



Webinar

**Windows,
Doors
& Skylights**

Welcome

Presenters

- John Burgess, BRANZ Senior Consultant
- Robert Champion, W&GANZ Technical Director
- Christian Hoerning, MBIE, BSP Senior advisor



BUILDING
PERFORMANCE

H1

H1 Energy Efficiency Acceptable Solution H1/AS1

Energy efficiency for all housing,
and buildings up to 300 m²

FIFTH EDITION | EFFECTIVE 29 NOVEMBER 2021

MINISTRY OF BUSINESS,
INNOVATION & EMPLOYMENT
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BUILDING
PERFORMANCE

H1

H1 Energy Efficiency Verification Method H1/VM1

Energy efficiency for all housing,
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New Zealand Government



Webinar

**Windows,
Doors
& Skylights**

Consultation



window
& glass
association nz

Our proposal



window
& glass
association nz

BUILDING PERFORMANCE

Outcome of a
Building Code
Transition p
efficiency c
Decisions for a mer
verification meth
15 July 2022



Name of Paper	Feedback on the Transition period for the energy efficiency of housing
Author	Brett Francis on behalf of the Window & Glass Association
Date	June 2022

1. We propose a fourth option to those proposed in the consultation, one that introduces a third step into the implementation plan for the improvement of the thermal performance of windows:
- 1.1 From 4th November 2022 - all consents lodged will require that glazed windows and doors have a minimum thermal performance value of R0.37 across ALL climate zones.

This provides the change to window thermal performance for Climates Zones 1 & 2 (70% of residential construction) as originally planned and an improvement in all other zones.

- 1.2 From 5th May 2023 - all consents lodged will require that glazed windows and doors have a minimum thermal performance value as described in H1/AS1 - Fifth Edition:
- | | |
|---------------------|-------|
| Climate Zones 1 & 2 | R0.37 |
| Climate Zones 3 & 4 | R0.46 |
| Climate Zones 5 & 6 | R0.50 |

- 1.3 From 3rd November 2023 - all consents lodged will require that glazed windows and doors have a minimum thermal performance value as described in H1/AS1 - Fifth Edition:
- | | |
|--------------------------|-------|
| Climate Zones 1, 2, 3, 4 | R0.46 |
| Climate Zones 5 & 6 | R0.50 |

The frame and glazing combination required to achieve the suggested R0.37 is a traditional aluminium frame with a high performance double glazed IGU, i.e. window and door frames as we currently know them but with the glazing upgraded to meet the new levels from clear double glazing to Low-e coated glass with inert gas. It would be expected that the impact to the homeowner for the new first step would be an increase of approximately \$5000.

2. We note the transition date for commercial construction remains unchanged. We believe this is confusing and believe for consistency that all buildings under 300m² should be included in any delay.

3. Our proposal responds to three issues:
- 3.1 The re-organising of glass product lines to comply with the new performance requirements has been set in motion with the November 2022 implementation date firmly in mind. High performance glass has been ordered, production is underway and shipping lines have been booked to ensure the original implementation plan could be achieved.
- a. The incoming Low E glass has a shelf life and cannot simply be stored until it is required several months down the track.
- b. The incoming orders are part of a much larger plan. The glass companies have forecast their requirements 12 months or more ahead and the orders have been staged

Our proposal



Name of Paper	Feedback
the Transi	n behalf,
those prop	n for the
all conse	mal perf
window	is origina
ents lodg	nce valu
1 & 2	
1 & 4	
1 & 6	
consents	perform
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be an inci	
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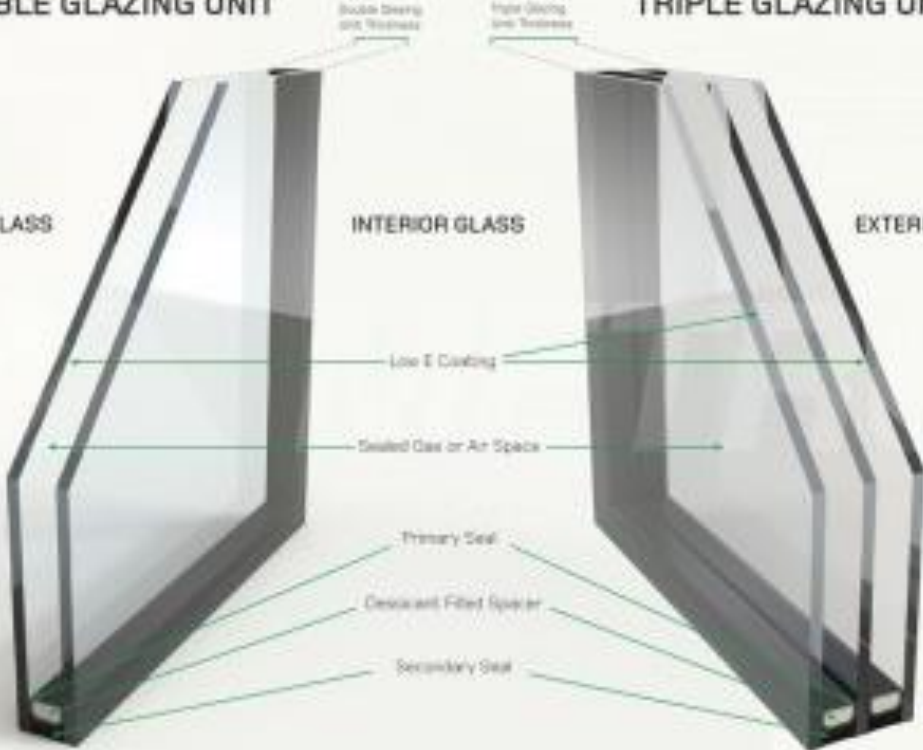
DOUBLE GLAZING UNIT

TRIPLE GLAZING UNIT

EXTERIOR GLASS

INTERIOR GLASS

EXTERIOR GLASS



been booked to ensure the original implementation date firmly
a. The incoming Low E glass has a shelf life and cannot simply be stored until it is
required several months down the track.
b. The incoming orders are part of a much larger plan. The glass companies have
forecast their requirements 12 months or more ahead and the orders have been staged

Our proposal



3 Our proposal responds to three issues:

3.1 The re-organising of glass product lines to comply with requirements has been set in motion with the November in mind. High performance glass has been ordered, production lines have been booked to ensure the original implementation. Delaying the implementation is not an option for glass suppliers.

a. The incoming Low E glass has a shelf life and cannot be required several months down the track.

b. The incoming orders are part of a much larger plan. Suppliers forecast their requirements 12 months or more ahead.

Energy efficiency of housing
Glass Association

...one that introduces a third
thermal performance of windows:

...that glazed windows and
...7 across ALL climate zones.

...for Climates Zones 1 & 2 (70%
improvement in all other zones.

...glazed windows and doors have
S1 - Fifth Edition:

...glazed windows and
...in H1/AS1 - Fifth

...R0.37 is a traditional
...down



Our proposal



3 Our proposal responds to three issues:

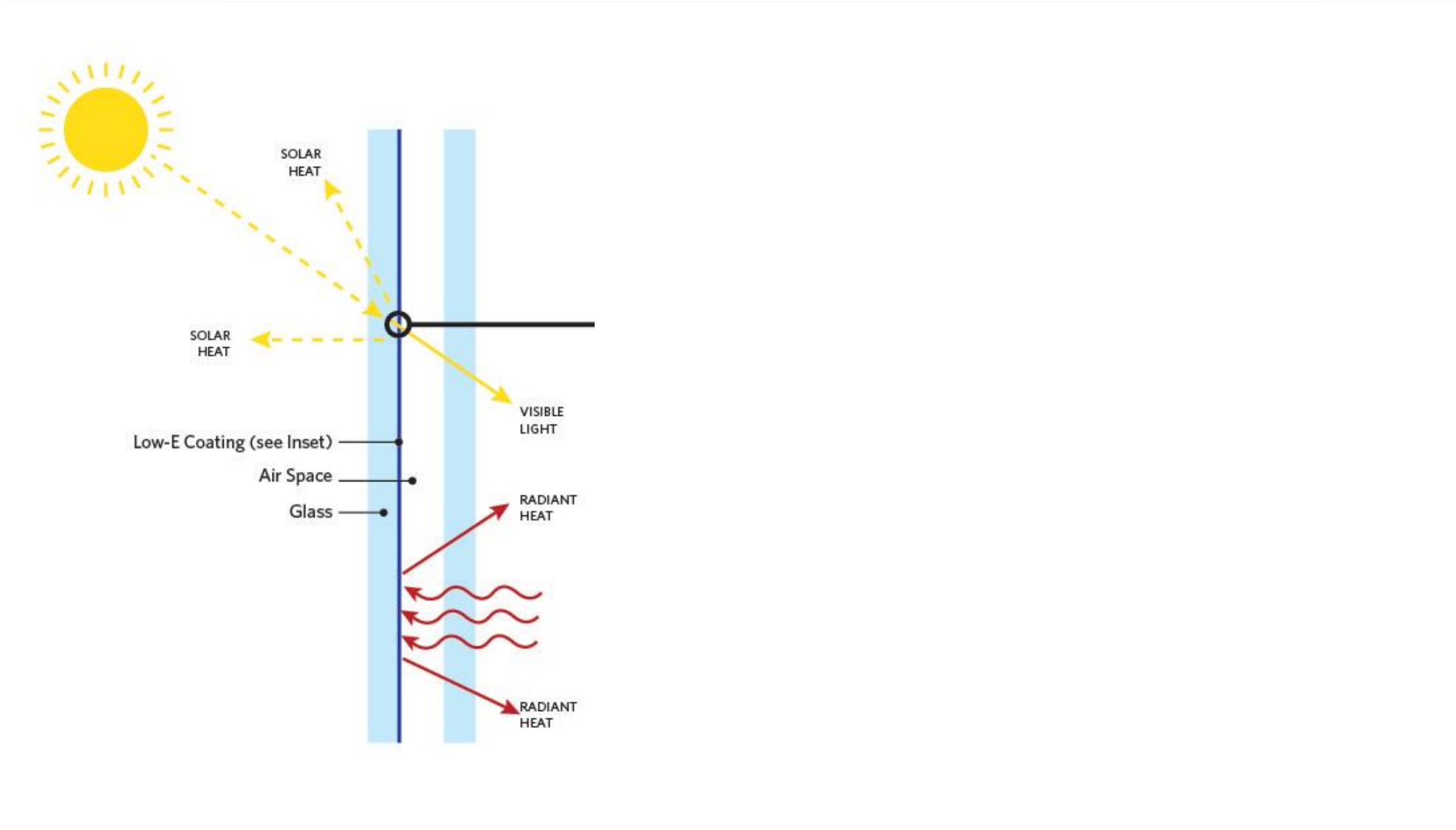
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a. The incoming Low E glass has a shelf life and cannot be required several months down the track.

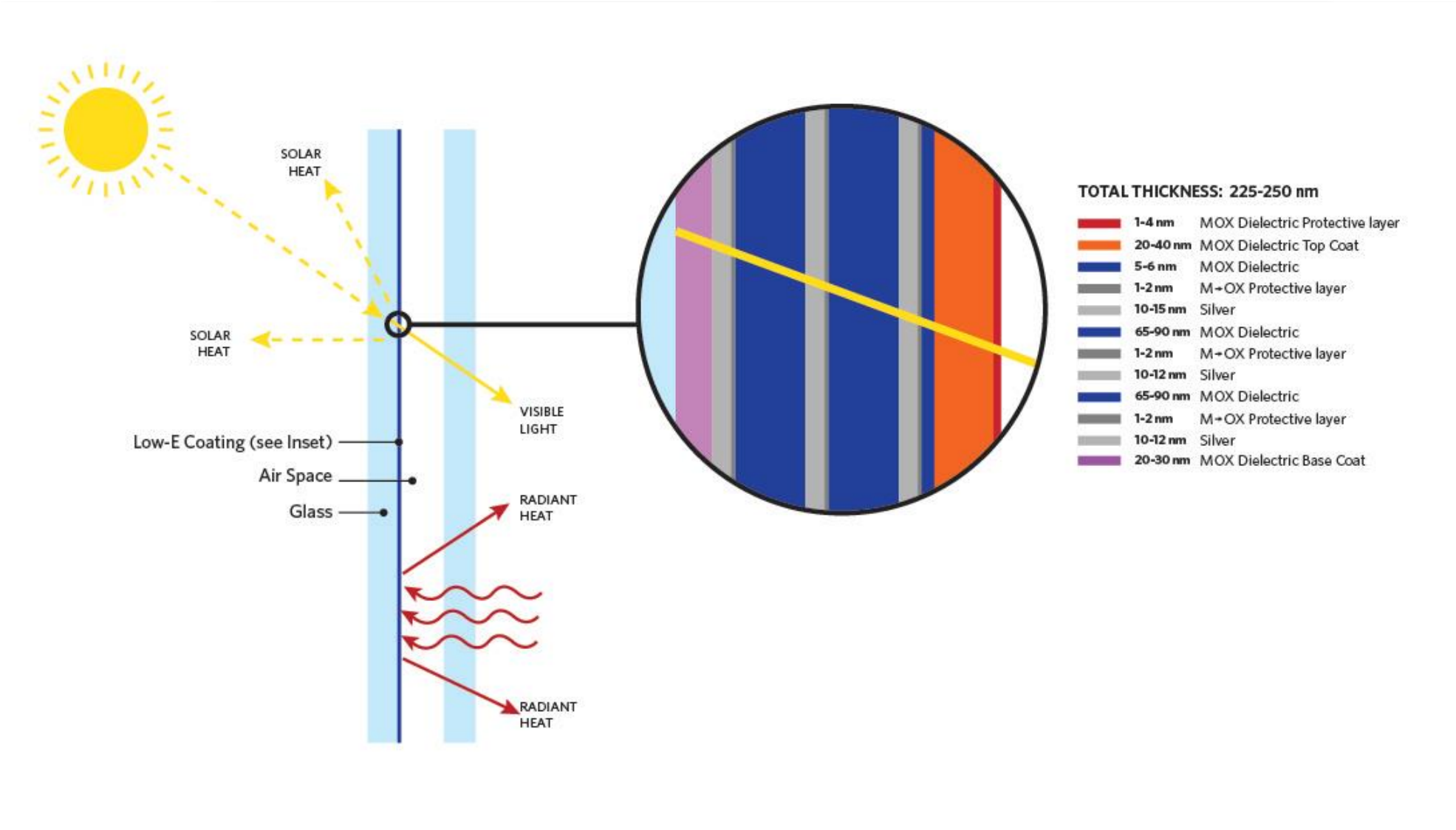
b. The incoming orders are part of a much larger plan. Suppliers forecast their requirements 12 months or more ahead.



Low-E glass



Low-E glass



Low-E glass



Low-E glass



Outcome



Transition

TABLE 1.4: Minimum R-values for each building element for housing in H1/AS1 and H1/VM1

Options	Climate zone					
	1	2	3	4	5	6
Roofs						
Current minimum requirements	R2.9		R2.9/3.3		R3.3	
1 May 2023			R6.6↑			
Walls						
Current minimum requirements	R1.9		R1.9/2.0		R2.0	
1 May 2023			R2.0↑			
Floors						
Current minimum requirements			R1.3			
Slab-on-ground floors 1 May 2023	R1.5↑	R1.5↑	R1.5↑	R1.5↑	R1.6↑	R1.7↑
Other floors 1 May 2023		R2.5↑		R2.8↑	R3.0↑	
Windows and doors						
Current minimum requirements			R0.26			
3 November 2022	R0.37↑		R0.37↑		R0.37↑	
1 May 2023	R0.37		R0.46↑		R0.50↑	
2 November 2023	R0.46↑		R0.46		R0.50	

Transition

TABLE 1.4: Minimum R-values for each building element for housing in H1/AS1 and H1/VM1

Options	Climate zone					
	1	2	3	4	5	6

Windows and doors			
Current minimum requirements	R0.26		
3 November 2022	R0.37↑	R0.37↑	R0.37↑
1 May 2023	R0.37	R0.46↑	R0.50↑
2 November 2023	R0.46↑	R0.46	R0.50

for housing only ...

All zones

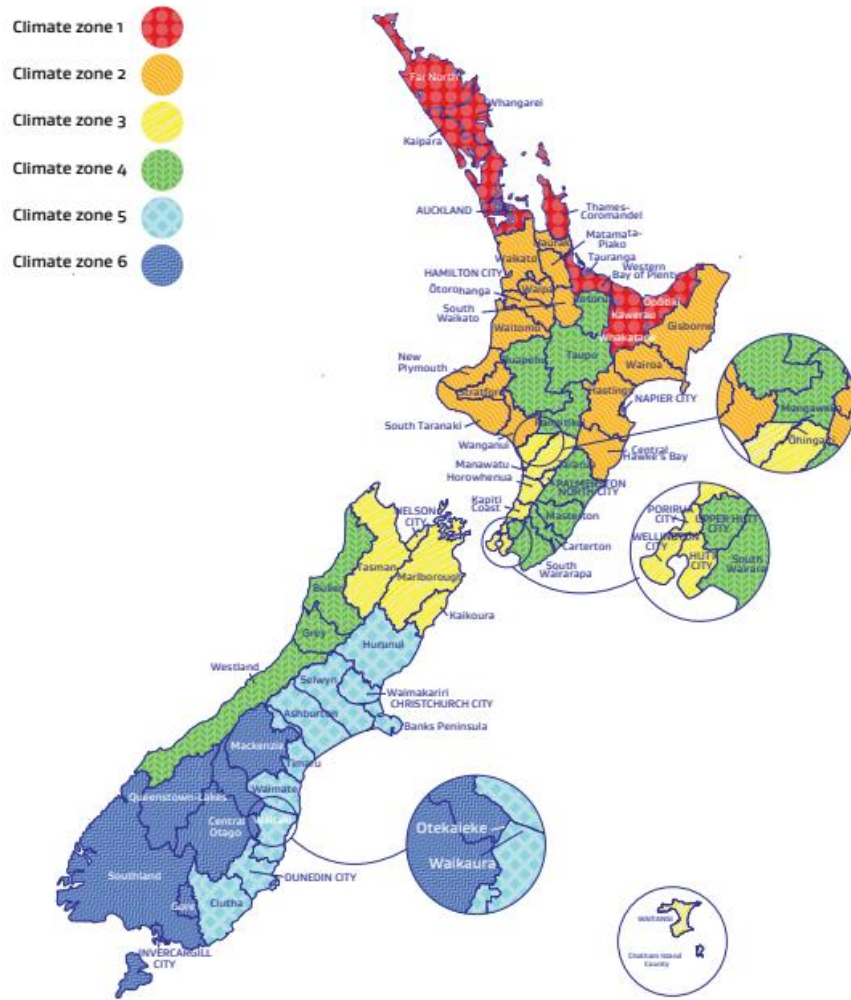


TABLE 1.4: Minimum R-values for each building element for housing in H1/AS1 and H1/VM1

Climate zone			
Options			
Windows and doors			
Current minimum requirements			
3 November 2022	R0.37↑	R0.37↑	R0.37↑
1 May 2023			
2 November 2023			

Type of glazing	$U_g^{(1)}$	Spacer type ⁽²⁾	Example IGU ^{(3), (4)} (informative)	R _{window} (m ² ·K/W) for different frames			
				Aluminium frame	Thermally broken aluminium frame	uPVC frame	Timber frame
Double pane	2.63	Aluminium	Glass: Clear/Clear Gas: Air			R0.40	R0.44
	1.90	Aluminium	Glass: Low E ₁ /Clear Gas: Argon		R0.39	R0.50	R0.56
	1.60	Thermally improved	Glass: Low E ₂ /Clear Gas: Argon		R0.42	R0.56	R0.63
	1.30	Thermally improved	Glass: Low E ₃ /Clear Gas: Argon		R0.46	R0.63	R0.71
	1.10	Thermally improved	Glass: Low E ₄ /Clear Gas: Argon	R0.37	R0.50	R0.69	R0.77
	0.90	Thermally improved	Glass: Low E ₄ /Clear Gas: Krypton	R0.40	R0.54	R0.76	R0.85

By zone

- Climate zone 1 
- Climate zone 2 
- Climate zone 3 
- Climate zone 4 
- Climate zone 5 
- Climate zone 6 

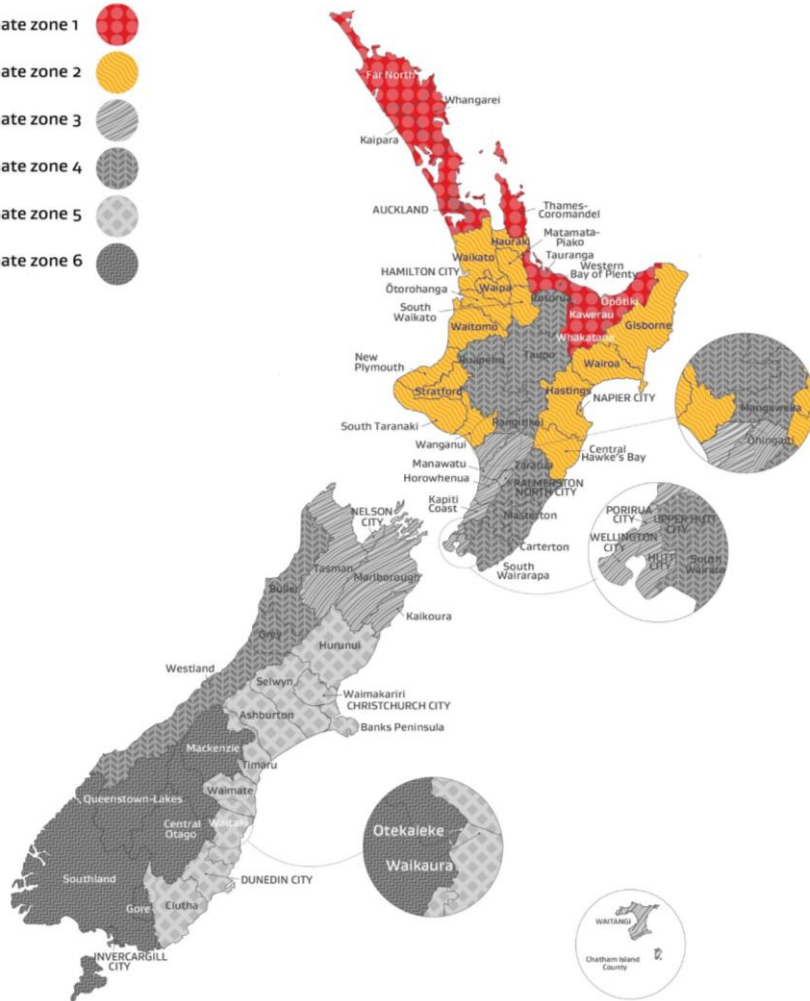


TABLE 1.4: Minimum R-values for each building element for housing in H1/AS1 and H1/VM1

Climate zone			
Options			
Windows and doors			
Current minimum requirements			
3 November 2022	R0.37↑		
1 May 2023	R0.37		
2 November 2023			

Type of glazing	$U_g^{(1)}$	Spacer type ⁽²⁾	Example IGU ^{(3), (4)} (informative)	R _{window} (m ² -K/W) for different frames			
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	1.90	Aluminium	Glass: Low E ₁ /Clear Gas: Argon		R0.39	R0.50	R0.56
	1.60	Thermally improved	Glass: Low E ₂ /Clear Gas: Argon		R0.42	R0.56	R0.63
	1.30	Thermally improved	Glass: Low E ₃ /Clear Gas: Argon		R0.46	R0.63	R0.71
	1.10	Thermally improved	Glass: Low E ₄ /Clear Gas: Argon	R0.37	R0.50	R0.69	R0.77
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By zone

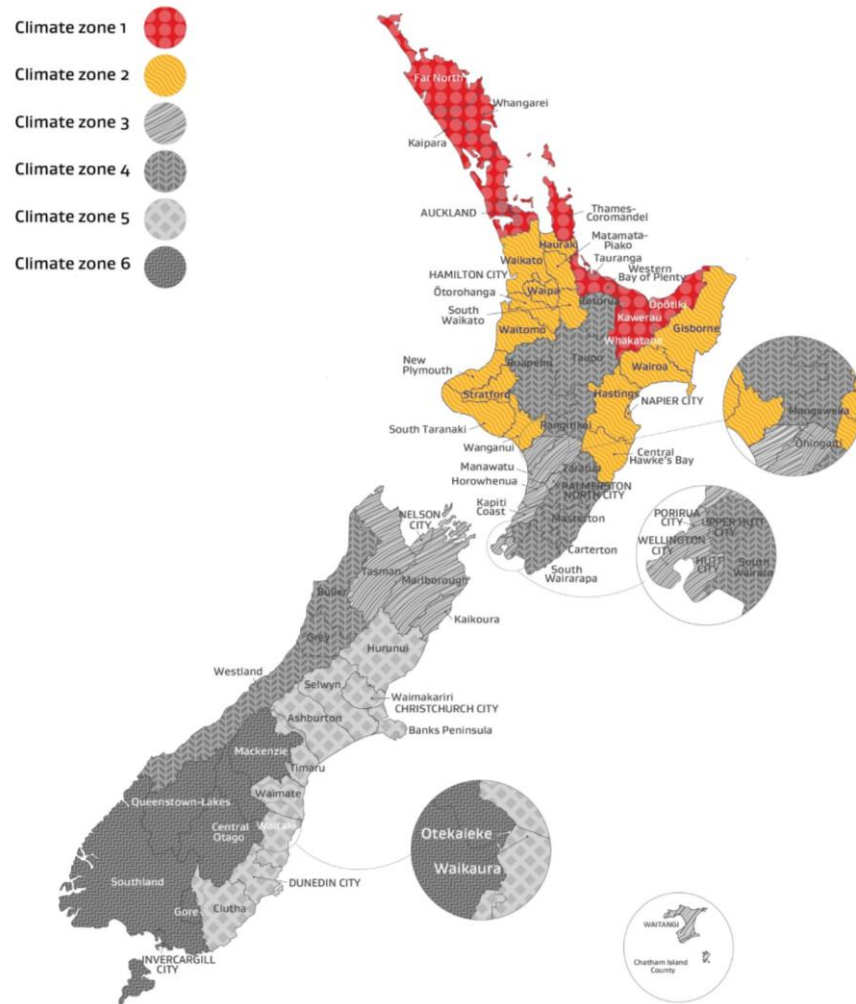


TABLE 1.4: Minimum R-values for each building element for housing in H1/AS1 and H1/VM1

Options	Climate zone	
	1	2
Windows and doors		
Current minimum requirements		
3 November 2022		
1 May 2023		
2 November 2023	R0.46↑	

Type of glazing	$U_g^{(1)}$	Spacer type ⁽²⁾	Example IGU ^{(3), (4)} (informative)	R _{window} (m ² ·K/W) for different frames			
				Aluminium frame	Thermally broken aluminium frame	uPVC frame	Timber frame
Double pane	2.63	Aluminium	Glass: Clear/Clear Gas: Air				
	1.90	Aluminium	Glass: Low E _i /Clear Gas: Argon			R0.50	R0.56
	1.60	Thermally improved	Glass: Low E ₂ /Clear Gas: Argon			R0.56	R0.63
	1.30	Thermally improved	Glass: Low E ₃ /Clear Gas: Argon		R0.46	R0.63	R0.71
	1.10	Thermally improved	Glass: Low E ₄ /Clear Gas: Argon		R0.50	R0.69	R0.77
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By zone

- Climate zone 1 
- Climate zone 2 
- Climate zone 3 
- Climate zone 4 
- Climate zone 5 
- Climate zone 6 

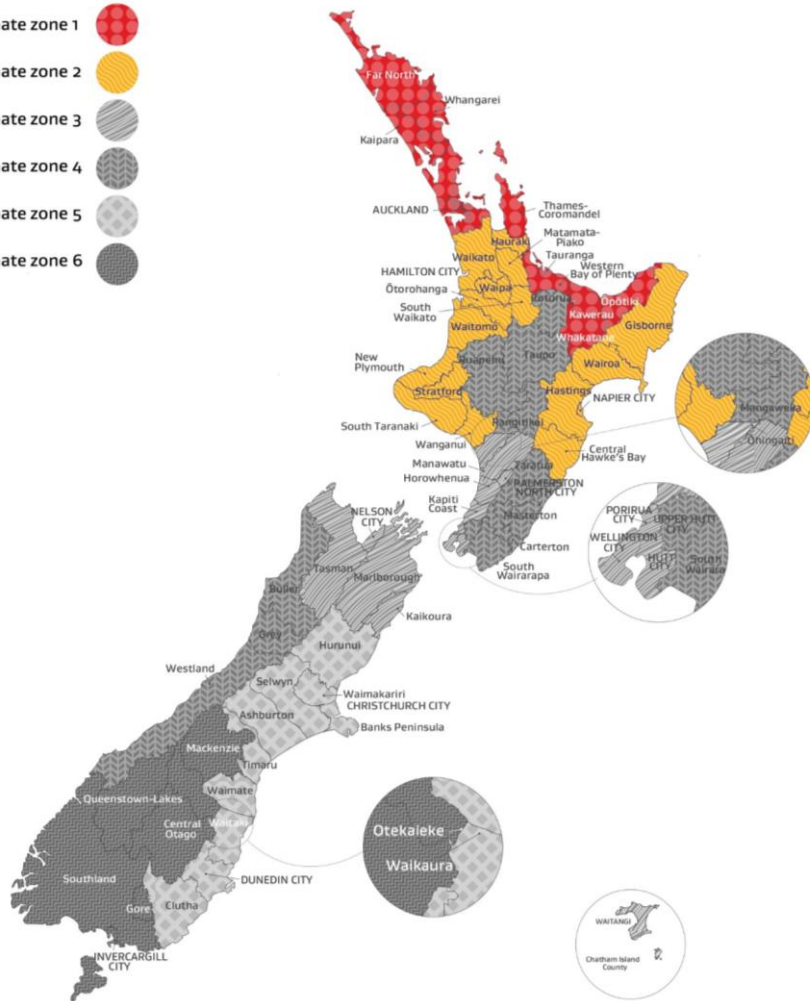


TABLE 1.4: Minimum R-values for each building element for housing in H1/AS1 and H1/VM1

Options	Climate zone	
	1	2

Windows and doors

Current minimum requirements

3 November 2022

1 May 2023

2 November 2023

R0.46↑

Type of glazing	$U_g^{(1)}$	Spacer type ⁽²⁾	Example IGU ^{(3), (4)} (informative)	R _{window} (m ² ·K/W) for different frames			
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	0.90	Thermally improved	Glass: Low E ₄ /Clear Gas: Krypton			R0.54	R0.76 R0.85

By zone

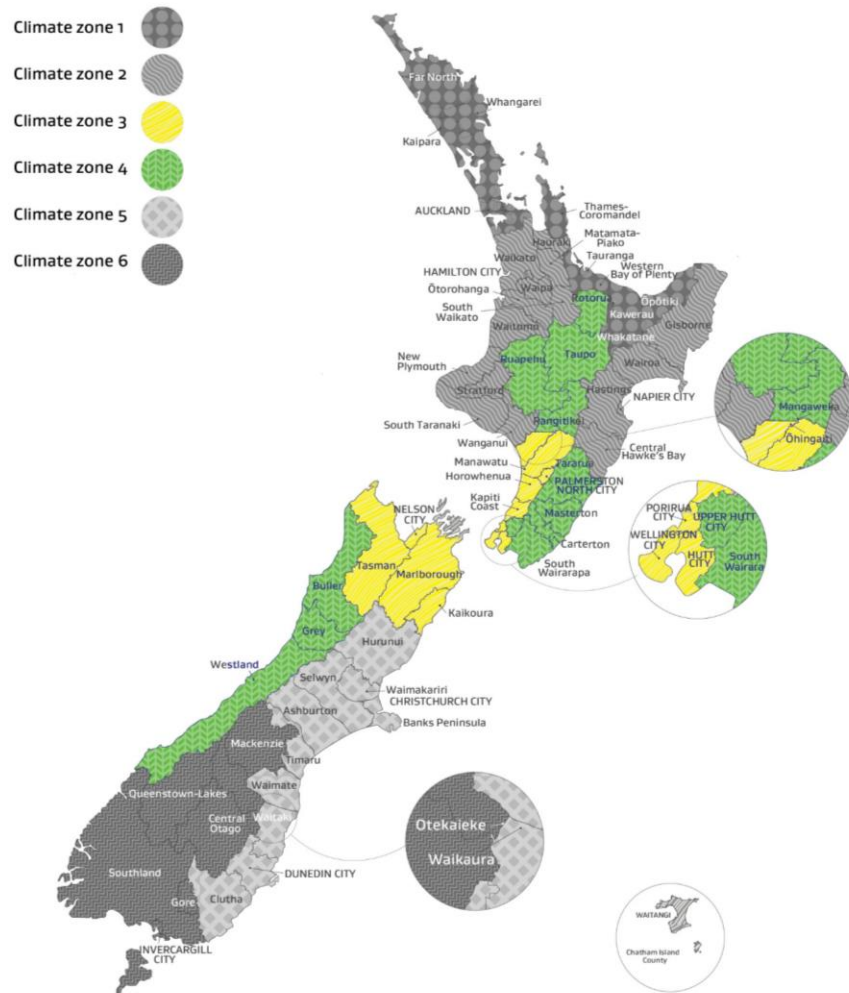


TABLE 1.4: Minimum R-values for each building element for housing in H1/AS1 and H1/VM1

Climate zone			
Options			
Windows and doors			
Current minimum requirements			
3 November 2022			
1 May 2023			
2 November 2023			

Type of glazing	$U_g^{(1)}$	Spacer type ⁽²⁾	Example IGU ^{(3), (4)} (informative)	R _{window} (m ² ·K/W) for different frames			
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	0.90	Thermally improved	Glass: Low E ₄ /Clear Gas: Krypton		R0.54	R0.76	R0.85

By zone

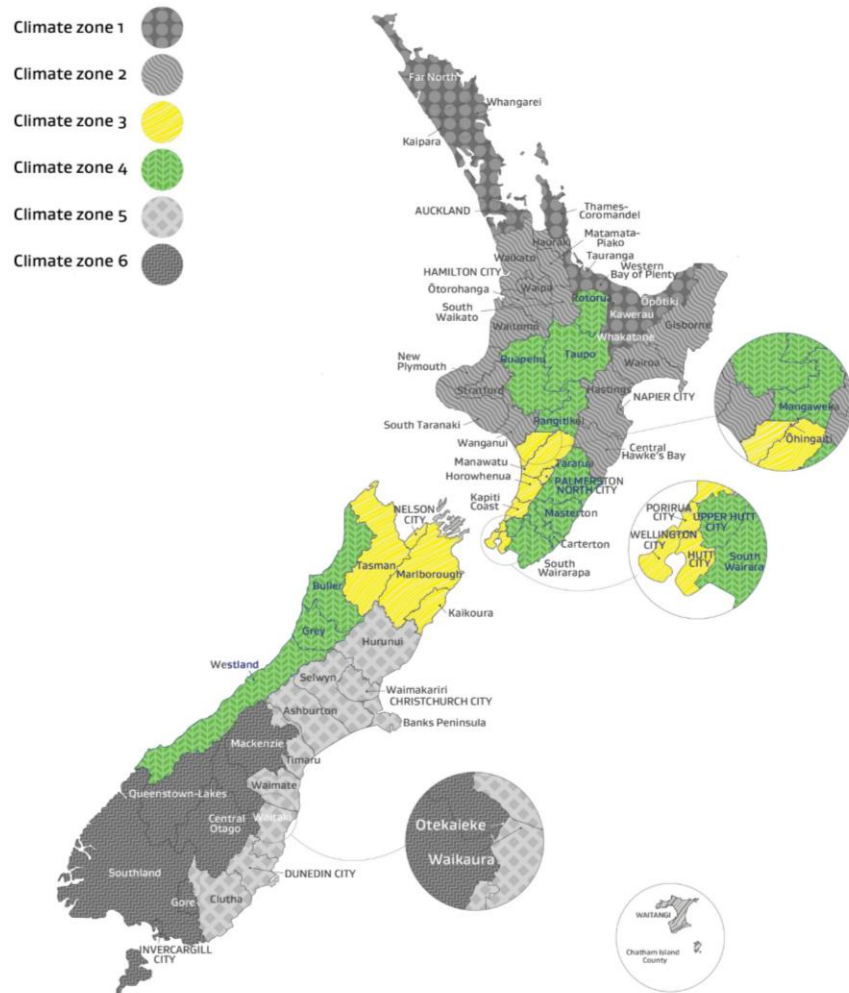


TABLE 1.4: Minimum R-values for each building element for housing in H1/AS1 and H1/VM1

Options	Climate zone	
	3	4

Windows and doors

Current minimum requirements

3 November 2022

1 May 2023

R0.46↑

2 November 2023

R0.46

Type of glazing	$U_g^{(1)}$	Spacer type ⁽²⁾	Example IGU ^{(3), (4)} (informative)	R _{window} (m ² ·K/W) for different frames			
				Aluminium frame	Thermally broken aluminium frame	uPVC frame	Timber frame
Double pane	2.63	Aluminium	Glass: Clear/Clear Gas: Air				
	1.90	Aluminium	Glass: Low E ₁ /Clear Gas: Argon			R0.50	R0.56
	1.60	Thermally improved	Glass: Low E ₂ /Clear Gas: Argon			R0.56	R0.63
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By zone

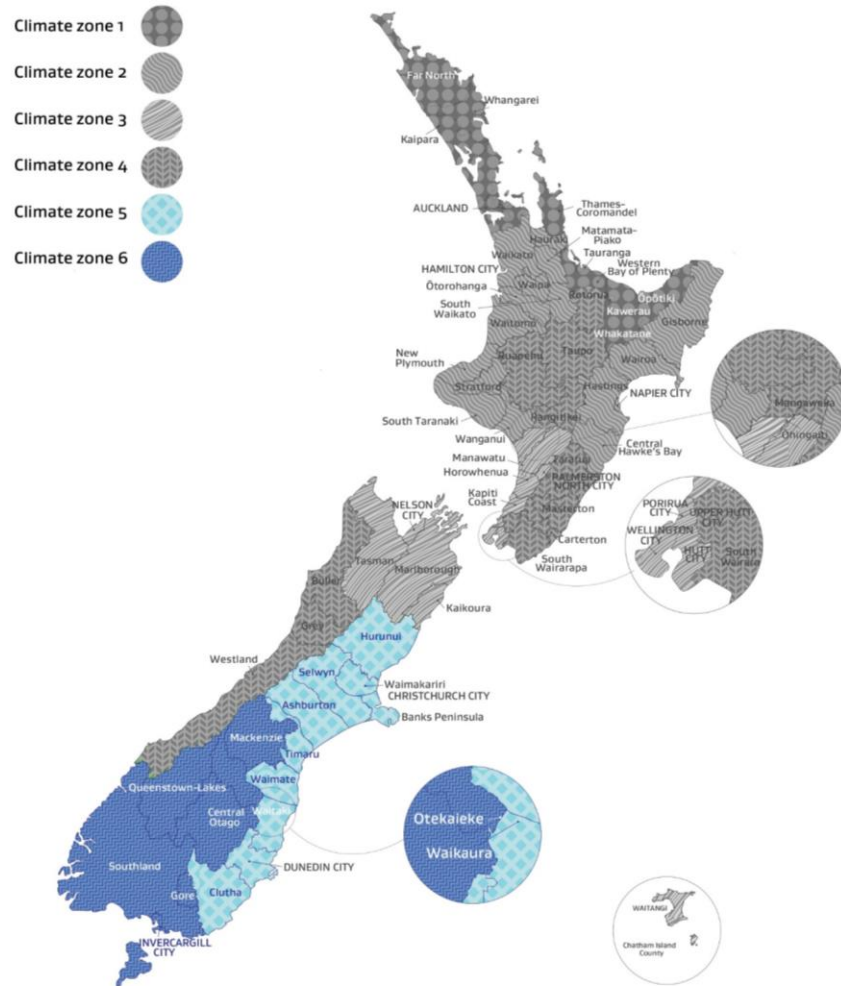


TABLE 1.4: Minimum R-values for each building element for housing in H1/AS1 and H1/VM1

Climate zone			
Options			
Windows and doors			
Current minimum requirements			
3 November 2022			
1 May 2023			
2 November 2023			

Type of glazing	$U_g^{(1)}$	Spacer type ⁽²⁾	Example IGU ^{(3), (4)} (informative)	R _{window} (m ² ·K/W) for different frames			
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By zone

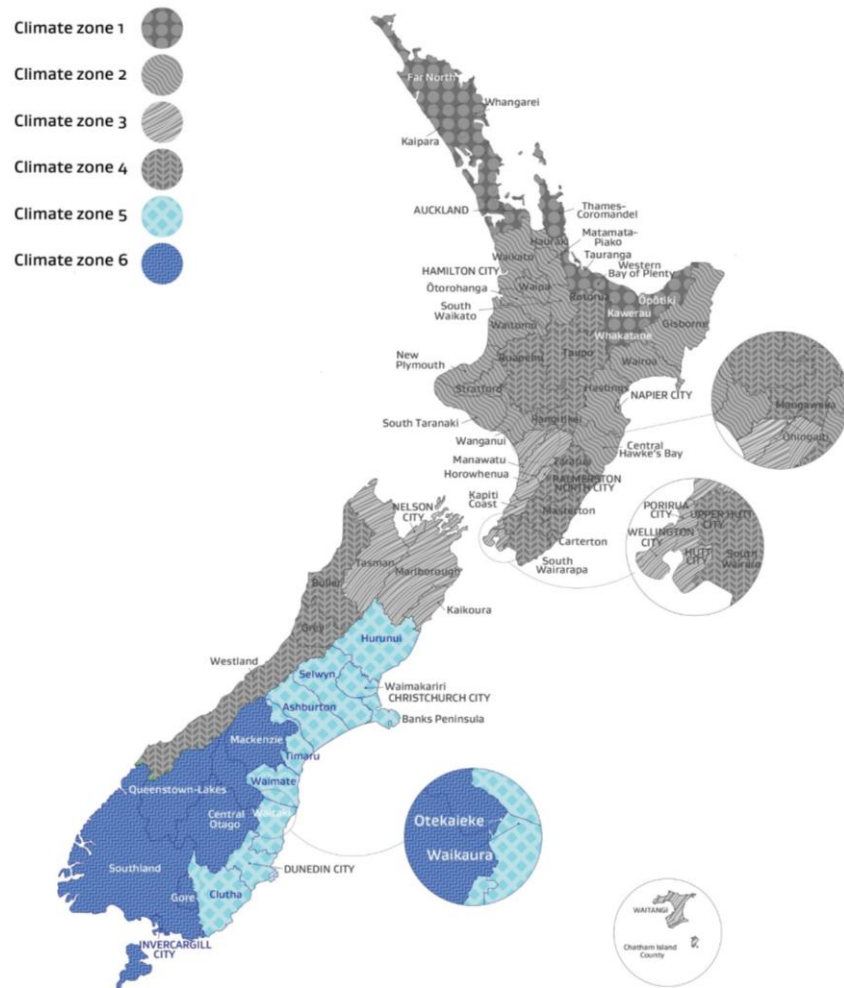


TABLE 1.4: Minimum R-values for each building element for housing in H1/AS1 and H1/VM1

Climate zone			
Options			
			5
			6
Windows and doors			
Current minimum requirements			
3 November 2022			
1 May 2023			
2 November 2023			

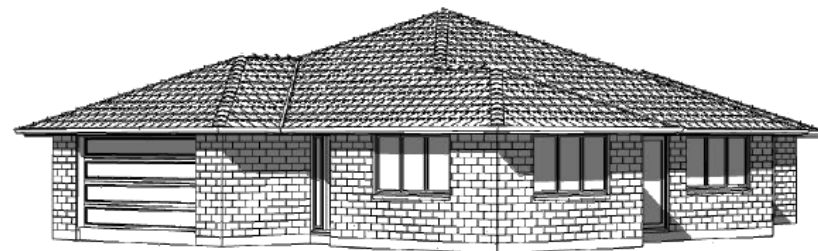
Type of glazing	$U_g^{(1)}$	Spacer type ⁽²⁾	Example IGU ^{(3), (4)} (informative)	R _{window} (m ² ·K/W) for different frames			
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	0.90	Thermally improved	Glass: Low E ₄ /Clear Gas: Krypton		R0.54	R0.76	R0.85



















Combinations

TABLE E.1.1.1: Construction R-values (R_{Window}) of selected generic vertical windows and doors

Paragraph E.1.1.1 a)

R_{window} ($\text{m}^2\cdot\text{K/W}$) for different frames



		Building Type - Average House 1 - 4 Bed = 242m ² - 19 Units = 46m ²																					
4																							
5				2.222 x 1.585	1.330x 2.430	1.330x 2.430	1.330x 2.430	2.222 x 0.830	2.222 x 2.430	2.222 x 0.830	2.222 x 2.430	1.330x 2.430	1.030 x 0.630	1.330 x 1.630	0.630 x 1.630	1.330 x 1.630	1.030 x 1.430	1.030 x 0.630	1.330 x 1.630	2.222 x 0.910	2.222 x 0.830	1.330 x 0.830	
6				3.522	3.232	3.232	3.232	1.844	5.399	1.844	5.399	3.232	0.649	2.168	1.027	2.168	1.473	0.649	2.168	2.022	1.844	1.104	
7				46	1	2	2	2	3	4	3	4	2	5	6	7	6	8	5	6	9	3	10
8				Average (R _{win})	Entry	Lounge	Lounge	Family	Family	Dining	Dining	Bed 1	Bed 1	Ensuite	Bed 2	Bed 2	Bed 3	Bathroom	WC	Bed 4	Garage	Garage	Study
9				0.27	0.2341	0.278	0.278	0.278	0.271	0.278	0.271	0.278	0.278	0.244	0.28	0.253	0.28	0.267	0.244	0.28	0.254	0.271	0.265
10																							
11																							
12	4 Clear/16/4 Clear																						
13	Gas Air																						
14	Spacer Alum	Weighted Av																					
15	Ucog 2.63	0.27																					
16	SHGC 0.77	Average																					
17		0.26	0.2341	0.2773	0.2773	0.2773	0.2728	0.2733	0.2728	0.2733	0.2773	0.2432	0.273	0.228	0.273	0.251	0.2432	0.273	0.266	0.2728	0.264		
18																							
19	Clear / Low-E ¹	X	X	X									X	X	X	X	X	X	X	X	X	X	X
20	Gas Argon																						
21	Spacer Alum	Weighted Av																					
22	Ucog 1.90	0.31																					
23	SHGC 0.56	Average																					
24		0.30	0.2539	0.3234	0.3234	0.3234	0.3171	0.3204	0.3234	0.3204	0.3234	0.2713	0.317	0.25	0.317	0.283	0.2713	0.317	0.299	0.3171	0.304		
		H1 Table final	Psi values	H1 Table draft	Al Frame - small AH1	Aluminium Frame - AH1	Al Frame - large AH1	T Broken Frame - small AH1	Thermally Broken Frame - AH1	T Broken Frame - large AH1	uPVC ...												

Ready

<

Gas: Argon

Combinations

TABLE E.1.1.1: Construction R-values (R_{Window}) of selected generic vertical windows and doors

Paragraph E.1.1.1 a)

Type of glazing	$U_g^{(1)}$	Spacer type ⁽²⁾	Example IGU ^{(3), (4)} (informative)	R_{window} ($\text{m}^2\text{-K/W}$) for different frames			
				Aluminium frame	Thermally broken aluminium frame	uPVC frame	Timber frame
Double pane	2.63	Aluminium	Glass: Clear/Clear Gas: Air	R0.26	R0.32	R0.40	R0.44
	1.90	Aluminium	Glass: Low E_g /Clear Gas: Argon	R0.30	R0.39	R0.50	R0.56
	1.60	Thermally improved	Glass: Low E_g /Clear Gas: Argon	R0.33	R0.42	R0.56	R0.63
	1.30	Thermally improved	Glass: Low E_g /Clear Gas: Argon	R0.35	R0.46	R0.63	R0.71
	1.10	Thermally improved	Glass: Low E_g /Clear Gas: Argon	R0.37	R0.50	R0.69	R0.77
	0.90	Thermally improved	Glass: Low E_g /Clear Gas: Krypton	R0.40	R0.54	R0.76	R0.85
Triple pane	1.89	Thermally improved	Glass: Clear/Clear/Clear Gas: Air		R0.38	R0.50	R0.56
	1.20	Thermally improved	Glass: Low E_g /Clear/Clear Gas: Argon		R0.48	R0.66	R0.74
	1.00	Thermally improved	Glass: Low E_g /Clear/Clear Gas: Argon		R0.52	R0.73	R0.81
	0.70	Thermally improved	Glass: Low E_g /Low E_g /Clear Gas: Argon		R0.59	R0.86	R0.95
	0.60	Thermally improved	Glass: Low E_g /Low E_g /Clear Gas: Argon		R0.62	R0.91	R1.01

Combinations

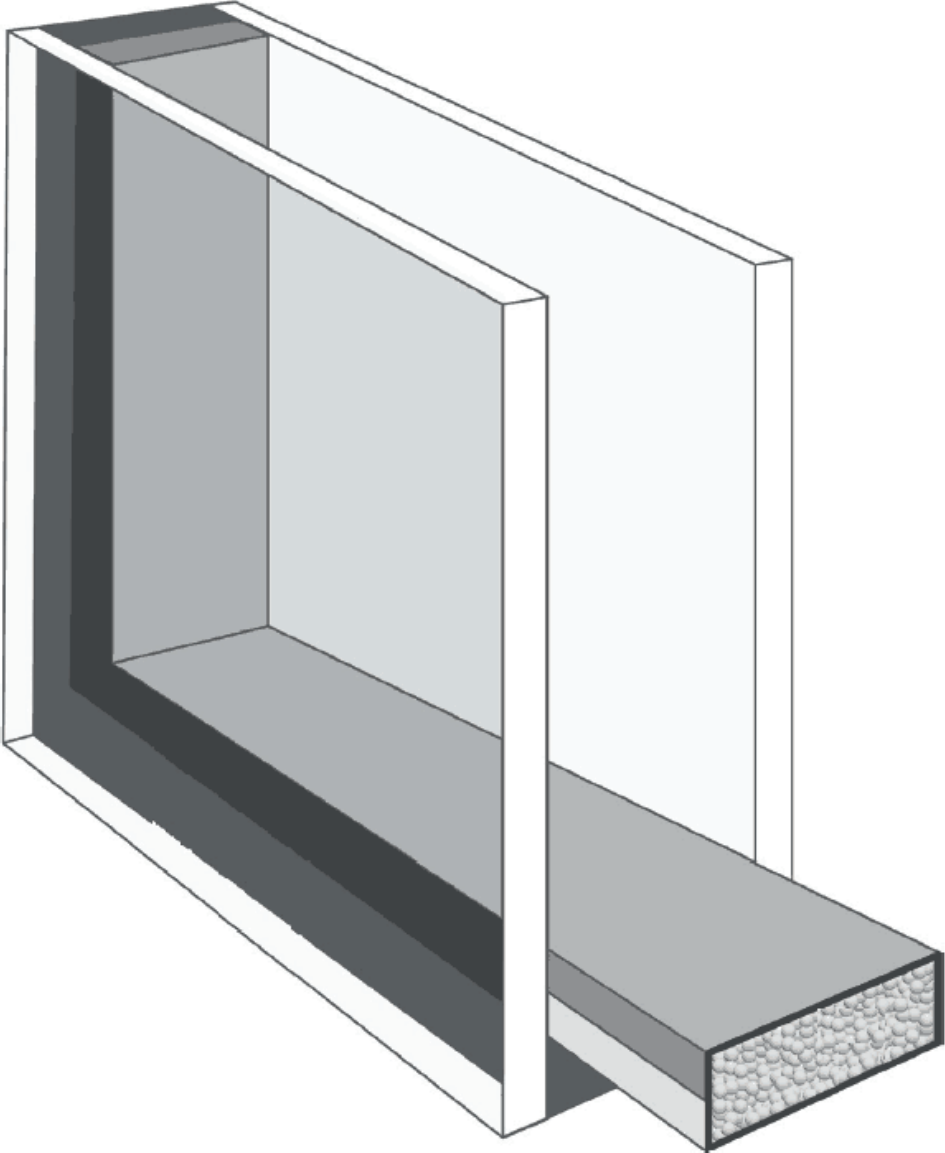
TABLE E.1.1.1: Construction R-values (R_{Window}) of selected generic vertical windows and doors
Paragraph E.1.1.1 a)

Type of glazing	Construction	R-value
-----------------	--------------	---------

Aluminium

Thermally improved

Triple pane	1.89	Thermally improved	Glazing
	1.20	Thermally improved	Glazing
	1.00	Thermally improved	Glazing
	0.70	Thermally improved	Glazing
	0.60	Thermally improved	Glazing



Combinations

TABLE E.1.1.1: Construction R-values (R_{Window}) of selected generic vertical windows and doors
[Paragraph E.1.1.1 a\)](#)

Type of glazing	$U_g^{(1)}$	Spacer type ⁽²⁾	Example IGU ^{(3), (4)} (informative)	R_{window} ($\text{m}^2\text{-K/W}$) for different frames		
				Aluminium	Thermally broken	uPVC Timber frame
Double pane	2.63		Gas: Air			R0.44
	1.90					R0.56
	1.60					R0.63
	1.30		Gas: Argon			R0.71
	1.10	impro				R0.77
Triple pane	0.90	Thermally improved	Glass: Gas: K	54	R0.76	R0.85
	1.89	Thermally improved	Glass: Gas: A	38	R0.50	R0.56
	1.20	Thermally improved	Glass: Gas: A	48	R0.66	R0.74
	1.00	Thermally improved	Glass: Gas: A	52	R0.73	R0.81
	0.70	Thermally improved	Glass: Gas: A	59	R0.86	R0.95
	0.60	Thermally improved	Glass: Gas: Argon	62	R0.91	R1.01

Low E_3/C_1

Low E_4/C_1

Combinations

TABLE E.1.1.1: Construction R-values (R_{Window}) of selected generic vertical windows and doors
 Paragraph E.1.1.1 a)

Type of glazing	$U_g^{(1)}$	Spacer type ⁽²⁾	Example IGU ^{(3), (4)} (informative)	R_{window} ($\text{m}^2\cdot\text{K}/\text{W}$) for different frames			
				Aluminium frame	Thermally broken aluminium frame	uPVC frame	Timber frame
Double pane	2.63	Aluminium	Glass: Clear/Clear Gas: Air	R0.26	R0.32	R0.40	R0.44
	1.90	Aluminium	Glass: Low E_g /Clear Gas: Argon	R0.30	R0.39	R0.50	R0.56
	1.60	Thermally improved	Glass: Low E_g /Clear Gas: Argon	R0.33	R0.42	R0.56	R0.63
	1.30	Thermally improved	Glass: Low E_g /Clear Gas: Argon	R0.35	R0.46	R0.63	R0.71
	1.10	Thermally improved	Glass: Low E_g /Clear Gas: Argon	R0.37	R0.50	R0.69	R0.77
	0.90	Thermally improved	Glass: Low E_g /Clear Gas: Krypton	R0.40	R0.54	R0.76	R0.85
Triple pane	1.89	Thermally improved	Glass: Clear/Clear/Clear Gas: Air		R0.38	R0.50	R0.56
	1.20	Thermally improved	Glass: Low E_g /Clear/Clear Gas: Argon		R0.48	R0.66	R0.74
	1.00	Thermally improved	Glass: Low E_g /Clear/Clear Gas: Argon		R0.52	R0.73	R0.81
	0.70	Thermally improved	Glass: Low E_g /Low E_g /Clear Gas: Argon		R0.59	R0.86	R0.95
	0.60	Thermally improved	Glass: Low E_g /Low E_g /Clear Gas: Argon		R0.62	R0.91	R1.01

Combinations

TABLE E.1.1.1: Construction R-values (R_{Window}) of selected generic vertical windows and doors

Paragraph E.1.1.1 a)

Type of glazing	$U_g^{(1)}$	Spacer type ⁽²⁾	Example IGU ^{(3), (4)} (informative)	R_{window} ($\text{m}^2\cdot\text{K}/\text{W}$) for different frames			
				Aluminium frame	Thermally broken aluminium frame	uPVC frame	timber frame
Double pane	2.63	Aluminium	Glass: Clear/Clear Gas: Air	R0.26	R0.32	R0.40	R0.44
	1.90	Aluminium	Glass: Low E_g /Clear Gas: Argon	R0.30	R0.39	R0.50	R0.56
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Triple pane	1.89	Thermally improved	Glass: Clear/Clear/Clear Gas: Air		R0.38	R0.50	R0.56
	1.20	Thermally improved	Glass: Low E_g /Clear/Clear Gas: Argon		R0.48	R0.66	R0.74
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	0.60	Thermally improved	Glass: Low E_g /Low E_g /Clear Gas: Argon		R0.62	R0.91	R1.01

Design decision

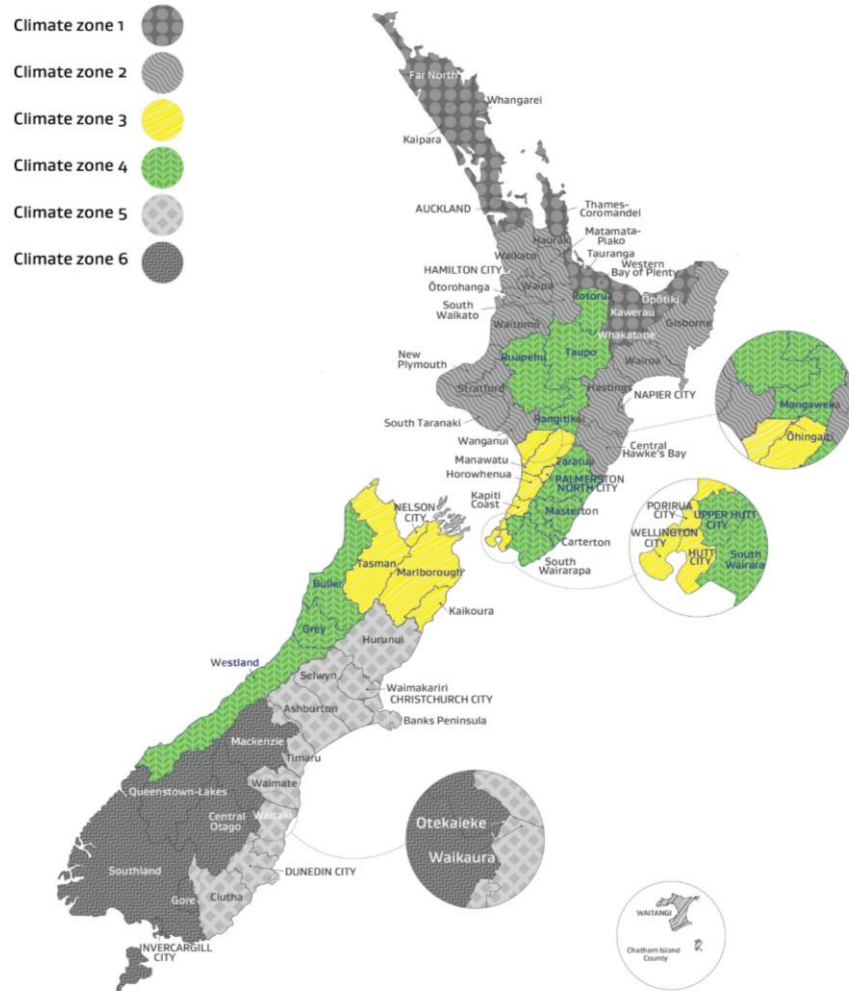


TABLE 1.4: Minimum R-values for each building element for housing in H1/AS1 and H1/VM1

Options	Climate zone	
	3	4

Windows and doors

Current minimum requirements

3 November 2022

1 May 2023

2 November 2023

R0.46↑

Type of glazing	$U_g^{(1)}$	Spacer type ⁽²⁾	Example IGU ^{(3), (4)} (informative)	R _{window} (m ² ·K/W) for different frames			
				Aluminium frame	Thermally broken aluminium frame	uPVC frame	Timber frame
Double pane	2.63	Aluminium	Glass: Clear/Clear Gas: Air				
	1.90	Aluminium	Glass: Low E ₁ /Clear Gas: Argon			R0.50	R0.56
	1.60	Thermally improved	Glass: Low E ₂ /Clear Gas: Argon			R0.56	R0.63
	1.30	Thermally improved	Glass: Low E ₃ /Clear Gas: Argon		R0.46	R0.63	R0.71
	1.10	Thermally improved	Glass: Low E ₄ /Clear Gas: Argon		R0.50	R0.69	R0.77
	0.90	Thermally improved	Glass: Low E ₄ /Clear Gas: Krypton		R0.54	R0.76	R0.85

Compliance decision

Climate zone 1



TABLE 1.4: Minimum R-values for each building element for housing in H1/AS1 and H1/VM1

Options	Climate zone	
	3	4
Windows and doors		
Current minimum requirements		
3 November 2022		
1 May 2023		R0.46↑
2 November 2023		

Type of glazing	U _g ⁽¹⁾	Spacer type ⁽²⁾	Example IGU ^{(3), (4)} (informative)	R _{window} (m ² -K/W) for different frames			
				Aluminium frame	Thermally broken aluminium frame	uPVC frame	Timber frame
Double pane	2.63	Aluminium	Glass: Clear/Clear Gas: Air	R0.26	R0.32	R0.40	R0.44
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	1.60	Thermally improved	Glass: Low E ₂ /Clear Gas: Argon	R0.33	R0.42	R0.56	R0.63
	1.30	Thermally improved	Glass: Low E ₃ /Clear Gas: Argon	R0.35	R0.46	R0.63	R0.71
	1.10	Thermally improved	Glass: Low E ₄ /Clear Gas: Argon	R0.37	R0.50	R0.69	R0.77
	0.90	Thermally improved	Glass: Low E ₄ /Clear Gas: Krypton	R0.40	R0.54	R0.76	R0.85



Compliance

Brand/Logo Header



Statement of Thermal Performance for Windows & Doors

Date of Issue

Name and Address of Manufacturer / Supplier

Project / Site Details - including Address

Consent No.

I / We declare that the;
supplied by us to this Project / Site, achieve a weighted average R-value as stated below,
R-value or $R_{window} = R$ m²K/W

This value has been determined using one of the following,
i) from Table E.1.1.1 (see over),
ii) from WEERS calculator,
iii) other Calculation.

Name

Signature

Window & Glass Association Membership No.

V1.5 - 06.10.22

Statement of Thermal Performance



HI ENERGY EFFICIENCY ACCEPTABLE SOLUTION H1/AS1

Windows, doors, and skylights

TABLE E.1.1.1: Construction R-values (R_{window}) of selected generic vertical windows and doors

Paragraph E.1.1.1a)

Type of glazing	U_g	Spacer type	Example IGU (m ² /W) (Informative)	R_{window} (m ² K/W) for different frames			
				Aluminium frame	Thermally broken aluminium frame	uPVC frame	Timber frame
Double pane	2.63	Aluminium	Glass: Clear/Clear Gas: Air	R0.26	R0.32	R0.40	R0.44
	1.90	Aluminium	Glass: Low E/Clear Gas: Argon	R0.30	R0.39	R0.50	R0.56
	1.60	Thermally improved	Glass: Low E/Clear Gas: Argon	R0.33	R0.42	R0.56	R0.63
	1.30	Thermally improved	Glass: Low E/Clear Gas: Argon	R0.35	R0.46	R0.63	R0.71
	1.10	Thermally improved	Glass: Low E/Clear Gas: Argon	R0.37	R0.50	R0.69	R0.77
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	1.89	Thermally improved	Glass: Clear/Clear/Clear Gas: Air	R0.38	R0.50	R0.56	
	1.20	Thermally improved	Glass: Low E/Clear/Clear Gas: Argon	R0.48	R0.66	R0.74	
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	0.70	Thermally improved	Glass: Low E/Low E/Clear Gas: Argon	R0.59	R0.86	R0.95	
Triple pane	0.60	Thermally improved	Glass: Low E/Low E/Clear Gas: Argon	R0.62	R0.91	R1.01	



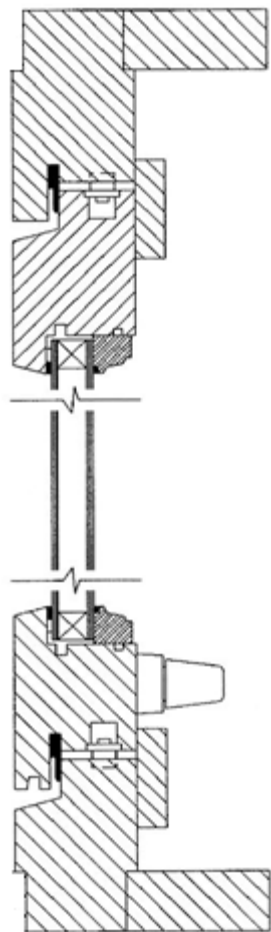


Webinar

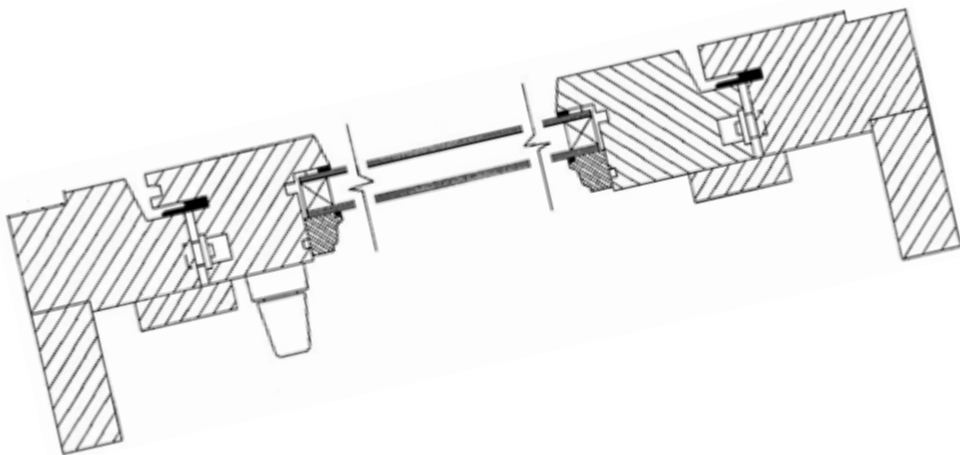
Windows, Doors & Skylights

**Skylight vs window R-values
Emissivity**

Skylight vs window R-values



Type of glazing	$U_g^{(1)}$	Spacer type ⁽²⁾	Example IGU ^{(3), (4)} (informative)	R_{window} ($m^2 \cdot K/W$) for different frames			
				Aluminium frame	Thermally broken aluminium frame	uPVC frame	Timber frame
Double pane	2.63	Aluminium	Glass: Clear/Clear Gas: Air	R0.26	R0.32	R0.40	R0.44
	1.90	Aluminium	Glass: Low E _i /Clear Gas: Argon	R0.30	R0.39	R0.50	R0.56

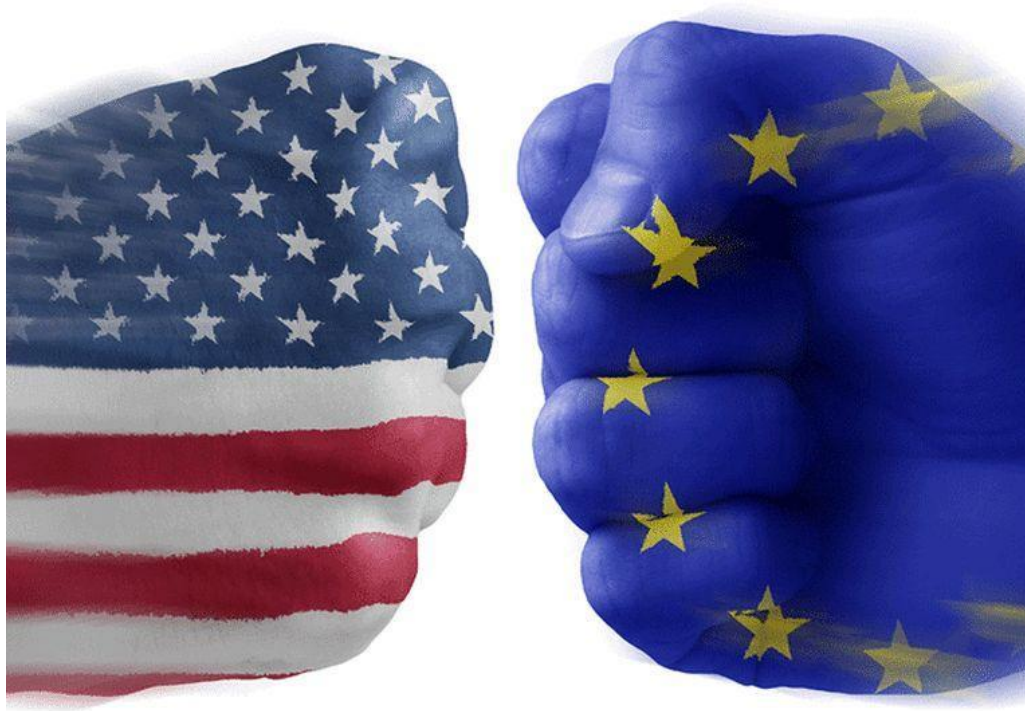


Vertical	
R_{win}	0.56

Near - Horizontal	
R_{win}	0.43

Europe vs USA

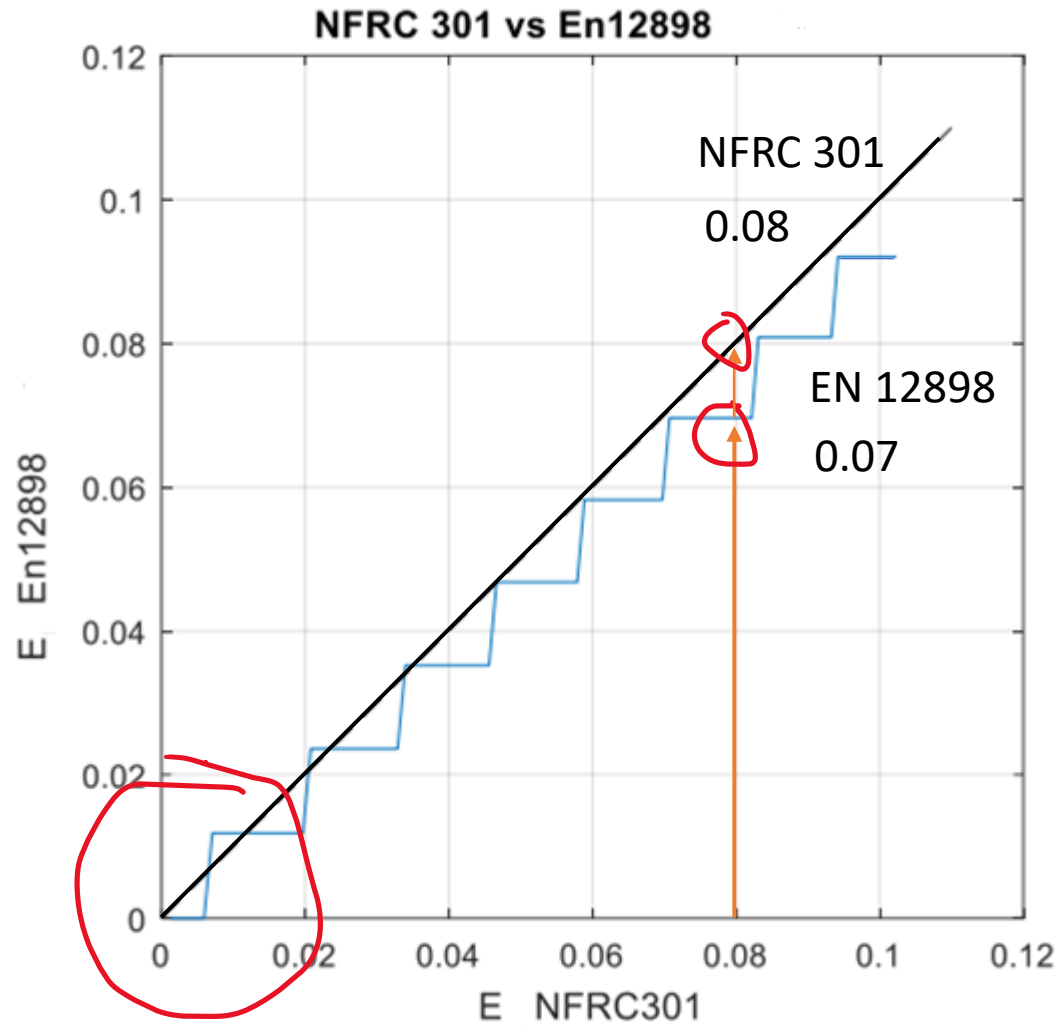
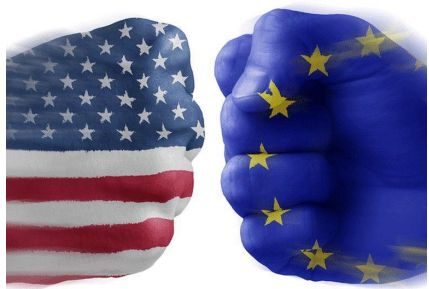
Emissivity, ϵ : The relative ability of a surface to reflect or emit heat by radiation. Emissivity ranges from 0.00 to 1.00. (Blackbody emissivity is 1.0).



NFRC 301

H1 - EN 673 / EN 12898

Europe vs USA (NFRC 301)





Webinar

**Windows,
Doors
& Skylights**

Some questions answered

New H1 Energy Efficiency requirements – 3 Questions on windows and doors



Christian Hoerning
Senior Advisor Building Science
Ministry of Business, Innovation &
Employment (MBIE)

Question 1:

Modern homes tend to include an opaque entrance door panel. How is this accounted for within H1?

H1/AS1 5th edition amd 1:

2.1.2 **Schedule method**

2.1.2.1 The schedule method shall only be used where:

- a) The *glazing area* is 30% or less of the *total wall area*; and
- b) The combined *glazing area* on the east, south, and west facing walls (refer to [Appendix D](#)) is 30% or less of the combined total area of these walls; and
- c) The *skylight area* is no more than 1.5 m² or 1.5% of the *total roof area* (whichever is greater);
- d) The *opaque door area* is no more than 6 m² or 6% of the *total wall area* (whichever is greater).

H1/AS1 5th edition amd 1:

Opaque/non-glazed areas of doors must meet the equivalent R-value as for windows.

H

TABLE 2.1.2.2C: Alternative minimum construction R-values for building elements that do not contain embedded heating systems - for housing only where building consent applications are submitted before 1 May 2023

Paragraph 2.1.2.2 b)

Building element	Construction R-values (m ² ·K/W)	
	Region A ⁽¹⁾	Region B ⁽²⁾
Roof	R2.9	R3.3
Wall	R1.9	R2.0
Floor	R1.3	R1.3
Windows and doors	R0.37	R0.37
Skylights	R0.37	R0.37

Notes:

(1) Region A comprises all of the North Island/Te Ika-a-Māui excluding the Taupo District, the Ruapehu District and the part of the Rangitikei District north of 39°50'S (-39.83), and all offshore islands north of 37°15'S (-37.25).

(2) Region B comprises the Taupo District, the Ruapehu District, the part of the Rangitikei District north of 39°50'S (-39.83), the South Island/Te Waipounamu, Stewart Island/Rakiura, the Chatham Islands, and all offshore islands south of 37°15'S (-37.25).

H1/AS1 5th edition amd 1:

Opaque/non-glazed areas of doors must meet the equivalent R-value as for windows.

TABLE 2.1.2.2B: Minimum construction R-values for building elements that do not contain embedded heating systems

Paragraph 2.1.2.2 b)

Building element	Construction R-values (m ² ·K/W) ⁽¹⁾					
	Climate zone 1	Climate zone 2	Climate zone 3	Climate zone 4	Climate zone 5	Climate zone 6
Roof ⁽²⁾	R6.6	R6.6	R6.6	R6.6	R6.6	R6.6
Wall	R2.0	R2.0	R2.0	R2.0	R2.0	R2.0
Floor						
Slab-on-ground floors	R1.5	R1.5	R1.5	R1.5	R1.6	R1.7
Floors other than slab-on-ground	R2.5	R2.5	R2.5	R2.8	R3.0	R3.0
Windows and doors ⁽³⁾	R0.46 ⁽³⁾	R0.46 ⁽³⁾	R0.46	R0.46	R0.50	R0.50
Skylights	R0.46	R0.46	R0.54	R0.54	R0.62	R0.62

Notes:

(1) Climate zone boundaries are shown in [Appendix C](#).

(2) In roofs with a roof space, where the insulation is installed over a horizontal ceiling, the roof R-value may be reduced to R3.3 for a distance of up to 500 mm from the outer edge of the ceiling perimeter where space restrictions do not allow the full-thickness of insulation to be installed.

(3) For building consent applications submitted before 2 November 2023, the minimum construction R-values for windows and doors in climate zones 1 and 2 are permitted to be reduced to R0.37 m²·K/W.

H1/AS1 5th edition amd 1:

2.1.3 Calculation method

- 2.1.3.1 This method compares the proposed *building* with the reference *building* which is insulated in accordance with the Schedule method. This method permits *roof*, wall, floor, window, door, and *skylight* insulation combinations which differ from these tables, but the *building* must perform at least as well as the reference *building*.
- 2.1.3.2 The calculation method shall only be used where the *glazing area* is 40% or less of the *total wall area*.

H1/AS1 5th edition amd 1:

2.1.3 Calculation method

2.1.3.1 This method compares the proposed *building* with the reference *building* which is insulated in accordance with the Schedule method. This method permits *roof*, wall, floor, window, door, and *skylight* insulation combinations which differ from these tables, but the *building* must perform at least as well as the reference *building*.

2.1.3.2 The calculation method shall only be used where the *glazing area* is 40% or less of the *total wall area*.

Glazing Area (A_{glazing})

The total area of vertical windows and doors that include glazing in the *thermal envelope* including transparent or translucent glazing, frames and opening tolerances, decorative glazing, and louvres. This excludes opaque panels, opaque doors, and *skylights*.

H1/AS1 5th edition amd 1:

2.1.3 Calculation method

2.1.3.6 HL_{Proposed} shall be calculated as the sum of all the *building element* heat losses according to Equation 2.

Equation 2:
$$HL_{\text{Proposed}} = \frac{A_{\text{roof}}}{R_{\text{roof}}} + \frac{A_{\text{wall}}}{R_{\text{wall}}} + \frac{A_{\text{floor}}}{R_{\text{floor}}} + \frac{A_{\text{glazing}}}{R_{\text{window}}} + \frac{A_{\text{door, opaque}}}{R_{\text{door, opaque}}} + \frac{A_{\text{skylight}}}{R_{\text{skylight}}}$$

H1/AS1 5th edition amd 1:

Appendix E. Windows, doors, and skylights

E.1 Vertical windows and doors

E.1.1 Methods for determining construction R-values

E.1.1.1 The *construction R-values* for vertical windows and glazing in doors (R_{window}) shall include the effects of both the glazing and the frame. R_{window} shall be determined using one of the following methods:

H

- a) For housing only, from [Table E.1.1.1](#); or
- b) Calculation in accordance with Verification Method H1/VM1 Appendix E.

E.1.1.2 Acceptable methods for determining the *construction R-values* of opaque doors and opaque door panels (R_{door}) are contained in NZS 4214.

i

COMMENT:

1. The *R-values* in [Table E.1.1.1](#) are representative *construction R-values* of vertical windows and glazing in doors typical to New Zealand housing. The values provided in this table are not representative of windows and doors in *buildings* other than **housing**.
2. [Table E.1.1.1](#) does not apply to opaque doors, or to opaque door panels.
3. For doors with glazing, the *R-values* in [Table E.1.1.1](#) include the effects of both the glazing and the frame, but not the effect of any opaque parts other than the frames around the glazing. For doors with both glazing and opaque panels, when using [Table E.1.1.1](#), the opaque panel areas need to be treated separately from the areas with glazing (including frames around the glazing), with the *R-value* of the opaque panel areas determined in accordance with Paragraph E.1.1.2.

H1/AS1 5th edition amd 1:

Appendix E. Windows, doors, and skylights

E.1 Vertical windows and doors

E.1.1 Methods for determining construction R-values

E.1.1.1 The *construction R-values* for vertical windows and glazing in doors (R_{window}) shall include the effects of both the glazing and the frame. R_{window} shall be determined using one of the following methods:

H

- a) For housing only, from [Table E.1.1.1](#); or
- b) Calculation in accordance with Verification Method H1/VM1 Appendix E.

E.1.1.2 Acceptable methods for determining the *construction R-values* of opaque doors and opaque door panels (R_{door}) are contained in NZS 4214.

NZS 4214:2006

New Zealand Standard

Methods of Determining the Total Thermal Resistance of Parts of Buildings

Superseding NZS 4214(Int):2002 and NZS 4214:1977

i

COMMENT:

1. The *R-values* in [Table E.1.1.1](#) are representative *construction R-values* of vertical windows and glazing in doors typical to New Zealand housing. The values provided in this table are not representative of windows and doors in *buildings* other than **housing**.
2. [Table E.1.1.1](#) does not apply to opaque doors, or to opaque door panels.
3. For doors with glazing, the *R-values* in [Table E.1.1.1](#) include the effects of both the glazing and the frame, but not the effect of any opaque parts other than the frames around the glazing. For doors with both glazing and opaque panels, when using [Table E.1.1.1](#), the opaque panel areas need to be treated separately from the areas with glazing (including frames around the glazing), with the *R-value* of the opaque panel areas determined in accordance with Paragraph E.1.1.2.

H1/VM1 5th edition amd 1:

Appendix E. Windows, doors, skylights, and curtain walling

E.1 Vertical windows and doors

E.1.1 Methods for determining construction R-values

E.1.1.1 The *construction R-values* for vertical windows and doors shall be determined using one of the following methods:

- a) Calculation of the *construction R-value* of each individual window and door that is part of the *thermal envelope*, in accordance with Section E.1.2; or
- b) Calculation of the representative *construction R-value* of all windows and doors that are part of the *thermal envelope* of the proposed *building*, which is then deemed to apply to all windows and doors of the proposed *building*, in accordance with [Section E.1.3](#); or
- c) For **housing** only, based on the performance tables in Acceptable Solution H1/AS1 Appendix E.

H1/VM1 5th edition amd 1:

- E.1.2.3 For each door that is part of the *thermal envelope* of the proposed *building*, the door *construction R-value* (R_D) shall be calculated in accordance with Equation E.2. The *construction R-value* shall be rounded down to no less than two significant figures.

Equation E.2: $R_D = \frac{1}{U_D}$

where:

R_D is the *construction R-value* of the door ($\text{m}^2\cdot\text{K}/\text{W}$); and

U_D is the thermal transmittance of the door ($\text{W}/(\text{m}^2\cdot\text{K})$), determined in accordance with Paragraph E.1.2.4.



COMMENT: The door *construction R-value* (R_D) includes the effects of the frame, any glazing and any opaque panels.

- E.1.2.4 The thermal transmittance (U_D) of each door that is part of the *thermal envelope* of the proposed *building* shall be determined in accordance with ISO 10077-1, with:
- a) The thermal transmittance of any glazing (U_g) determined using BS EN 673; and
 - b) The thermal transmittance of the frame (U_f) determined using ISO 10077-2. For frames with special extensions overlapping the wall or other *building elements*, such as frames with flanges to the cladding, the following deviations from ISO 10077-2 Section 6.3.1, are permitted:
 - i) special extensions may be disregarded or included in the calculation model, but shall be disregarded when determining the projected width of the frame section (b_f) as per ISO 10077-2 Appendix F; and
 - ii) door reveal liners that are integral with the door unit may either be disregarded or included in the calculation model.

Question 2:

The calculation method allows insulation to be increased in one area to compensate for poorer performing areas of the building envelope. Some might use this opportunity to down spec window performance. Does H1 set a minimum performance level for building elements?

H1/AS1 5th edition amd 1:

2.1.3 Calculation method

2.1.3.8 The *construction R-value* in the proposed *building* for *roofs, walls, and floors*, that form part of the *building thermal envelope* shall be at least 50% of the *construction R-value* of the corresponding *building element* in the reference *building* equation.

→ No minimum R-value for windows & doors in the calculation and modelling methods.

Question 3:

With more than 1 million existing homes in New Zealand, how do retro glazed and replacement windows fit within H1 and the Building Code generally?

Question 3:

With more than 1 million existing homes in New Zealand, how do retro glazed and replacement windows fit within H1 and the Building Code generally?

1. Do you need building consent?
2. Will replacement windows need to meet the same H1 requirements as in new homes?

Do you need building consent for replacing windows in an existing home?

Building Act 2004:

Schedule 1

Building work for which building consent not required

Existing buildings: additions and alterations

8 Windows and exterior doorways in existing dwellings and outbuildings

Building work in connection with a window (including a roof window) or an exterior doorway in an existing dwelling that is not more than 2 storeys or in an existing outbuilding that is not more than 2 storeys, except,—

- (a) in the case of replacement, if the window or doorway being replaced has failed to satisfy the provisions of the [building code](#) for durability, for example, through a failure to comply with the external moisture requirements of the building code; or
- (b) if the building work modifies or affects any specified system.

Will replacement windows need to meet the same H1 requirements as in new homes?

Building Act 2004:

42A Building work for which building consent is not required under Schedule 1

- (1) Despite section 40, subject to the conditions set out in subsection (2) and whether or not a building consent would otherwise have been required, a building consent is not required for building work in the following categories:
 - (a) building work described in Part 1 of Schedule 1; or
 - (b) building work described in Part 2 of Schedule 1 that is carried out by an authorised person (*see* subsection (3)); or
 - (c) building work described in Part 3 of Schedule 1 if the design of the building work has been carried out or reviewed by a chartered professional engineer and the building work has been carried out in accordance with that design.
- (2) Subsection (1) is subject to the following conditions:
 - (a) the building work complies with the building code to the extent required by this Act;
 - (b) after the building work is completed, the building,—
 - (i) if it complied with the building code immediately before the building work began, continues to comply with the building code; or
 - (ii) if it did not comply with the building code immediately before the building work began, continues to comply at least to the same extent as it did then comply;

Will replacement windows need to meet the same H1 requirements as in new homes?

Building Act 2004:

112 Alterations to existing buildings

- (1) A building consent authority must not grant a building consent for the alteration of an existing building, or part of an existing building, unless the building consent authority is satisfied that, after the alteration,—
 - (a) the building will comply, as nearly as is reasonably practicable, with the provisions of the building code that relate to—
 - (i) means of escape from fire; and
 - (ii) access and facilities for persons with disabilities (if this is a requirement in terms of section 118); and
 - (b) the building will,—
 - (i) if it complied with the other provisions of the building code immediately before the building work began, continue to comply with those provisions; or
 - (ii) if it did not comply with the other provisions of the building code immediately before the building work began, continue to comply at least to the same extent as it did then comply.



Webinar

**Windows,
Doors
& Skylights**

Q&A

Thank you