Snow Load Report

1. Roof and Building Data

Ground Snow Load (Pg):	50.0 psf
Roof Pitch:	.75 /12
Risk Category:	I
Eave-to-Ridge (W):	250 ft.
Terrain Category:	C
Exposure:	Partially Exposed
Thermal Factor (C_t):	1.20
Roof Surface:	Metal
Roof System:	Rafter
Spacing:	144 in. o/c
Overhang:	36 in.

2. Design Loads

Top Chord Dead Load:	7	psf
Bottom Chord Dead Load:	10	psf

SF (Slope Factor) = 1/Cosine(Φ) = 1.00 (Dead loads specified on a projected horizontal basis take into account the effect of the pitch via a slope factor.)

Adj. TCDL (TCDL x SF): 7.0 psf

3. Design Assumptions

Code Standard:	ASCE 7-10
Number of Plies:	1 PLY
Bottom Chord Pitch:	0 /12

4. Snow Load Calculations

Calculate flat roof snow load p_f using the following equation:

$$p_f = 0.7 C_e C_t I_s p_g$$

where:

p_f = Flat Roof Snow Load in psf
C_e = 1.00 = Exposure Factor, as determined by ASCE 7-10 Table 7-2 (Terrain Cat. C, Exp. Partially Exposed)
C_t = 1.20 = Thermal Factor, as determined by ASCE 7-10 Table 7-3
I_s = 0.80 = Importance Factor, as determined by ASCE 7-10 Table 1.5-2 (Risk Cat. I)
p_g = 50.0 psf = Ground Snow Load in psf

$p_f = 0.7 C_e C_t I_s p_g = 0.7(1.00)(1.20)(0.80)(50.0) = 33.6$ psf

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A minimum roof snow load, p_m shall apply to monoslope, hip and gable roofs with slopes less than 15 degrees using the following equations:

Where p_g is 20 psf or less: $p_m = I_s p_g$
Where p_g exceeds 20 psf: $p_m = I_s(20)$

Minimum roof snow load of $p_m = I_s(20) = 0.80 \times 20 = 16.0$ psf and hence does not control.

For locations where p_g is 20 psf or less, but not zero, all roofs with slopes (in degrees) less than W/50 with W in feet shall included a 5 psf rain-on-snow surcharge load. This additional load applies only to the sloped roof (balanced) load case and need not be used in combination with drift, sliding, unbalanced, minimum, or partial loads.

Roof slope in degrees (3.58°) is less than W/50 = 5.0. However, ground snow load (p_g = 50.0 psf) is greater than 20 psf, the 5.0 psf rain-on-snow surcharge load does not apply.

Calculate sloped roof snow load p_s using the following equation:

$p_s = C_s p_f$

where:

p_s = Sloped Roof Snow Load in psf
C_s = 1.00 = Roof Slope Factor, as determined by ASCE 7-10 Sec. 7.4.1-7.4.4 and Figure 7-2
p_f = Flat Roof Snow Load in psf

Roof surface (Metal) is considered a "slippery" roof. For a C_t = 1.20 the roof slope factor C_s is given by the dashed line of ASCE 7-10 Figure 7-2c.

$p_s = C_s p_f = (1.00)(33.6) = 33.6$ psf

Calculate unbalanced snow load for hip and gable roofs as shown in ASCE 7-10 Figure 7-5.
Unbalanced snow loads are required for roof pitches between 1/2 on 12 to 7 on 12.
Using the following equations:

$\gamma = 0.13 p_g + 14$ (snow density)
$h_d = .43 \sqrt[3]{l_u} \sqrt[4]{p_g + 10} - 1.5$ (drift height) [if l_u < 20 ft., use l_u = 20 ft.]
$l_d = \frac{8}{3} h_d \sqrt{S}$ (width of drift surcharge)
$p_d = h_d \gamma / \sqrt{S}$ (drift surcharge snow load)

where:

γ = Snow density in pcf, not to exceed 30 pcf.
h_d = Drift height in feet, as determined by eqn. or ASCE 7-10 Fig. 7-9.
l_u = W = Ridge to eave distance in feet, windward side of roof.
S = 12/Roof Pitch
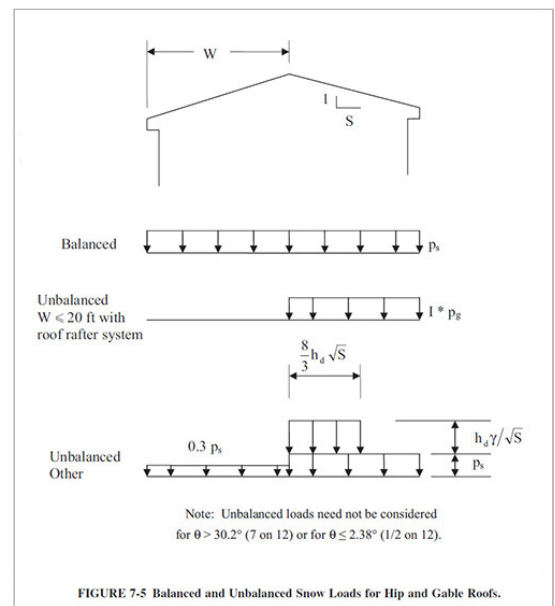l_d = Width of drift surcharge in feet.
p_d = Drift Surcharge Snow Load in psf

FIGURE 7-5 Balanced and Unbalanced Snow Loads for Hip and Gable Roofs.

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$p_{windward} = 0.3p_s = (0.3)(33.6) = 10.1 \text{ psf}$

$p_{leeward} = p_s = 33.6 \text{ psf}$

$\gamma = 0.13(50.0) + 14 = 20.50 \text{ pcf}$

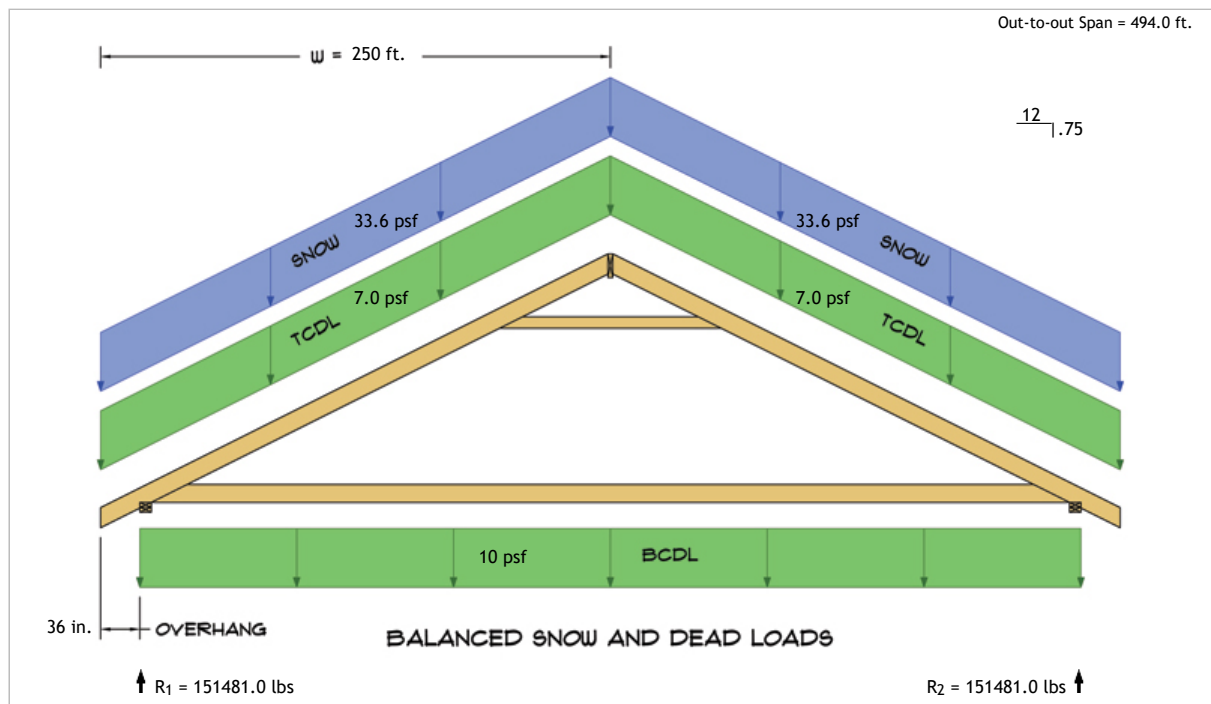$h_d = .43\sqrt[3]{250}\sqrt[4]{50.0 + 10} - 1.5 = 6.04 \text{ ft.}$ [$l_u = 250$ ft.]

$l_d = \dfrac{8}{3} \times 6.04 \times \sqrt{12/.75} = 64.42 \text{ ft.}$

$p_d = \dfrac{6.04 \times 20.50}{\sqrt{12/.75}} = 31.0 \text{ psf}$

On warm roofs apply a distributed $2p_f$ snow load on all overhanging portions as per ASCE 7-10 section 7.4.5. No other loads except dead loads shall be present on the roof when this uniformly distributed load is applied.
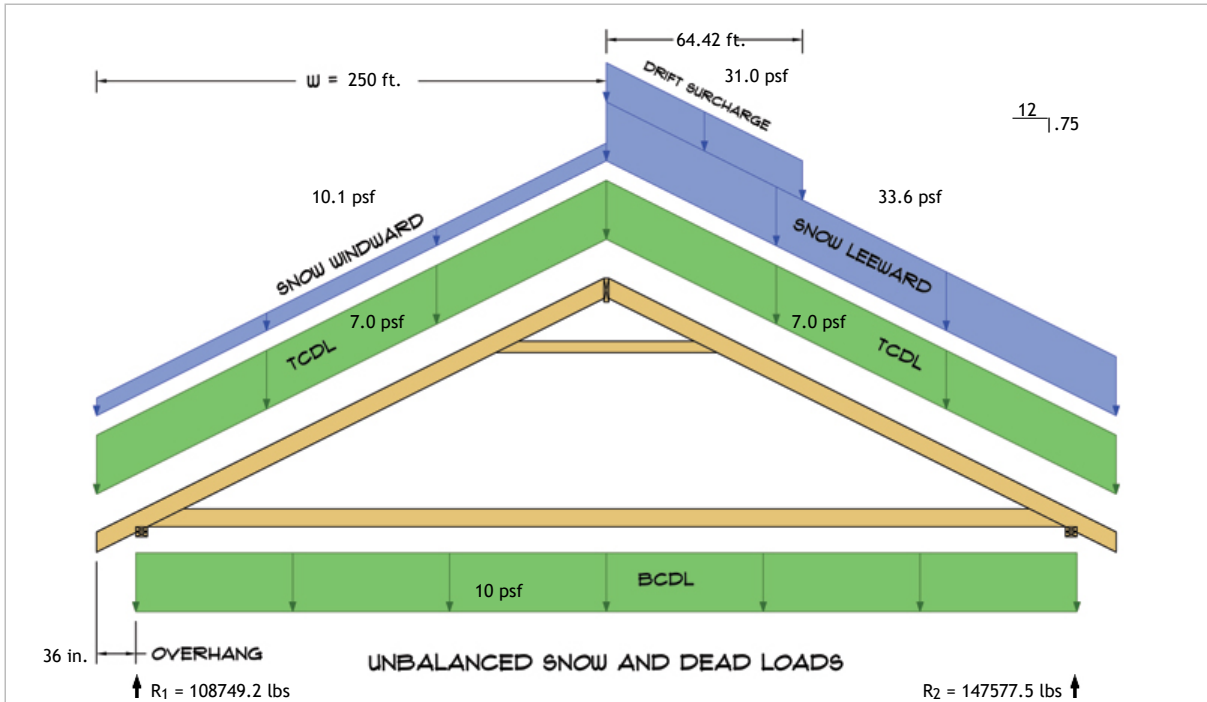
$2p_f = (2)(33.6) = 67.2 \text{ psf}$

Out-to-out Span = 494.0 ft.

w = 250 ft.

$\frac{12}{}$ ⌐.75

33.6 psf   33.6 psf

SNOW   SNOW

7.0 psf   7.0 psf

TCDL   TCDL

10 psf   BCDL

BALANCED SNOW AND DEAD LOADS

36 in.   OVERHANG

R₁ = 151481.0 lbs   R₂ = 151481.0 lbs

$R_1 = D + S = 50681.0 \text{ lbs} + 100800.0 \text{ lbs}$

$R_2 = D + S = 50681.0 \text{ lbs} + 100800.0 \text{ lbs}$

UNBALANCED SNOW AND DEAD LOADS
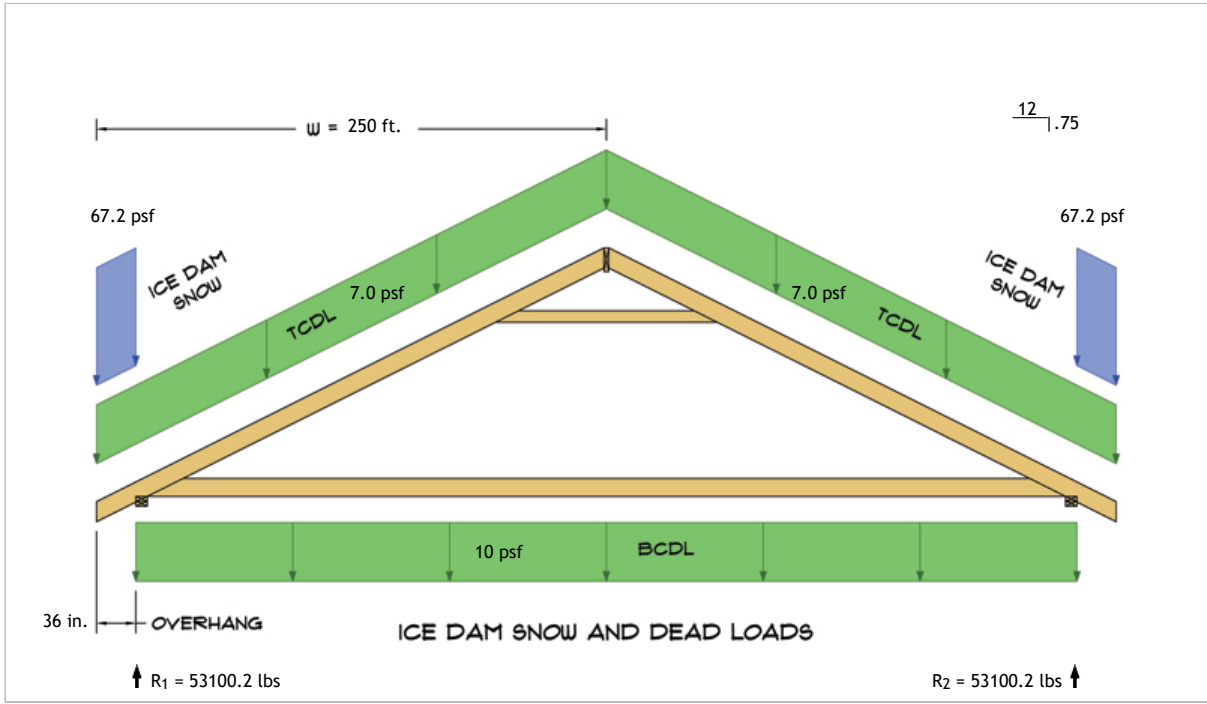
64.42 ft.
31.0 psf
DRIFT SURCHARGE
w = 250 ft.
12 |.75
10.1 psf
SNOW WINDWARD
33.6 psf
SNOW LEEWARD
7.0 psf
TCDL
7.0 psf
TCDL
10 psf
BCDL
36 in.
OVERHANG
R₁ = 108749.2 lbs
R₂ = 147577.5 lbs

$R_1 = D + S = 50681.0 \text{ lbs} + 58068.3 \text{ lbs}$
$R_2 = D + S = 50681.0 \text{ lbs} + 96896.5 \text{ lbs}$

ICE DAM SNOW AND DEAD LOADS

w = 250 ft.
12 |.75
67.2 psf
ICE DAM SNOW
67.2 psf
ICE DAM SNOW
7.0 psf
TCDL
7.0 psf
TCDL
10 psf
BCDL
36 in.
OVERHANG
R₁ = 53100.2 lbs
R₂ = 53100.2 lbs

$R_1 = D + S = 50681.0 \text{ lbs} + 2419.2 \text{ lbs}$
$R_2 = D + S = 50681.0 \text{ lbs} + 2419.2 \text{ lbs}$

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