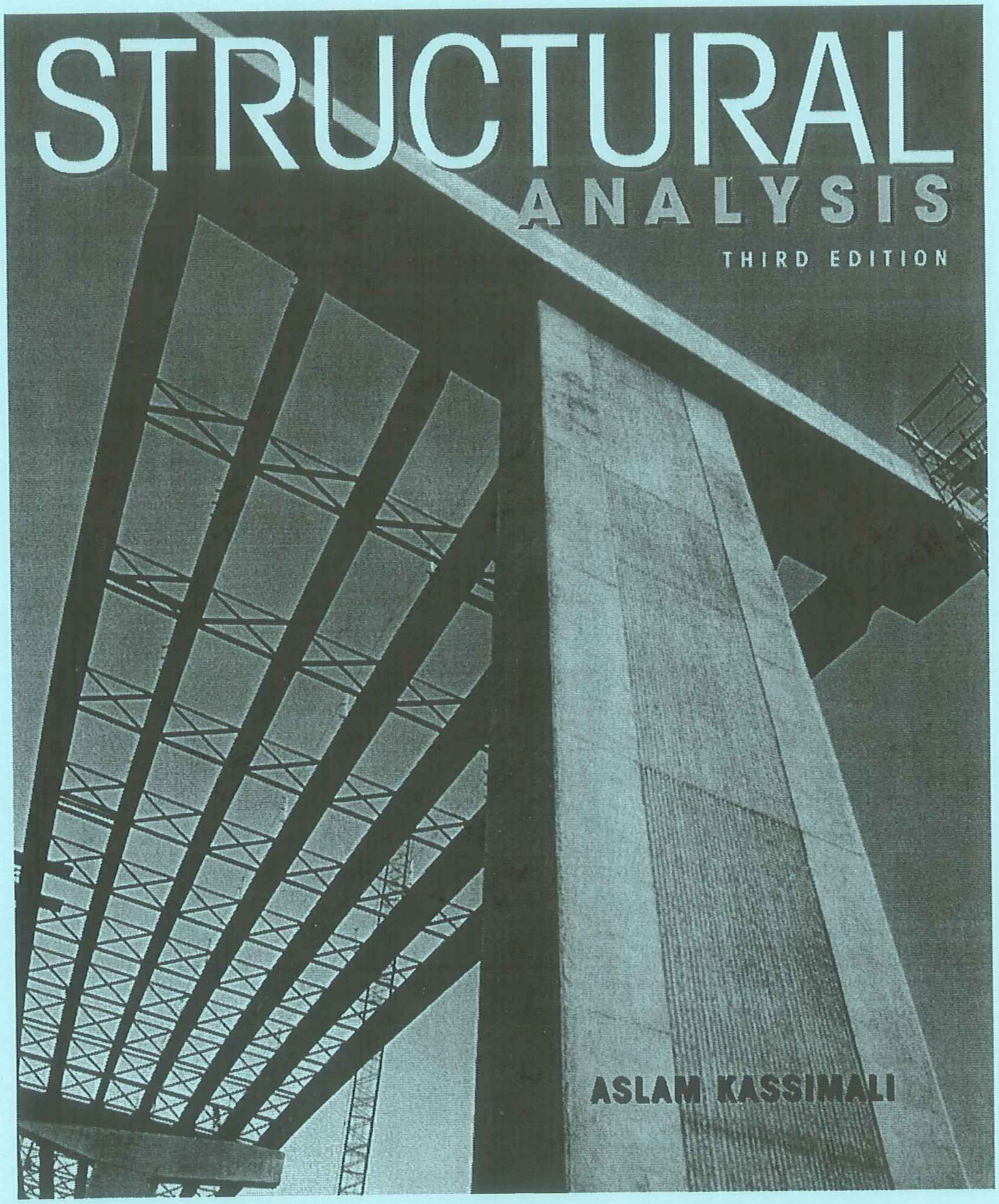
INSTRUCTOR'S SOLUTIONS MANUAL

to accompany



ISBN 0-534-39169-9

ASLAM KASSIMALI

THOMSON
ENGINEERING

ISBN 0-534-39169-9

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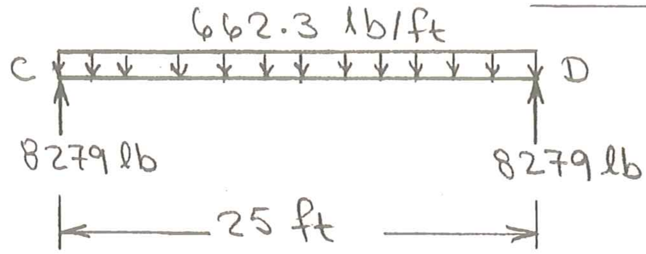
Loads on Structures

CHAPTER 2

$\boxed{2.1}$ Beam CD

Uniformly distributed load $= 150(12)\left(\frac{4}{12}\right) + 490\left(\frac{18.3}{144}\right)$

$= \underline{662.3 \text{ lb/ft}}$



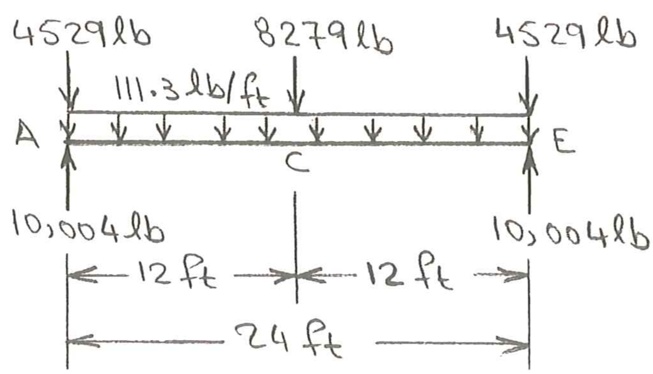
Girder AE

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

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



$\boxed{2.4}$

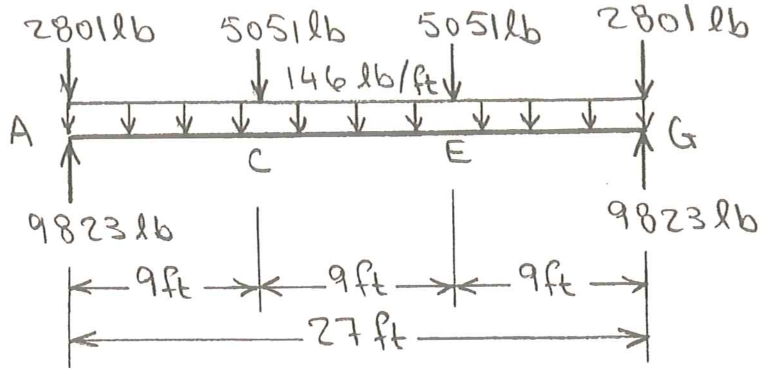
Uniformly distributed load $= 490\left(\frac{42.9}{144}\right) = \underline{146\text{ lb/ft}}$

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

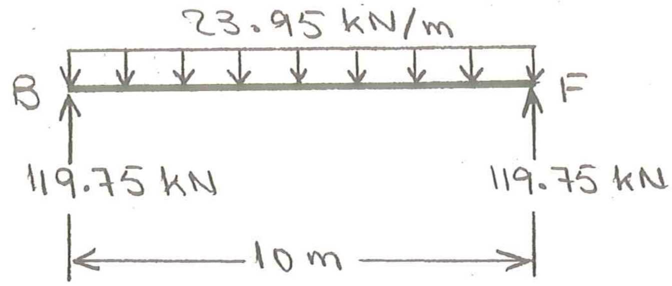
$$= \left[150(9)\left(\frac{4}{12}\right) + 490\left(\frac{16.2}{144}\right)\right]\left(\frac{20}{2}\right) = \underline{5051\text{ lb}}$$



$\boxed{2.6}$ Live load $= 4.79$ kPa $= 4.79\ kN/m^2$

Beam BF

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

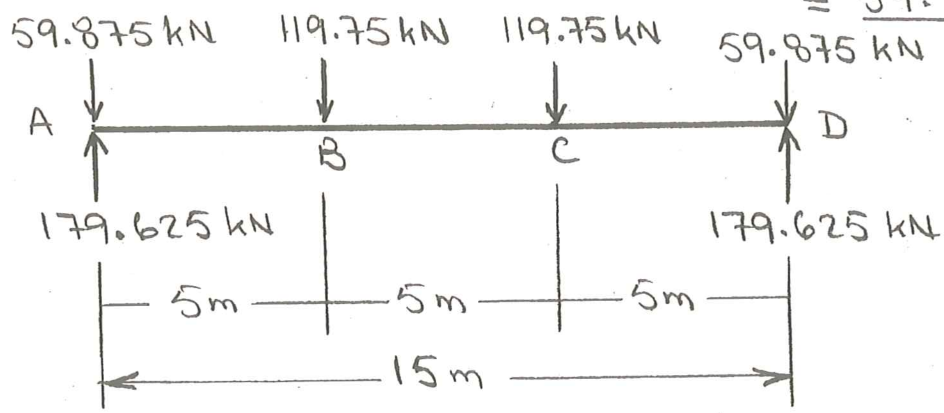


Girder AD

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

Concentrated loads at A and D $= \left[4.79(2.5)\right]\frac{10}{2}$

$= \underline{59.875\ kN}$



$\boxed{2.8}$ $V = 85$ mph, $h = 40 + (15/2) = 47.5$ ft,

$I = 1.0$, $z_g = 1200$ ft, $\alpha = 7.0$, $K_{zt} = 1$

and $K_d = 1$

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

$$q_h = 0.00256(0.8)(1)(1)(85)^2(1) = 14.8 \text{ psf}$$

$G = 0.85$

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

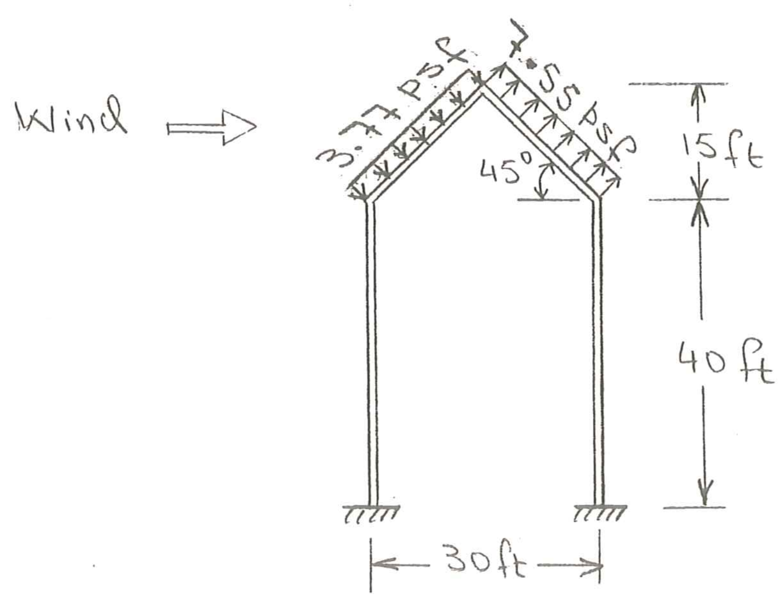
$C_p = 0.3$ for windward side

$C_p = -0.6$ for leeward side

Thus, the wind pressures are:

$p_h = 14.8(0.85)(0.3) = \underline{3.77 \text{ psf}}$ for windward side

$p_h = 14.8(0.85)(-0.6) = \underline{-7.55 \text{ psf}}$ for leeward side



$\boxed{2.10}$ $V = 90$ mph, $h = 30 + \frac{11}{2} = 35.5$ ft

$I = 1.15$, $z_g = 900$ ft, $\alpha = 9.5$, $K_{zt} = 1$

and $K_d = 1$

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

$$q_h = 0.00256(1.02)(1)(1)(90)^2(1.15) = 24.32 \text{ psf}$$

$G = 0.85$

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

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

$C_p = -0.3$ and 0.2 for windward side

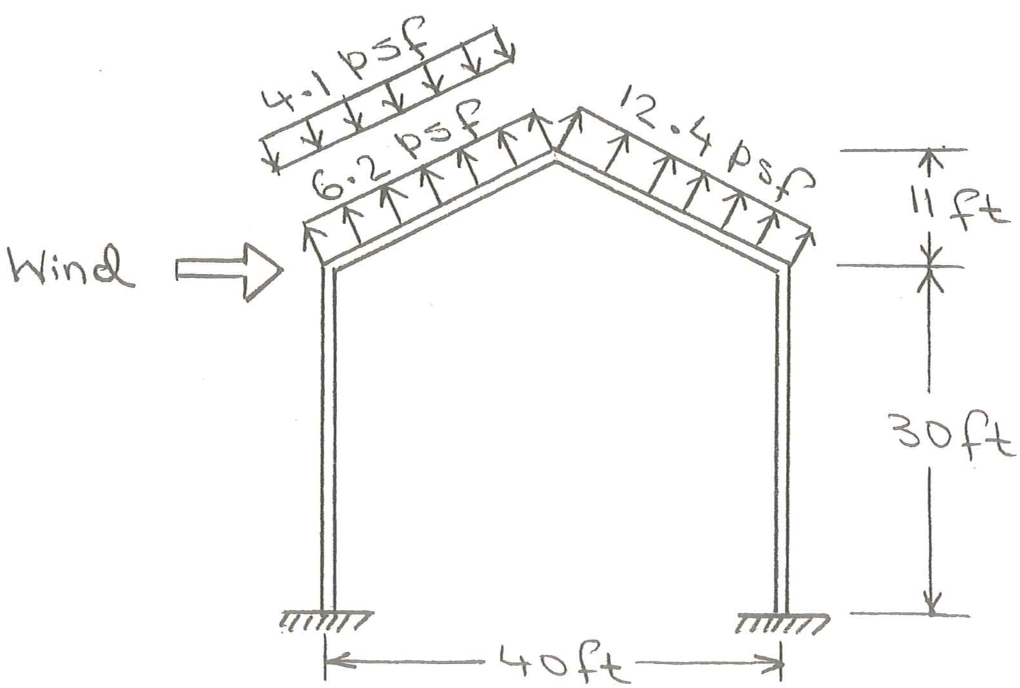
$C_p = -0.6$ for leeward side

Thus, the wind pressures are:

$p_h = 24.32(0.85)(-0.3) = \underline{-6.2 \text{ psf}}$ for windward side

$p_h = 24.32(0.85)(0.2) = \underline{4.1 \text{ psf}}$

$p_h = 24.32(0.85)(-0.6) = \underline{-12.4 \text{ psf}}$ for leeward side



$\boxed{2.12}$ $p_g = 20\,psf$, $C_e = 1$, $C_t = 1$, $I = 1.2$

$p_f = 0.7\, C_e\, C_t\, I\, p_g = 0.7\,(1)(1)(1.2)(20) = 16.8\,psf$

$\theta = \tan^{-1}(11/20) = 28.8^\circ$, $\frac{70}{W} + 0.5 = \frac{70}{20} + 0.5 = 4^\circ$

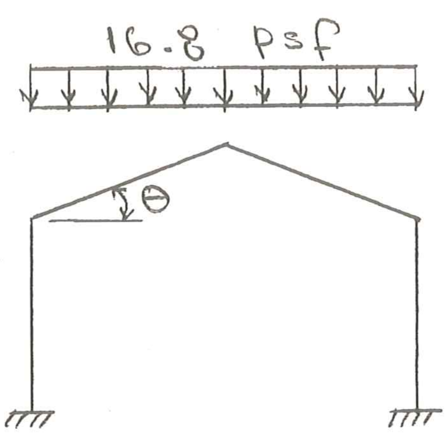
Therefore, the minimum values of p_f need not be considered.

$C_s = 1$

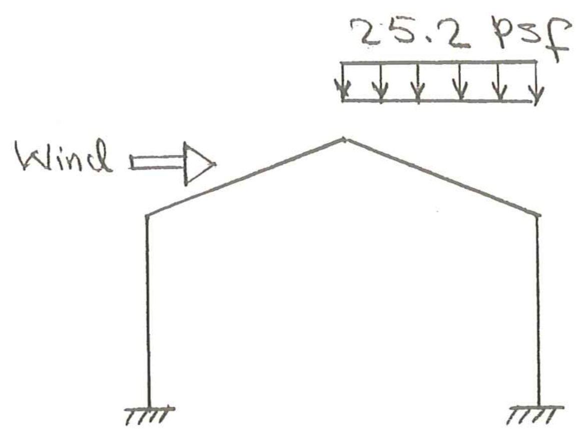
Balanced load $= p_s = C_s\, p_f = 1\,(16.8) = \underline{16.8\ psf}$

Unbalanced load $= 1.5\, p_s / C_e = 1.5(16.8)/1$

$= \underline{25.2\ psf}$



Balanced Snow Load



Unbalanced Snow Load