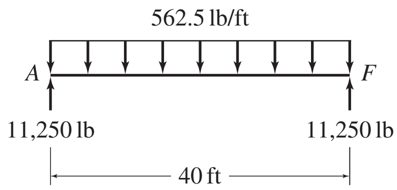
Axial load $= 0.96(3)4 = 11.52\,\text{kN}$



2.3

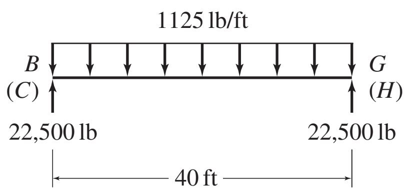
Beam AF

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

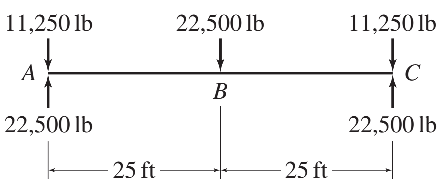


Beams BG and CH

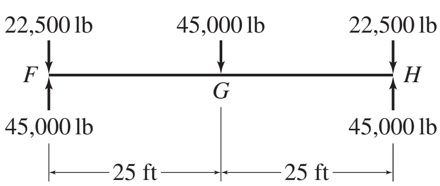
Uniformly distributed load $= 45(25)(1) = \underline{1125\text{ lb}}$



Girder AC



Girder FH



2.4

Column A

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

Column F

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

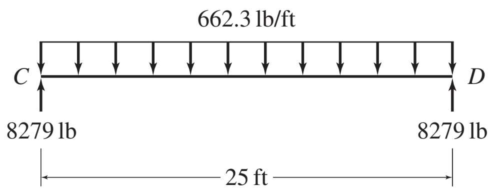
Column H

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

2.5

Beam CD

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



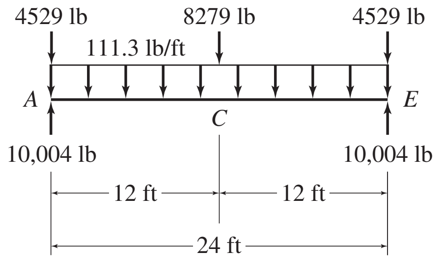
Girder AE

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

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

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

Girder AE

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

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

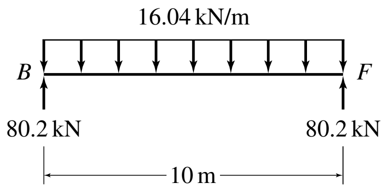
Concentrated loads at A and E $= \underline{4529\ \text{lb}}$

2.7

Beam BF

Uniformly distributed load

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



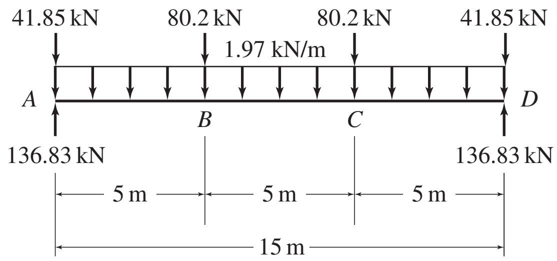
Girder AD

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

Concentrated loads at B and C $= \underline{80.2\,\text{kN}}$

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

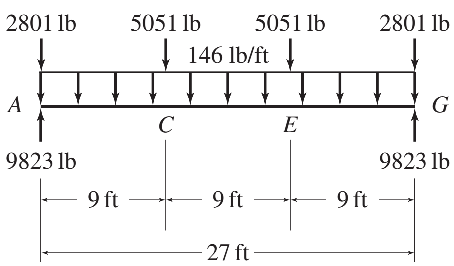
Uniformly distributed load $= 490\left(\dfrac{42.9}{144}\right) = \underline{146\ \text{lb/ft}}$

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

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

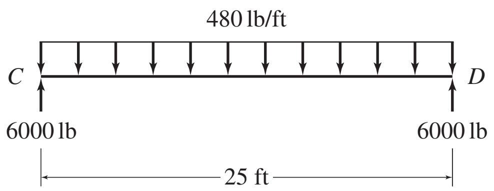


2.9

Live load = 40 psf

Beam CD

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

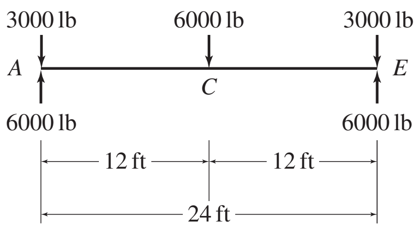


Girder AE

Concentrated load at C $= \underline{6000\text{ lb}}$

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

$$= \underline{3000\text{ lb}}$$

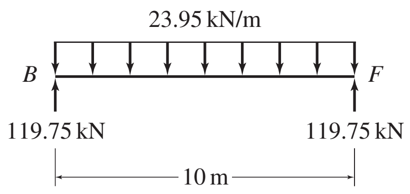


2.10

Live load = 4.79 kPa = 4.79 kN/m^2

Beam BF

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

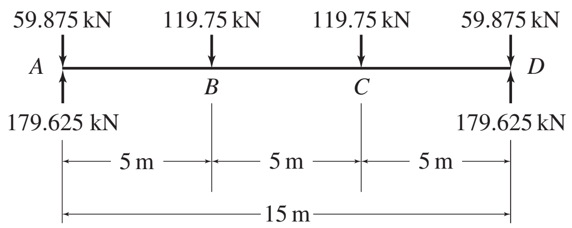


Girder AD

Concentrated loads at B and C $= \underline{119.75\text{ kN}}$

Concentrated loads at A and D $= 4.79(2.5)\dfrac{10}{2}$

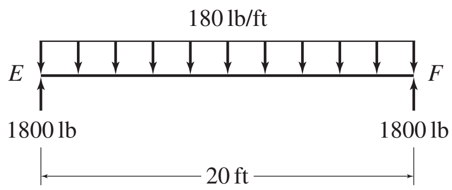
$= \underline{59.875\text{ kN}}$



2.11

Beam EF

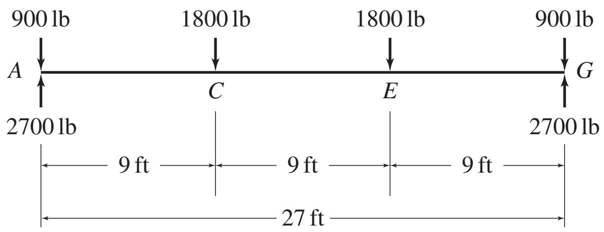
Uniformly distributed load $= 20(9) = \underline{180\ \text{lb/ft}}$



Girder AG

Concentrated loads at C and E $= \underline{1800\ \text{lb}}$

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



Column A

Concentrated load $= \underline{2700\ \text{lb}}$

2.12

$V = 95$ mp▯, $h = 40 + (15/2) = 47.5$ ft, $z_g = 1200$ 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 $\theta = 45°$ and $h/L = 47.5/30 = 1.58$:

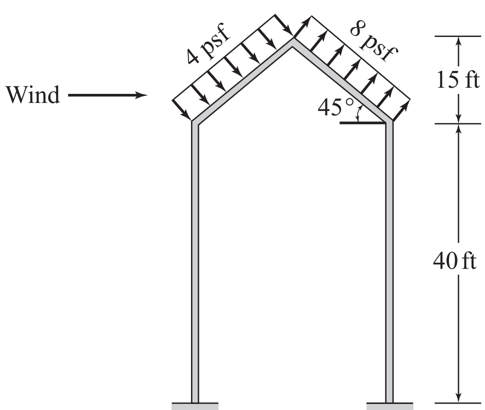
$$C_p = 0.3 \qquad \text{for windward side}$$

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

Thus, the wind pressures are:

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

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



2.13

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

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

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

$$G = 0.85$$

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

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

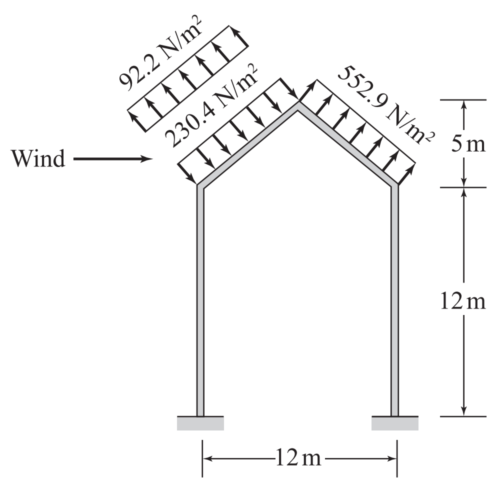
$$C_p = -0.1 \text{ and } 0.25 \text{ for windward side}$$

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

Thus, the wind pressure are:

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

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



2.14

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

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

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

$$G = 0.85$$

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

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

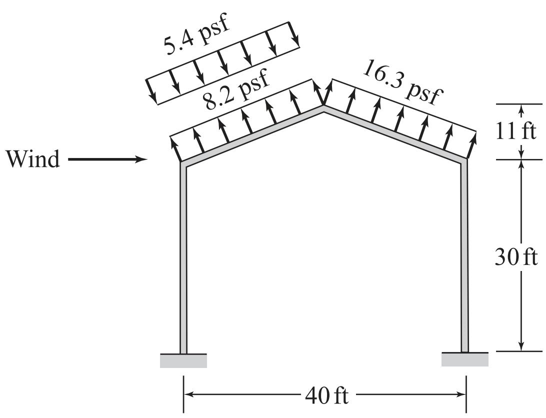
$C_p = -0.3$ and 0.2 for windward side

$C_p = -0.6$ for leeward side

Thus, the wind pressures are:

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

$$p_h = 32(0.85)(-0.6) = \underline{-16.3 \text{ psf}} \quad \text{for leeward side}$$



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

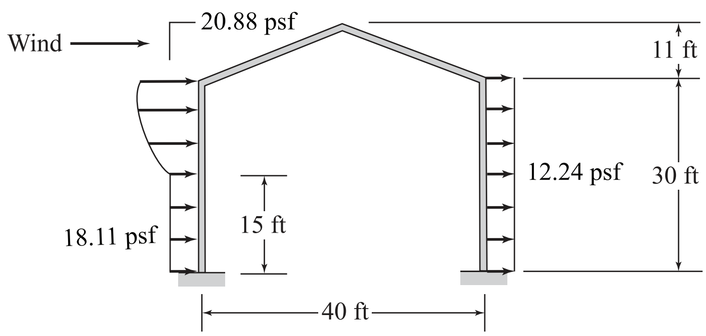
Thus, the wind pressure, $p_h = 32\,(0.85)\,(-0.45)$

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

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

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

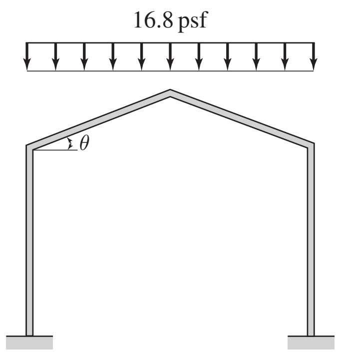
$p_f = 0.7\,C_e\,C_t\,I_s\,p_g = 0.7(1)(1)(1.2)(20) = 16.8\,\text{psf}$

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

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

$C_s = 1$

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



Balanced Snow Load

2.17

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

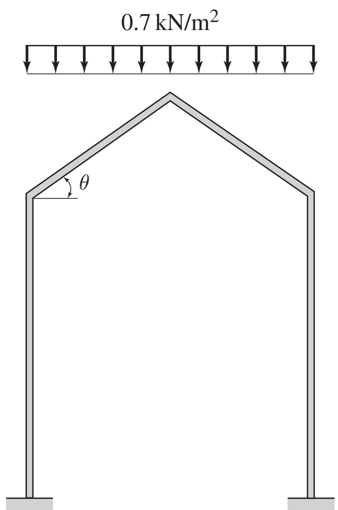
$p_f = 0.7\,C_e C_t\,I_s p_g = 0.7(1)(1)(1.1)(1.2) = 0.92\,\text{kN/m}^2$

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

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

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

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



Balanced Snow Load