Flat-Roof Snow Load:

$$p_f = 0.7C_eC_tIp_g$$

where

p_g = 25 lb/ft^2 (1.20 kN/m^2) (from Fig. 7-1)
C_e = 0.9 (from Table 7-2 for Terrain Category B and a fully exposed roof)
C_t = 1.0 (from Table 7-3)
I = 1.1 (from Table 1.5-2)

Thus:

p_f = (0.7)(0.9)(1.0)(1.1)(25) = 17 lb/ft^2
In SI: p_f = (0.7)(0.9)(1.0)(1.1)(1.19) = 0.83 kN/m^2

Tangent of vertical angle from eaves to crown = 5/40 = 0.375

Angle = 21°.

Because the vertical angle exceeds 10°, the minimum roof snow load, p_m, does not apply. See Section 7.3.4.

Sloped-Roof Snow Load:

$$p_s = C_sp_f$$

From Fig. 7-2a, C_s = 1.0 until slope exceeds 30°, which (by geometry) is 30 ft (9.1 m) from the centerline. In this area p_s = 17(1) = 17 lb/ft^2 (in SI p_s = 0.83(1) = 0.83 kN/m^2). At the eaves, where the slope is (by geometry) 41°, C_s = 0.72 and p_s = 17(0.72) = 12 lb/ft^2 (in SI p_s = 0.83(0.72) = 0.60 kN/m^2). Because slope at eaves is 41°, Case II loading applies.

Unbalanced Snow Load: Because the vertical angle from the eaves to the crown is greater than 10° and less than 60°, unbalanced snow loads must be considered.

Unbalanced load at crown
= 0.5 p_f = 0.5(17) = 9 lb/ft^2
(in SI: = 0.5(0.83) = 0.41 kN/m^2)

Unbalanced load at 30° point
= 2 p_fC_s/C_e = 2(17)(1.0)/0.9 = 38 lb/ft^2
(in SI: = 2(0.83)(1.0)/0.9 = 1.84 kN/m^2)

Unbalanced load at eaves
= 2(17)(0.72)/0.9 = 27 lb/ft^2
(in SI: = 2(0.83)(0.72)/0.9 = 1.33 kN/m^2)

Rain on Snow Surcharge: A rain-on-snow surcharge load need not be considered, since p_g > 20 psf (0.96 kN/m^2) (see Section 7.10). See Fig. C7-6 for both loading conditions.

Example 3: Determine design snow loads for the upper and lower flat roofs of a building located where p_g = 40 lb/ft^2 (1.92 kN/m^2). The elevation difference between the roofs is 10 ft (3 m). The 100 ft × 100 ft (30.5 m × 30.5 m) unventilated high portion is heated and the 170 ft wide (51.8 m), 100 ft (30.5 m) long low portion is an unheated storage area. The building is in an industrial park in flat open country with no trees or other structures offering shelter.

High Roof:

$$p_f = 0.7C_eC_tIp_g$$

where

p_g = 40 lb/ft^2 (1.92 kN/m^2) (given)
C_e = 0.9 (from Table 7-2)
C_t = 1.0 (from Table 7-3)
I = 1.0 (from Table 1.5-2)

Thus:

p_f = 0.7(0.9)(1.0)(1.0)(40) = 25 lb/ft^2
(in SI: p_f = 0.7(0.9)(1.0)(1.0)(1.92) = 1.21 kN/m^2)

Because p_g = 40 lb/ft^2 (1.92 kN/m^2) and I_s = 1.0, the minimum roof snow load value of p_m = 20(1.0) = 20 lb/ft^2 (0.96 kN/m^2) and hence does not control (see Section 7.3.4).

Low Roof:

$$p_f = 0.7C_eC_tIp_g$$

where

p_g = 40 lb/ft^2 (1.92 kN/m^2) (given)
C_e = 1.0 (from Table 7-2) partially exposed due to presence of high roof
C_t = 1.2 (from Table 7-3)
I = 0.8 (from Table 1.5-2)

Thus:

p_f = 0.7(1.0)(1.2)(0.8)(40) = 27 lb/ft^2
In SI: p_f = 0.7(1.0)(1.2)(0.8)(1.92) = 1.29 kN/m^2

Because p_g = 40 lb/ft^2 (1.92 kN/m^2) and I_s = 0.8, the minimum roof snow load value of p_m = 20(0.8) = 16 lb/ft^2 (0.77 kN/m^2) and hence does not control (see Section 7.3.4).

Drift Load Calculation:

γ = 0.13(40) + 14 = 19 lb/ft^3
(in SI: γ = 0.426(1.92) + 2.2 = 3.02 kN/m^3

$h_b = p_f/19$ = 27/19 = 1.4 ft
(in SI: h_b = 1.29/3.02 = 0.43 m)

h_c = 10 – 1.4 = 8.6 ft
(in SI: h_c = 3.05 – 0.43 = 2.62 m)