High country township design load and weathertightness envelope design

Guidance document

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This guidance has been developed to:

- assist with the design of buildings for Selwyn District high country townships and general alpine regions, and
- clarify Selwyn District Council building consent authority (BCA) expectations regarding B1 structure and E2 external moisture for these buildings.

This information:

- relates to snow (kPa)and wind (m/s) loadings for B1 structural components and E2 weathertightness in importance level 2 buildings in alpine regions and our high country townships*, and
- identifies the minimums that will be accepted.

Wind & snow load guidance – townships

Table 1 below provides a summary of minimum wind and snow loads expectations for some regional townships in Selwyn District as advised by SDC consultant engineers.

Note:

- This table is used by SDC for comparison against the calculations of the project engineer's specific engineering design.
- Designers can elect to design for levels greater than those indicated in these tables as determined by their engineering advice.
- Wind speeds are minimum for the townships – higher wind speeds may be calculated on windward edges.
- SED calculations are required when in the lee zone if using AS/NZS1170 or when NZS3604 methodology identifies this.

Table 1. Summary of minimum wind and snow loads for townships in Selwyn District for the purposes of B1 structure.

Township	Minimum design wind speed AS/NZS1170 (m/s)	Minimum design wind speed NZS3604:2011	Minimum open-ground snow load Sg (kPa)	Lee zone as identified in AS/NZS 1170.2:2021
Arthurs Pass	46	Very high	3.4	No
Castle Hill village	46	Very high	3.4	No
Coalgate	47	Very high	1.6	Yes
Darfield	41	High	1.4	No
Glentunnel	48	Very high	1.8	Yes
Hororata	47	Very high	1.4	Yes
Lake Coleridge village	45	Very high	2.2	Yes
Sheffield/Waddington	50 (rounded up)	Very high	1.9	Yes

Township	Minimum design wind speed AS/NZS1170 (m/s)	Minimum design wind speed NZS3604:2011	Minimum open-ground snow load Sg (kPa)	Lee zone as identified in AS/NZS 1170.2:2021
Springfield	55	Extra high	2.3	Yes
Whitecliffs	49	Very high	1.9	Yes

*Note - Proposed township boundaries shown in dotted blue line on the Proposed Selwyn District Plan.

Wind design

Your building will need specific engineering design (SED) and your application should include these calculations that confirm the site-specific loadings when your site is located within the Lee zone of the Southern Alps

- this applies when AS/NZS 1170 is the means of compliance, or
- if using NZS3604:2011 as a means of compliance where the site windspeed designation indicates SED is required (using Table 5.4).

Lee zones are identified in AS/NZS1170.2:2021 Tables 4.4, 4.5 and Figure 4.6

Determining structural compliance with the New Zealand Building Code (NZBC) using NZS3604

The scope of B1/AS1 (NZS3604:2011) is limited to wind zones up to and including extra high or up to 55m/s.

Table 5.4 of NSZ3604 requires specific engineering design when:

- the wind zone is High and above, and
- the site is located within the lee zone.

Where a structural engineer is engaged, they:

- must provide a site-specific wind speed calculation. This will be accepted if the windspeed is at or above those shown in Table 1.
- where this is determined to be 55m/s and below, the engineer is to provide specific design for each element or they may choose to confirm that NZS3604:2011 can then be used for the **structural design.**

NZS3604:2011

1 SCOPE AND INTERPRETATION

1.1 SCOPE

1.1.1 Construction requirements

NZS 3604 sets out construction requirements for timber-framed buildings within the limits specified in 1.1.2.

See figure 1.1 and figure 1.2 for information on determining if a building is covered by NZS 3604.

1.1.2 Buildings covered by this Standard

NZS 3604 shall apply only to buildings within the following limits:

(k) The building wind zone determined from 5.2.1 and table 5.1 shall be Low, Medium, High, Very high or Extra high (i.e. L, M, H, VH or EH). *Specific engineering design (SED)* in table 5.4 indicates the application is outside the scope of the Standard;

Table 5.4 – Determination of wind zone

Region	Ground roughness	Topographic class and site exposure							
		T1		T2		T3		T4	
		Sheltered	Exposed	Sheltered	Exposed	Sheltered	Exposed	Sheltered	Exposed
A	Urban	L	M	M	H	H	H	H	VH
	Open	M	H	H	VH	H	VH	VH	EH
W	Urban	M	H	H	VH	H	VH	EH	EH
	Open	H	VH	VH	EH	VH	EH	SED	SED

NOTE –
Wind speeds below are the maximum ultimate limit state wind speed for each wind zone.
L = Low wind speed of 32 m/s
M = Medium wind speed of 37 m/s
H = High wind speed of 44 m/s
VH = Very high wind speed of 50 m/s
EH = Extra high wind speed of 55 m/s
SED = Specific engineering design (not covered by this Standard)

Winds in lee zones shall be increased as follows:
Low wind becomes High
Medium wind becomes Very high
High wind, and above become SED

Note: Structural engineer's wind speed calculations do not consider the weathertightness envelope, refer to following for further guidance.

Snow design

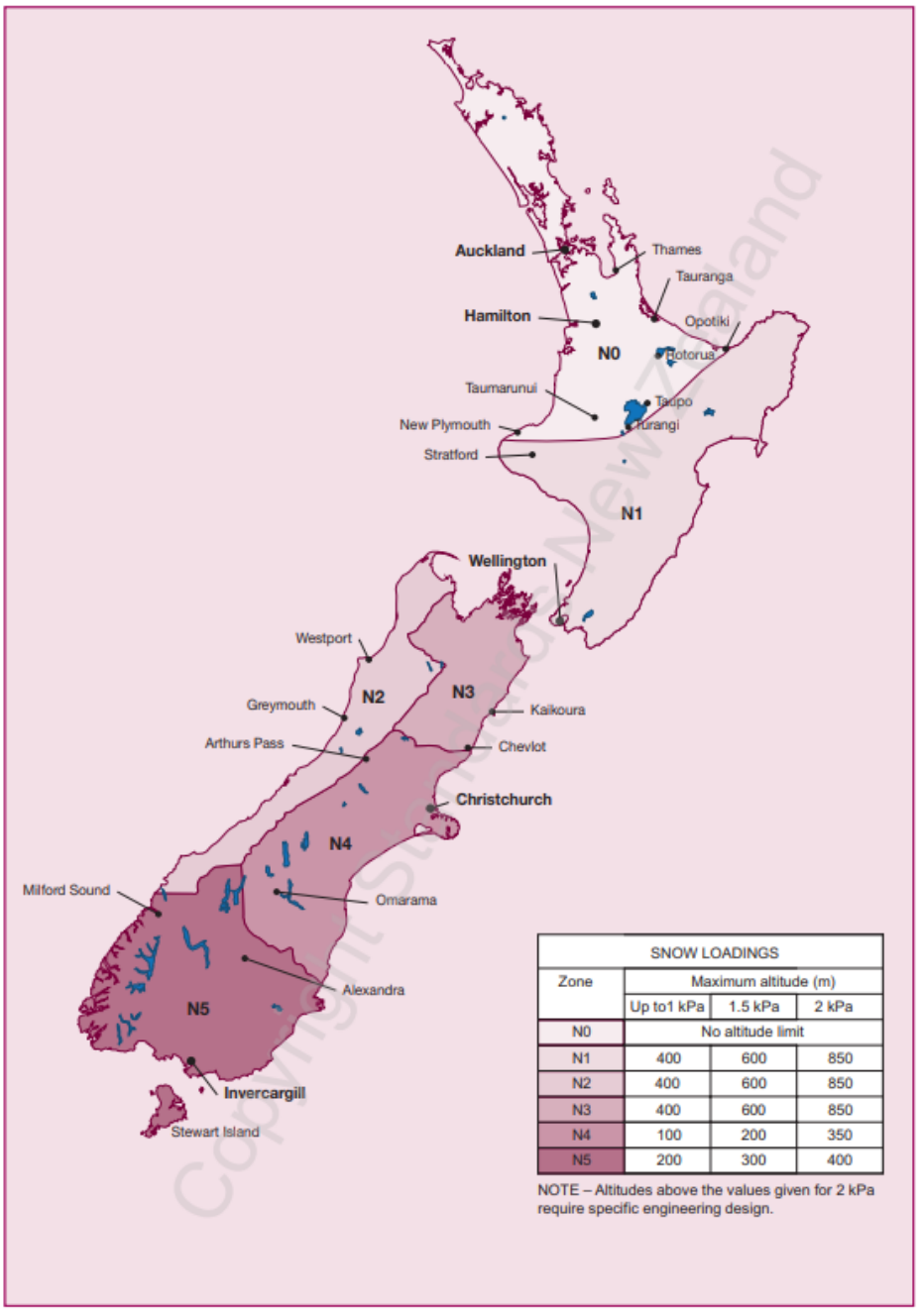
Table 1 includes the minimum for open ground snow (Sg) identified by SDC consultant engineers.

NZS3604:2011 is limited (1.1.2 (d)) to a scope of 2kPa for open ground snow (Sg).

The snow load (Sg) is to be calculated for the site and all structural elements affected are to be designed by SED where:

- township sites in table 1 above 2.0kPa, or
- for sites with snow loadings above 2.0kPa as identified by Figure 15.1 NZS3604:2011 (ie above 350m altitude for our region N4).

SECTION 15 – 1.5 AND 2.0 kPa SNOW LOADING **NZS 3604:2011**



SNOW LOADINGS			
Zone	Maximum altitude (m)		
	Up to1 kPa	1.5 kPa	2 kPa
N0	No altitude limit		
N1	400	600	850
N2	400	600	850
N3	400	600	850
N4	100	200	350
N5	200	300	400

NOTE – Altitudes above the values given for 2 kPa require specific engineering design.

Figure 15.1 – Snow zones

Weathertightness design

NZBC E2-External moisture

E2/AS1 is limited to buildings within the scope of NZS3604:2011 as noted under section 1.1.

The lee zone impact on NZBC compliance means that the design must be SED when the site location:

- has a wind speed exceeding high or 44m/s, and
- is also located within the lee zone of the Southern Alps (refer table 5.4 NZS3604:2011).

This also means that the scope of E2/AS1 is exceeded and the design requires an alternative solution compliance pathway to meet the performance requirements of NZBC E2.

Our BCA appreciates that specialists suitably qualified to review the weathertightness of a building are not readily available for residential scale projects.

Designing for buildings that are located within the lee zone must consider:

- the impact of accelerated windspeeds and how these contribute to the risk of water ingress from driven rain, and
- the contribution of greater rainfall intensities, freezing, and snow in alpine locations within the lee zone which challenge typical E2/AS1 designs that may be suitable elsewhere within the district.

Even where SED nominates windspeeds for structural purposes that might be high or very high under NZS3604, do not use these windspeeds as the sole consideration in designing solutions for E2.

Acceptable solution E2/AS1

1.0 Scope

This Acceptable Solution covers the *weathertightness* of the *building* envelope. Notes shown under 'COMMENT', occurring throughout this document are for guidance purposes only and do not form part of this Acceptable Solution.

1.1 Construction included

The scope of this Acceptable Solution is limited to the materials, products and processes contained herein, for *buildings* within the scope of NZS 3604, and:

Our expectation when proposing to build in the lee zone, foothills and alpine zones is that the LBP designer considers options such as the below example to demonstrate that the building will meet the performance requirements of E2:

1. From the E2/AS1 acceptable solution apply the minimum requirements for Extra High wind zones, including:
    a. Rigid air barriers

b. Cladding installed over a drained cavity
c. Hooks and hems to flashing edges
d. Flashing upstands shall be increased by 25mm beyond those shown in table 7 or elsewhere in the E2/AS1 solution
e. No change in roof pitch flashings
f. Roof cladding fixings tables 11, 12, 13 and 14
g. Stop ends to roof cladding.

Alternatively:

2. Provide a peer review of the external envelope from a suitably qualified professional who can demonstrate that they are experienced to consider the effects of the building's performance in the alpine lee zone.

Additional code clauses affected by alpine locations

E1: Surface water

Castle Hill has a specific stormwater disposal design including features related to freezing conditions - see ECAN discharge consent CRC064128.1.

E3 – Internal moisture

Buildings with elements like skillion roof construction in rooms with higher moisture generation should be designed to reduce the possibility of excessive condensation within the roof space and the potential for freezing of this condensation and subsequent poor drying.

G12 – Water supply

The typical insulation levels to pipe work used at lower altitudes are not usually adequate to prevent freezing of pipework, especially when pipes are located on outer walls or within roof spaces.

We recommend getting advice from plumbers who are specialist for these environments to consider the location of pipework within the building and also, if applicable, the frost protection of pipework between external water tanks, pumps, and into the building.

G13 – Effluent disposal

Where an on-site disposal system with low dose 'dripper' pipework is used to disperse the effluent liquid, consider burying the pipework for frost protection and appropriate layout and end of run valves that ensure the pipework drains to empty at the completion of the pumped dispersal cycle.