User's Guide – NBC 1995 Structural Commentaries (Part 4)

Second Revisions*

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The attached replacement pages contain the second revisions to the above-noted user's guide. They are identified by an *r2*.

*Amendments previously published: First Errata dated July 1996.

jections can melt as a result of heat loss through the roof or solar radiation or exhausted warm air. The resulting meltwater may migrate to the lower areas causing heavy loads. The centres of bays are particularly vulnerable if the drains are located at the columns (high points). This redistribution of load may cause further deflection and lead to an instability similar to that produced by rain ponding (see Commentary I).

Detailed Explanations of Figures H-1 to H-6

29. In the following, Figures H-1, H-2(a) and H-2(b) apply to the basic shapes: the simple flat and shed roofs, the simple gable roofs and the simple arch and curved roofs. More complex shapes can often be considered as combinations of these. When the roofs shown in Figures H-1, H-2(a) and H-2(b) are adjacent to higher roofs or have projections or are combined to form valleys, reference should also be made to Figures H-3 to H-6. For all these simple and complex roofs, the basic snow load coefficient, C_b, is 0.8 in all loading cases.

30. Gable, flat and shed roofs (Figure H-1). On gable roofs both uniformly distributed and unbalanced loads should be considered for all slopes less than $70°$ (or $60°$ for unobstructed slippery roofs), as shown in Figure H-1. Where both slopes are equal

to or less than $15°$, the load distribution is determined by Case I, but is also subject to the general requirements of NBC Article 4.1.7.2. for "full and partial loading" which now apply to the Case I loading only. On slopes over $15°$, Case II, which accounts for unbalanced loading, and Case I both apply. Case II loading is intended to account for snow blown from the windward over to the leeward side as well as snow removed by sliding from one side. Flat and shed (single sloped) roofs are subject to Case I and "full and partial" loading only.

31. Arch roofs (Figures H-2(a) and H-2(b)). *r2* Uniform and unbalanced load distributions are particularly important for the design of curved roofs. [19][22][23] In addition, the requirements for "full and partial loading" apply. Case II loading may also be used for the design of domes (see Paragraph 24).
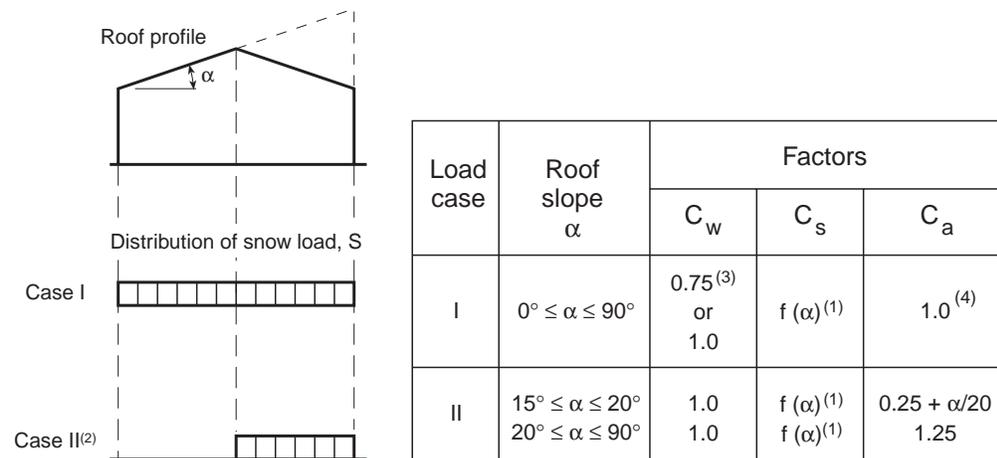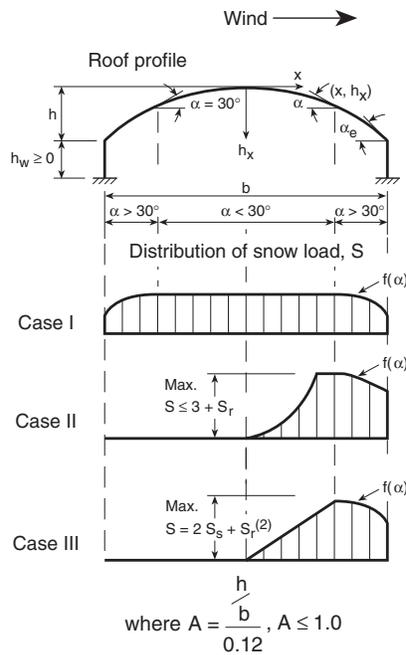

Load case	Roof slope α	Factors		
		C_w	C_s	C_a
I	$0° \leq \alpha \leq 90°$	$0.75^{(3)}$ or 1.0	$f(\alpha)^{(1)}$	$1.0^{(4)}$
II	$15° \leq \alpha \leq 20°$ $20° \leq \alpha \leq 90°$	1.0 1.0	$f(\alpha)^{(1)}$ $f(\alpha)^{(1)}$	$0.25 + \alpha/20$ 1.25

Figure H-1

Snow distributions and snow loading factors for gable, flat and shed roofs

Notes to Figure H-1:
(1) Varies as a function of slope α as defined in NBC Sentences 4.1.7.1.(4) and (5)
(2) Case II loading does not apply to gable roofs with slopes of $15°$ or less or to single-sloped (shed) roofs or to flat roofs.
(3) $C_w = 0.75$ may be reduced to 0.5 for exposed areas north of the treeline as defined in NBC Sentence 4.1.7.1.(3).
(4) For large flat roofs C_a, as defined in NBC Clause 4.1.7.1.(7)(b), may exceed 1.0.

Commentary H

Wind →

Roof profile

$\alpha = 30°$ α x (x, h_x)

h α_e

h_x

$h_w \geq 0$

b

$\alpha > 30°$ | $\alpha < 30°$ | $\alpha > 30°$

Distribution of snow load, S

$f(\alpha)$

Case I

$f(\alpha)$

Max. $S \leq 3 + S_r$

Case II

Max. $S = 2 S_s + S_r^{(2)}$

Case III

$f(\alpha)$

where $A = \dfrac{h/b}{0.12}$, $A \leq 1.0$

Load case	Range of application	Factors		
		C_w	C_s	C_a
I	All	$0.75^{(3)}$ or 1.0	$f(\alpha)^{(5)}$	1.0
II $^{(1)(6)}$	$\dfrac{h}{b} > 0.05$	1.0	$f(\alpha)^{(5)}$	$\dfrac{\gamma\,h_x}{S_s\,C_b}$ but not more than $\dfrac{3\,\text{kPa}}{S_s\,C_b} A$
III $^{(1)}$	$\dfrac{h}{b} > 0.05$	1.0	$f(\alpha)^{(5)}$	For $0 < x < x_{30}^{(4)}$ $\quad C_a = \dfrac{2}{C_b}\,\dfrac{x}{x_{30}}\,A$ For $x_{30} \leq x$ $\quad C_a = \dfrac{2}{C_b}\,A$

Figure H-2(a) r2

Snow distributions and snow loading factors for simple arch or curved roofs

Notes to Figure H-2(a):

(1) Use Case II or Case III, whichever produces the lower total load per unit length of building perpendicular to the span. **r2**

(2) Max. $S = 2 S_s + S_r$ occurs at $\alpha = 30°$ or at the edge of the roof if $\alpha_e < 30°$.

(3) $C_w = 0.75$ may be reduced to 0.5 for exposed areas north of the treeline as defined in NBC Sentence 4.1.7.1.(3).

(4) x_{30} = value of x where $\alpha = 30°$ or value of x at edge of roof if $\alpha_e < 30°$.

(5) Varies as a function of slope α as defined in NBC Sentence 4.1.7.1.(4).

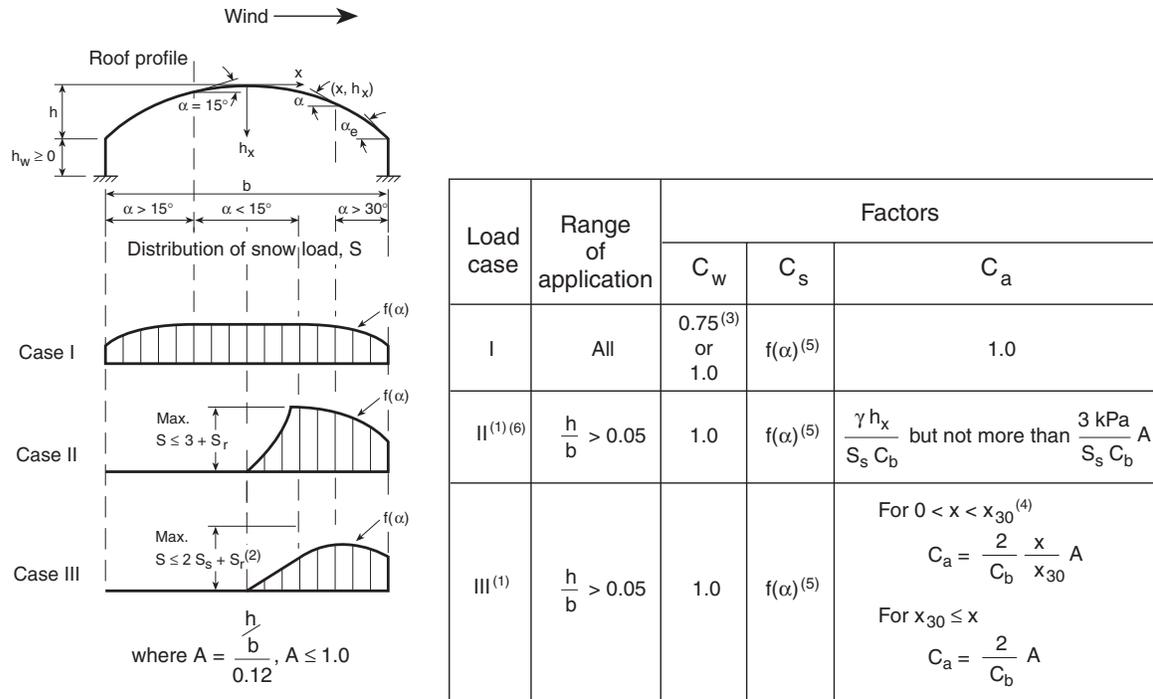(6) The full and partial loading provisions of NBC Sentence 4.1.7.2.(2) also apply to all curved roofs. **r2**

Wind ⟶

Roof profile

Distribution of snow load, S

$\alpha > 15°$ | $\alpha < 15°$ | $\alpha > 30°$

Case I $f(\alpha)$

Case II Max. $S \le 3 + S_r$ $f(\alpha)$

Case III Max. $S \le 2 S_s + S_r^{(2)}$ $f(\alpha)$

where $A = \dfrac{h/b}{0.12}$, $A \le 1.0$

Load case	Range of application	Factors		
		C_w	C_s	C_a
I	All	$0.75^{(3)}$ or 1.0	$f(\alpha)^{(5)}$	1.0
II$^{(1)(6)}$	$\dfrac{h}{b} > 0.05$	1.0	$f(\alpha)^{(5)}$	$\dfrac{\gamma h_x}{S_s C_b}$ but not more than $\dfrac{3\text{ kPa}}{S_s C_b} A$
III$^{(1)}$	$\dfrac{h}{b} > 0.05$	1.0	$f(\alpha)^{(5)}$	For $0 < x < x_{30}^{(4)}$ $C_a = \dfrac{2}{C_b}\dfrac{x}{x_{30}} A$ For $x_{30} \le x$ $C_a = \dfrac{2}{C_b} A$

Figure H-2(b) *r2*

Snow distributions and snow loading factors for simple arch or curved roofs with unobstructed slippery surfaces

Notes to Figure H-2(b):

(1) Use Case II or Case III, whichever produces the lower total load per unit length of building perpendicular to the span. ***r2***
(2) Max. $S = 2 S_s + S_r$ occurs at $\alpha = 15°$ or at the edge of the roof if $\alpha_e < 15°$. ***r2***
(3) $C_w = 0.75$ may be reduced to 0.5 for exposed areas north of the treeline as defined in NBC Sentence 4.1.7.1.(3).
(4) x_{30} = value of x where $\alpha = 30°$ or value of x at edge of roof if $\alpha_e < 30°$.
(5) Varies as a function of slope α as defined in NBC Sentence 4.1.7.1.(5).
(6) The full and partial loading provisions of NBC Sentence 4.1.7.2.(2) also apply to all curved roofs. ***r2***