BUILDING PERFORMANCE

# Outcome of consultation

## Building Code update 2021

Decisions for issuing, amending, and revoking acceptable solutions and verification methods

29 NOVEMBER 2021

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

New Zealand Government

# Foreword from the Manager Building Performance and Engineering

I would like to thank every person and organisation who took the time to prepare a submission for the Building Code 2021 update. With the overwhelming response to this year's consultation, the feedback we received provided us with a better understanding of how the proposals will affect the sector and contribute to meaningful change for all New Zealanders.

Consultation is an important part of the development of Building Code updates. MBIE consults on proposed updates to the Building Code to provide an opportunity for the public and sector to make submissions on the proposed changes. This document provides a summary of decisions made by MBIE in consideration of the feedback we received.

Maintaining and updating the Building Code is a continuous process and, as we look to implement changes for 2021, we will continue looking to address other challenges brought up in your submissions. Planning and development of future updates is already underway and we will continue to make changes that support higher density housing and the Building for Climate Change programme.

We heard in a number of submissions that the sector is looking for more certainty on how the building regulatory system will respond to climate change. As such, in this document we've included additional information on the timeframe for the building and construction sector's response to climate change.

I'd like to thank you again for your participation in this year's consultation and encourage you to continue to be part of future Building Code updates.

**Jenni Tipler**
*Manager, Building Performance and Engineering*

# Contents

# Summary of the consultation

## Consultation process

Between 6 April and 28 May 2021, MBIE sought feedback on the following proposals for the acceptable solutions and verification methods:

- Proposal 1. Energy efficiency for housing and small buildings
- Proposal 2. Energy efficiency for large buildings
- Proposal 3. Energy efficiency for heating, ventilation and air conditioning (HVAC) systems in commercial buildings
- Proposal 4. Natural light for higher-density housing
- Proposal 5. Weathertightness testing for higher-density housing
- Proposal 6. Standards referenced in B1 Structure
- Proposal 7. Editorial changes to Acceptable Solution B1/AS1

## Submissions received

More than 700 submissions have been received for this year's Building Code update, totalling 3000 responses and more than 600 pages of feedback. This is more than the previous five years of Building Code consultation responses combined.

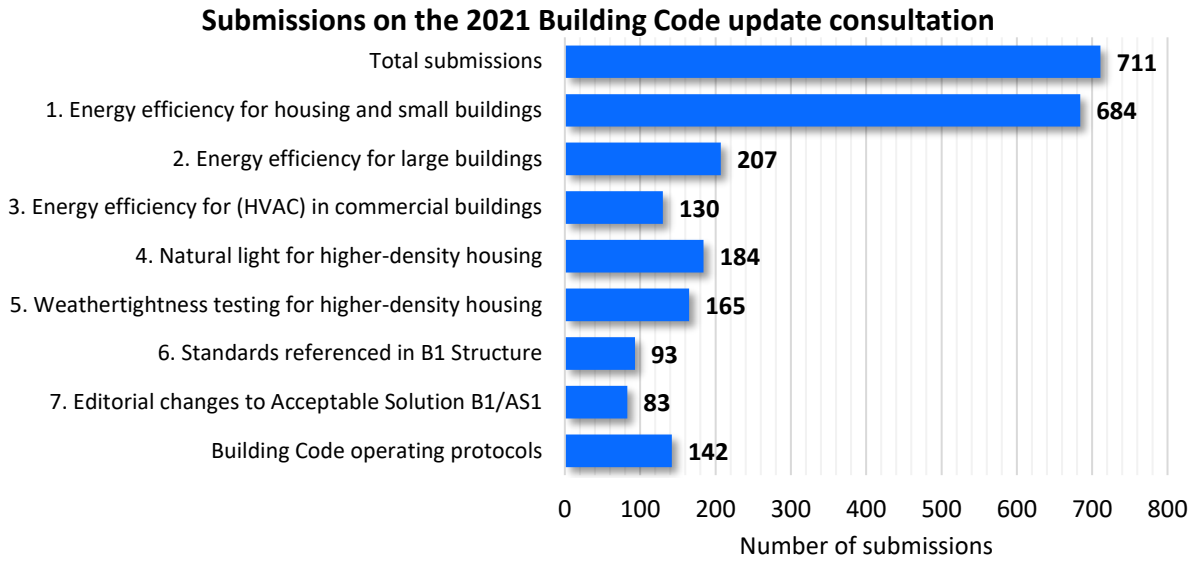
Feedback on the Building Code typically comes from the various parts of the construction sector. A number of responses also came direct from the public – building owners, occupants and renters – reflecting the high levels of public interest in improving the energy efficiency of the homes we build. A breakdown of the submissions by occupation is provided in the table below.

| Occupation | Number of submissions | Percent of submissions |
|---|---|---|
| Architects | 38 | 5% |
| Designers or engineers | 119 | 17% |
| Builders or tradespersons | 30 | 4% |
| Building Consent Authorities | 29 | 4% |
| Building product manufacturers | 55 | 8% |
| Building owners, occupants or renters | 254 | 36% |
| Other submitters including those who did not specify their occupation | 186 | 26% |
| **Total** | **711** | |

The largest category of submitters were identified as residential building owners/residents (including renters, property developers and similar). This was followed by a variety of individuals and organisations who work as designers or engineers.

The “other submitters” category includes 104 submitters who did not provide an answer. Common occupations identified in the other category included medical professionals and health advocates, climate change and energy efficiency researchers and advocates, students, building surveyors and town planners.

The large number of submissions was driven by the interest in Proposal 1 regarding the energy efficiency for housing and small buildings. This proposal received more than three times the number of submissions as the other proposals as shown in the graph on the next page.




## Summary of decisions

A summary of the decisions is provided in the table on the next page. In general, the feedback received was positive and led to MBIE proceeding with the proposed changes with some minor amendments.

## Transitions

The effective date for the new acceptable solutions and verification methods is 29 November 2021 with a transition period of 1 year ending on 3 November 2022.

The new window insulation requirements in H1/AS1 and H1/VM1 will have a two-step approach for the warmest part of the country (climate zones 1 and 2 including Auckland).

› Year 1. The warmest part (climate zones 1 and 2 including Auckland) will see an interim increase in the window insulation level.

› Year 2. Climate zone 1 and 2 will see an additional increase with new requirements effective 2 November 2023.

All other parts of the country (climate zones 3, 4, 5 and 6) will have a 1 year transition period. By the end of 2023, all parts of the country will have a similar minimum level of window insulation requirements. Further discussion is provided in Proposal 1. Energy efficiency for housing and small buildings.

# Summary of the consultation

**Building Code update 2021 – Summary of decisions**

| Proposal | Decision |
|---|---|
| **1. Energy efficiency for housing and small buildings** | MBIE is proceeding with changes to roof, window, wall and underfloor insulation requirements and issuing the new edition of H1/AS1 and H1/VM1 for housing and small buildings. The new R-values aims to reduce the energy needed for heating residential homes of approximately 40% over minimum previous status quo requirements |
| **2. Energy efficiency for large buildings** | MBIE is proceeding with changes to roof, window, wall and underfloor insulation requirements and issuing the new H1/AS2 and H1/VM2 for large buildings. This aims to reduce the energy needed for heating and cooling of 23% on average across new large buildings over previous minimum status quo requirements |
| **3. Energy efficiency for heating, ventilation and air conditioning (HVAC) systems in commercial buildings** | MBIE is publishing the new verification method H1/VM3 with modifications to the proposed text to clarify the requirements and address items raised in the consultation. |
| **4. Natural light for higher-density housing** | MBIE is publishing the new acceptable solutions G7/AS1 and G7/AS2 with minor modifications to the proposal. The existing outdated G7/VM1 will be replaced with a verification method to demonstrate compliance using computer modelling. |
| **5. Weathertightness testing for higher-density housing** | MBIE is issuing the new edition of E2/VM2 without any modifications to the proposal. |
| **6. Standards referenced in B1 Structure** | MBIE is referencing the new versions of these standards in the acceptable solutions and verification methods for B1 Structure. |
| **7. Editorial changes to Acceptable Solution B1/AS1** | MBIE is proceeding with the editorial corrections to Acceptable Solution B1/AS1 without any modifications to the proposal. |

# Building and construction sector climate change response timeframes

The building and construction sector must play a major part in helping New Zealand achieve net Carbon Zero by 2050. The Building for Climate Change programme is MBIE's main programme of work as the building system regulator to minimise the climate impact of the building and construction sector. The programme aims to reduce emissions from constructing and operating buildings, and to make sure our buildings are prepared for the future effects of climate change.

In this year's consultation, we heard that there is uncertainty about how the Building Code would address climate change in future. Many submitters discussed differences between the proposed changes to the Building Code and the Building for Climate Change frameworks that were consulted on in 2020.

Climate challenges mean we must think about how we build in a completely different way. Energy efficiency and carbon emissions must become core considerations for buildings if we are to succeed at reducing the negative impact our homes and workplaces have on the planet. This is a long-term change and it won't happen overnight. To start this shift, as part of this year's update we consulted on energy efficiency measures that could be enacted under the current Building Code regulations and design methodologies. These would also help to reduce emissions.

To continue the shift towards improved energy efficiency and reduced emissions, in the future the Building Code will move towards introducing carbon emissions caps and more holistic building performance measures. The pace of this change will be informed by both the direction set by Government and the need to balance the emissions reduction action with New Zealand's housing supply challenges.

We plan to reduce the building and construction sector's emissions by looking at:

- Operational carbon emissions from the energy and other resources used when operating buildings.
- Embodied carbon emissions that are emitted during the manufacture and use of the materials and products that form the building, and across its life, from construction to deconstruction.

The proposed Building for Climate Change operational efficiency framework will build on this year's update by requiring a more holistic consideration of building design and higher performing construction methods and materials. It will also enable flexibility in how people meet the framework's performance-based requirements. This could lead to, for instance, better insulated floors, triple glazing for colder climates, and better insulated external walls. The operational efficiency framework is also intended to result in buildings' indoor environmental qualities being lifted as thermal performance, the shape of the building, size and orientation of windows, airtightness, mechanical ventilation with heat recovery, and reduced thermal bridging are more holistically considered.

The timeline on the next page illustrates how we propose to embed carbon reduction approaches into the building system's regulatory framework over time. These approaches are split into different phases where we will continue to engage with the sector, introduce new requirements, and embed the changes. This timeline also shows planned future changes to the current Building Code compliance pathways that will support the proposed operational efficiency framework. At this stage this timeline is indicative and subject to amendment based on government decisions and sector feedback. It will be built on and finalised to provide the sector with early and clear signals about future changes, which will be phased to minimise disruption to the sector.

To learn more about the MBIE Building for Climate Change Programme see building-for-climate-change-programme.

# Building and construction sector climate change response timeframes

**Strengthening Current Building Code settings**

- Increase the level of insulation for new builds for roofs, windows, walls, and underfloors
- Provide a compliance pathway for the energy efficiency of HVAC systems

→

- NZS 3604 Timber-framed buildings
- Higher thermal performing windows and weathertightness detailing
- Assessing ventilation, airtightness, and internal moisture settings

**Building for Climate Change programme**

2021 | 2021 - 2023 | 2022 - 2026 | 2024 - 2029 | 2030 onwards | 2050

**2021 - 2023**

**ENGAGE**

- Confirm regulatory transformation roadmap
- Build carbon awareness and understanding
- Confirm embodied carbon data sources
- Develop carbon calculation tools and resources
- Partner with sector and consumers
- Incorporate sector insights from Government construction projects
- Finalise carbon mitigation methodologies
- Confirm adaptation approach for a path to climate-resilient homes and buildings

New Zealand's first Emissions Reduction Plan and National Adaptation Plan issued by Government

**2024 - 2029**

**ENABLE**

- New Building Code compliance pathway for operational efficiency available
- Introduction of mandatory disclosure of embodied carbon for new buildings
- Phased introduction of embodied carbon caps for new buildings
- Confirm emissions reduction approach for existing buildings
- Establish transitional programmes and support

**2030 onwards**

**EMBED**

- Progress towards final emission reductions caps
- Carbon calculation tools, resources and other technical infrastructure fully in place
- Sector upskilled to deliver low-emissions and climate-resilient construction
- Outcomes monitoring and continuous improvement process in place

Paris Agreement emissions reduction target deadline

**By 2050**

Aotearoa New Zealand's building-related emissions are significantly reduced. Co-benefits related to better homes and buildings, such as improved health, economic and social outcomes, are realised.

Key:
- Confirmed change/activity
- Future focus area
- Future focus area dependant on funding

# 1. Energy efficiency for housing and small buildings

## 1.1. What we proposed

To make buildings warmer, drier, healthier and more energy efficient, we proposed options to increase the minimum insulation levels for roof, windows, walls and floors for new housing and small buildings. The proposed options for minimum insulation levels varied across the country based on the relevant climate zone where the building is located.

The proposed new editions of Acceptable Solution H1/AS1 and Verification Method H1/VM1 were intended to:

› Lift minimum levels of insulation to make homes more comfortable and easier to heat and cool.

› Introduce a new climate zone map to better recognise variations in climate around New Zealand, and reflect this in the proposed requirements.

› Limit the scope of the current documents to housing and small buildings[1] and issue new documents for large buildings. Details of the new documents (H1/AS2 and H1/VM2) are discussed in Proposal 2.

The effectiveness of thermal insulation is measured in terms of thermal resistance or R-values (measured in $m^2 \cdot K/W$). There were three options proposed for the new minimum thermal insulation requirements against the status quo:

› **Option 1. Halfway to international standards** – Increase the minimum insulation to a level that is approximately half of that from other parts of the world with similar climates. This represented a modest increase in insulation levels versus the current minimum settings and would still leave New Zealand considerably behind other countries. This option had the least amount of upfront construction costs.

› **Option 2. Comparable to international standards** – Increase the minimum insulation to a level that is comparable with other parts of the world with similar climates. This represent a moderate level of change versus the current requirements and would significantly reduce energy demands for heating and cooling.

› **Option 3. Going further than international standards** – This was the greatest level of increase proposed. This option would put New Zealand's minimum insulation levels ahead of other parts of the world with similar climates. It would have the greatest impact on current construction requirements and the biggest reductions in energy use.

## 1.2. What we heard

### 1.2.1. Who submitted on the proposal

With over 684 submissions, this proposal for insulation in new housing and small buildings attracted a record number of submissions. The breakdown of the submissions based on occupation is provided in Table 1.1. Within the category of 'other submitters', 115 preferred not to say or left this information blank. Feedback on the Building Code typically comes from the various parts of the construction sector. Unique to this year, 15 submissions in the 'other submitters' category identified themselves as medical professionals or other types of health advocates.

[1] A small building is defined within the applicable requirements as those with an occupied space up to 300 $m^2$. Housing of any size (including multi-unit apartment buildings) was included in Proposal 1. Both housing and small buildings have similar heating and cooling characteristics.

**TABLE 1.1: Number of submission for proposal 1**

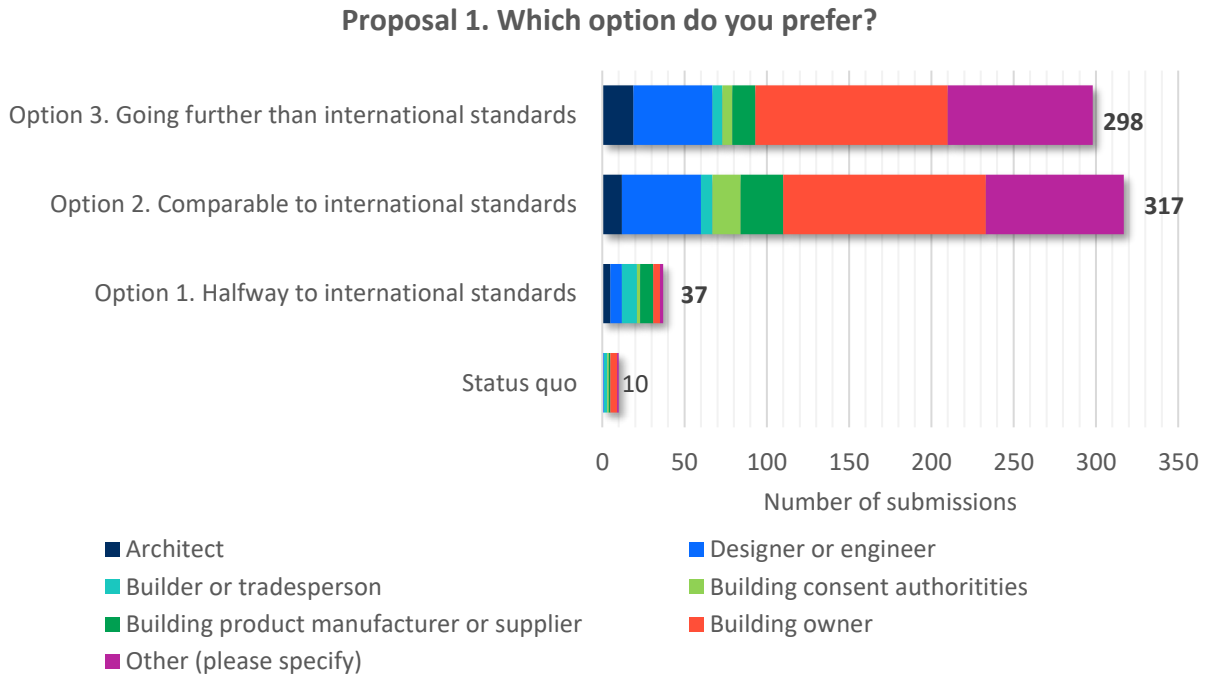
| Occupation | Number of submissions | Percent of submissions |
|---|---|---|
| Architects | 37 | 5% |
| Designers or engineers | 108 | 16% |
| Builders or tradespersons | 28 | 4% |
| Building Consent Authorities | 27 | 4% |
| Building product manufacturers | 51 | 7% |
| Building owners, occupants or renters | 251 | 37% |
| Other submitters including those who did not specify their occupation | 182 | 27% |
| **Total** | **684** | |

### 1.2.2. Submitter preferences on the options

We received overwhelming support for change from all parts of the building and construction sector including residential home owners and tenants. Over 98% of responses received preferred increases over the status quo. The breakdown of the preferred options is shown in Figure 1.1.[2]

Most submissions were split between options 2 and 3 (the most ambitious option) with similar levels of support around 45% each. There was no statistically significant difference between which occupation supported each option and all were at similar relative levels.

**FIGURE 1.1: Number of submissions supporting each option in the consultation**




When asked how fast the changes should come into effect, the most common response was Option 3 in 12 months with 26% of the submissions selecting this (Table 1.2).

[2] Note that not all submissions provided an answer for all questions in a proposal.

**TABLE 1.2: Proposal 1 – How quickly should this change come into effect for each option**

| Transition period | Percentage of submissions selecting each option and transition period | | |
|---|---|---|---|
| | Option 1 | Option 2 | Option 3 |
| **12 months** | 3% | 24% | 26% |
| **24 months** | 2% | 20% | 15% |
| **36 months or more** | 0% | 5% | 4% |

### 1.2.3. Impacts of the proposed changes

Common themes and impacts of the proposed options provided in the comments of the submissions included:

› **Long overdue** – This proposal for insulation requirements was long overdue as New Zealand has lagged behind other countries. Other countries are continuing to update their requirements so continued improvements are necessary to keep New Zealand on pace.

› **Health benefits** – Higher insulation settings will not only increase energy efficiency in buildings but will improve health, comfort, and wellbeing of occupants. This was strongly echoed in the submissions from medical professionals and health advocates who stated that these changes were likely to achieve cost savings to the health system due to reduced hospital admissions and GP visits.

› **Housing affordability** – Housing affordability was a concern to some submitters although they acknowledged the long term energy cost savings and increased health benefits. However, a more common theme in the submissions was the desire for warmer, drier, healthier homes.

Comments on the technical aspects of the proposal included:

› **New climate zones** – Overall, a majority of the submissions that commented on this aspect of the proposal were in favour of the new climate zones. In the consultation submissions, two district councils (Waitaki and Rangitīkei) requested their region be split into two climate zones to reflect the differences between alpine and coastal areas.

› **Thermal bridging, internal moisture, airtightness, ventilation, overheating in residential homes** – There are several aspects of building thermal performance not addressed in the proposal such as the shape of the building, size and orientation of windows, heat transfer through thermal bridging, the risk of interstitial moisture, infiltration and ventilation heat losses, and the risk of overheating in the summer.

› **Holistic performance-based requirements, not prescriptive R-values** – Many submitters were confused about the inconsistencies of the proposals with the recent Building for Climate Change consultation on the Transforming Operational Energy Framework and that the roadmap for future changes was uncertain. The submitters indicated a strong preference for the Building Code energy efficiency requirements to transition to the more holistic and performance-based method and to phase out prescriptive R-values as per current H1 compliance pathways. In this context, some submitters also pointed out that the Building Performance Index (BPI) is an outdated metric that should be replaced.

› **Interim step** – To achieve significantly higher R-values, the sector would need to significantly change the way building elements are designed and constructed. Improving all necessary building performance aspects at the same time will produce better outcomes as it simplifies the transition for the sector and reduces the risk of unintended consequences. However, submitters commented that this proposal could serve as a good interim measure until the methodology for holistic building performance through an operational efficiency framework is embedded into the regulations.

Comments on specific building elements and product availability included:

› **Timber framing** – Submissions from the timber industry highlighted risks of short term timber supply shortages if higher wall R-values resulted in increased demand for thicker wall studs too quickly. These submissions also noted the connection to the revision of the standard for timber framed buildings (NZS

3604). This standard does not cater well for achieving high thermal performance especially for external walls and a current review of this standard aims to improve this. Submitters asked for the timing of increased R-values to be coordinated with the completion of the standard update. Deviating from NZS 3604 practices can cause delays in design, consent and construction for higher performing houses. Further submissions highlighted the assumptions around the framing percentage of timber in external walls which is used to determine the R-value of the wall.

› **Availability of insulation products** – There were concerns raised about the availability of local New Zealand products to meet the demand for higher performing insulation and especially noted for wall cavities where space for additional layers of insulation is limited.

› **Windows** – There were concerns raised about the availability of higher performing window frames in New Zealand. Manufacturers in New Zealand are able to supply better glazing but higher performing window frames are still mainly sourced overseas. The manufacturing capacity for higher-performing window frames is currently limited in New Zealand due to the current low demand. Increasing the R-values for frames will increase demand and manufacturing but this will take time. Many submitters also asked for changes to E2/AS1 to improve the thermal performance of windows. Other submitters highlighted that Appendix D of the proposed H1/AS1 contains tables with window R-values that are outdated and do not cover the higher window R-values proposed.

› **Floors** – Some submitters noted the difficulty in insulating slab-on-ground floors. Currently, slab-on-ground floors are deemed to meet the status quo values even if they are not insulated. While additional perimeter insulation and underslab insulation improve the thermal performance, current slab-on-ground floor design and construction details mean there is a limit on what R-values are practically achievable, particularly for homes and buildings with small footprints.

› **High thermal mass walls** – Several submissions requested that the concessions for high mass walls (such as solid timber, concrete, masonry, or earth buildings) be added back into the prescriptive R-value schedule method in H1/AS1. In the proposal, designers of buildings with high mass walls would still have the option of using the simpler compliance methods of H1/AS1 but without any special treatment of buildings with high mass walls. Alternatively, buildings with these elements could be assessed through computer thermal modelling using Verification Method H1/VM1. Other submitters, including academic experts on building energy performance, supported the removal of these tables as proposed in the consultation.

Other comments on the proposal included:

› **Need for comprehensive sector guidance and education** – Many submissions noted that the sector, including designers, builders and building consent authorities will need significant educational support and guidance for how to design, build and ascertain compliance with significantly higher R-value requirements.

› **Inconsistencies with Healthy Homes Standards (HHS) for rental homes** – Some submitters pointed out that the current requirements do not ensure that a new home meets all the requirements of the Healthy Homes Standards and asked for this to be addressed in the Building Code. The primary issue of inconsistency is the absence of Building Code requirements for living room heater provision and sizing. It is noted that the settings are for 'new' buildings and that unless houses are being built specifically for rental accommodation, or are rented out at a later stage, the HHS will not affect them.

Based on the preferred options, preferred transition times, and comments on the proposals, the feedback from this consultation can be summarised as "go as far and fast as possible – without breaking anything in the system".

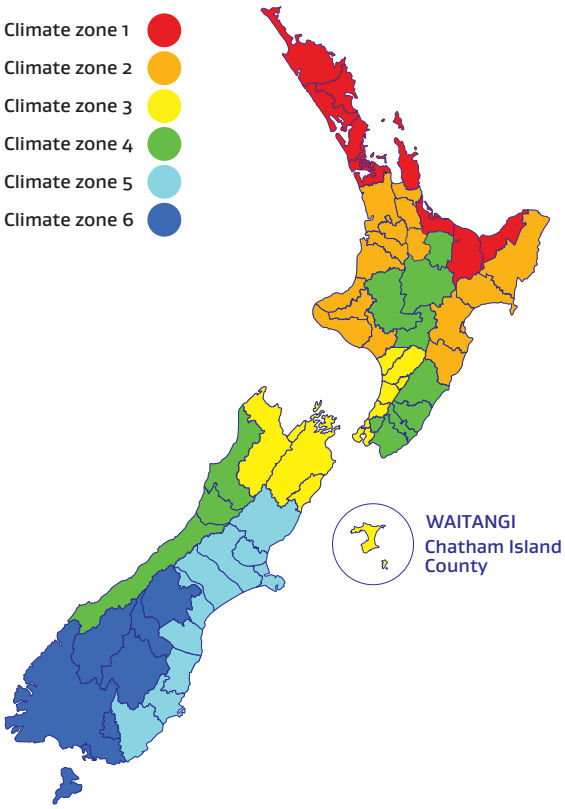
## 1.3. What we are doing

### 1.3.1. New climate zones

MBIE is expanding the number of climate zones used in the insulation requirements from 3 to 6. This will allow the insulation requirements to better reflect the different temperatures experienced in each zone.

The new climate zones follow territorial authority (local government) boundaries. In the consultation submissions, two district councils (Waitaki and Rangitīkei) requested their region be split into two climate zones to reflect the differences between alpine and coastal areas. We have listened to this feedback and have updated this into the climate zone map (Figure 1.1).

**FIGURE 1.1: New climate zones for New Zealand**




### 1.3.2. New R-values

We obtained a clear mandate for ambitious, achievable change while ensuring the stability of the building and construction sector. MBIE is proceeding with changes to roof, window, wall and underfloor insulation with the new minimum values summarised in Table 1.3 and will continue to work towards implementing carbon emissions caps through a holistic operational efficiency framework. Based on the feedback we received, some insulation requirements for residential buildings for specific building elements are the same between climate zones as higher R-values for colder zones are not achievable at this time and to also support efficiencies in the supply of products.

The new requirements will be implemented with a 1 year transition period with special provisions for windows (discussed in Section 1.3.2.2). To achieve significantly higher R-values, the sector would need to significantly change the way building elements are designed and constructed which would result in a much longer transition period at this time.

**TABLE 1.3: Increase in minimum R-values for residential and small buildings**

| Building element | Climate zone | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Roof | R6.6↑ | | | | | |
| Windows | R0.37↑ | | R0.46↑ | | R0.50↑ | |
| Wall | R2.0↑ | | | R2.0 | | |
| Slab-on-ground floors | R1.5↑ | | | R1.5↑ | R1.6↑ | R1.7↑ |
| Other floors | R2.5↑ | | | R2.8↑ | R3.0↑ | |

This new R-values will result in a reduction of the energy needed for heating residential homes of approximately 40% compared to previous minimum status quo requirements (Table 1.4).

**TABLE 1.4: Increases in energy efficiency for heating and cooling over status quo for different climate zones**

| Building type | Climate zone | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Single storey four bedroom home | 39% | 38% | 42% | 40% | 42% | 41% |

**Note:**
The reductions in energy use are based on computer modelling of energy use for heating and cooling and a comparison to the status quo. The analysis was conducted on a single-storey four bedroom house with timber framing. Energy use for this typical building was previously analysed in the consultation document to show a comparison in energy savings across the country. The heating energy reductions resulting from the new required insulation levels vary between 30% and 50% depending on the type of housing and its climate zone

A breakdown of the new R-values for each building element is discussed in the following sections. The new minimum R-values for the new H1/AS1 and H1/VM1 documents have been developed with the following intentions:

› The baseline performance of buildings is raised as a stepping stone to meet future carbon emission caps.

› Current design and construction practices in New Zealand are still able to be used with the new R-values. This addresses concerns in the submissions about the implementation of larger shifts and enables faster transition times with less adverse effects on existing supply chains. The new requirements are also able to be implemented in one year which shortens the timeframe for emission reductions.

› To reduce the disparity and excessive additional costs imposed on the cooler climate zones, the new minimum R-values are slightly higher in the new climate zones 1 and 2 and lower in climate zones 5 and 6 than proposed in the consultation options. Approximately 60% of New Zealanders currently live in climate zones 1 and 2.

When using the H1/AS1 schedule method for demonstrating compliance, the roof, windows, external walls and floor of a new home or small building need to meet or exceed each of the minimum R-values for the relevant climate zone. Alternatively, the H1/AS1 calculation method and the H1/VM1 modelling method allow lower R-values for some elements provided that the overall thermal performance of the proposed new home or small building is equal or better.

#### 1.3.2.1. Roofs

One of the simplest and most cost effective ways to boost thermal performance is to increase roof insulation. That is why we have decided to double the minimum amount of roof insulation required across the country. The proposed options for roof insulation are provided in Table 1.5. The new R-value of R6.6 reflects option 3 for climate zone 1 and falls between options 1 and 2 and 3 for the remaining climate zones.

In buildings with a roof space, the thicker roof insulation could generally be accommodated without any significant changes to the roof framing. The new requirements in H1/AS1 allow for the insulation to be reduced in thickness along the roof perimeter.

**TABLE 1.5: Roof insulation – Comparison of R-values from consultation to the new minimums**

| Options | Climate zone | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| **Status quo** | R2.9 | | R2.9/3.3 | | R3.3 | |
| **Option 1. Halfway to international standards** | R2.9 | R3.3 | | R3.7 | | R4.2 |
| **Option 2. Comparable to international standards** | R5.0 | R5.4 | R6.0 | R6.6 | R7.0 | R7.4 |
| **Option 3. Going further than international standards** | R6.6 | R7.0 | R7.4 | R7.8 | R8.4 | R9.0 |
| **New minimums for H1/AS1 and H1/VM1** | **R6.6↑** | | | | | |

### 1.3.2.2. Windows

Windows represent the largest source of heat loss in new homes so we are increasing the minimum insulation level for windows across the country with a focus on targeted higher upgrades in colder climate zones. The new R-values for windows are provided in Table 1.6.

We are making the changes to climate zones 1 and 2 in two steps. The next year will see an interim increase for these areas of the country. The following year, climate zones 1 and 2 will move to the same insulation level as climate zones 3 and 4. This interim step is required to allow window and glass manufacturers time to increase production of higher performing windows. By the end of 2023, all parts of the country will have to achieve an R-value of at least R0.46.

There are multiple solutions to improving window insulation performance and the new performance requirements do not prescribe one type of window over another. However, we expect that solutions like heat reflective glass with low-E coatings, uPVC frames, and thermally broken window frames will become more common options for meeting the requirements.

**TABLE 1.6: Windows – Comparison of R-values from consultation to the new minimums**

| Options | Climate zone | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| **Status quo** | R0.26 | | | | | |
| **Option 1. Halfway to international standards** | R0.26 | R0.29 | | R0.33 | | R0.39 |
| **Option 2. Comparable to international standards** | R0.39 | R0.42 | R0.45 | R0.49 | R0.55 | R0.62 |
| **Option 3. Going further than international standards** | R0.48 | R0.52 | R0.55 | R0.62 | R0.68 | R0.76 |
| **New minimums for H1/AS1 and H1/VM1 effective 29 November 2021 until 1 November 2023** | **R0.37↑** | | **R0.46↑** | | **R0.50↑** | |
| **New minimums for H1/AS1 and H1/VM1 effective 2 November 2023** | **R0.46↑** | | **R0.46** | | **R0.50** | |

To support the new requirements, we have also revised H1/AS1 and H1/VM1 to include a new calculation procedure and table of values for determining the R-values of windows. This was necessary to address

comments from submissions which noted the existing procedure and appendix did not reflect the higher R-values. The new procedure references the following standards:

› BS EN 673: 2011 Glass in building – Determination of thermal transmittance (U value) – Calculation method

› ISO 10077.1: 2017 Thermal performance of windows, doors and shutters – Calculation of thermal transmittance – General

› ISO 10077.2: 2017 Thermal performance of windows, doors and shutters – Calculation of thermal transmittance – Numerical methods for frames

› ISO 12631: 2017 Thermal performance of curtain walling – Calculation of thermal transmittance

MBIE discussed this new procedure with a variety of stakeholders across the building and construction sector. Most designers will be able to use the new table of values provided in H1/AS1 to determine their window R-value. Alternatively, the new window R-value calculation procedure can be used which is aligned with the existing Window Energy Efficiency Rating Scheme (WEERS) that is already used by the New Zealand window industry. The use of international standards for windows and curtain walls will also allow for an easier compliance pathway for imported products.

We also recognize that a challenge for introducing thermally broken frames is to retain weathertightness. Thermally broken window frames, when used, will still need to achieve compliance with E2 External moisture. For low rise buildings, this is generally achieved using the details shown in E2/AS1 (if applicable). The details in E2/AS1 are not optimised for thermally broken frames. However, the existing details and new R-values still provide a substantial increase in thermal performance over the status quo and can be used for compliance. Where designers wish to use details that provide further thermal improvements while retaining weathertightness, other means of compliance for E2 can be used. MBIE will continue work to revise the acceptable solutions and verification methods for E2 to optimise the thermal performance of windows while maintaining weathertightness.

#### 1.3.2.3. Walls

The new R-values for wall insulation are provided in Table 1.7. For walls, we received strong feedback that changes to insulation requirements would have to consider timber supply issues and the amount of timber framing in wall cavities. The amount of timber reduces the total wall insulation value and higher insulation requirements may require different framing practices or higher performing insulation products. This would be difficult to achieve for residential buildings across the country at this time. That is why we have left the requirements for walls in residential building mostly unchanged. The settings will still allow current framing practices to be used and designers will still have options to consider the amount of timber on the total insulation value of the wall.

**TABLE 1.7: Wall insulation – Comparison of R-values from consultation to the new minimums**

| Options | Climate zone | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| **Status quo** | R1.9 | | R1.9/2.0 | | R2.0 | |
| **Option 1. Halfway to international standards** | R1.9 | R2.2 | | | R2.4 | |
| **Option 2. Comparable to international standards** | R2.4 | R2.6 | R2.8 | R3.2 | R3.5 | R3.8 |
| **Option 3. Going further than international standards** | R2.9 | R3.2 | R3.5 | R3.8 | R4.4 | R5.0 |
| **New minimums for H1/AS1 and H1/VM1** | **R2.0↑** | | | **R2.0** | | |

In addition to these new R-values, MBIE is removing the tables of reduced R-values for buildings with high thermal-mass walls from H1/AS1. Verification Method H1/VM1 provides a better and fairer way to determine how much insulation is required for these types of buildings. Designers of buildings with high mass walls still have the option

of using the simpler compliance methods of H1/AS1 but without any special treatment of buildings with high mass walls.
MBIE will continue to work with industry experts to understand the risks and construction practise improvements required to enable higher performing walls and insulation in future Building Code updates. MBIE has already commissioned a revision to the standard for timber framed buildings (NZS 3604 Timber-framed buildings)[2], and is working with BRANZ to revise their House Insulation Guide.

MBIE will commission research to better understand and manage potential unintended consequences of high insulation levels in walls. For example, addressing 'thermal bridge' effects that can result in condensation forming in the wall when temperatures get too low. Thermal bridging effects also become more significant as the insulation difference between wall framing and the installed insulation increases. In typical walls more energy will be lost through the framing than the insulation, which has the effect of reducing the overall effectiveness of the wall insulation. This is why MBIE use the construction R-value to measure performance, as it accounts for both the insulation product and the framing materials making up the wall.

MBIE has discussed these issues with external experts and determined that further research in to the building science of thermal bridges and moisture control is required before introducing higher wall insulation requirements. This research will also look into new construction methods that will allow much higher insulation rating to be achieved in the future.

#### 1.3.2.4. Underfloor insulation

The new R-values for underfloor insulation are provided in Table 1.8.

For underfloor insulation, we recognised challenges in insulating concrete slab-on-ground floors versus other types of floors. We have split the requirements for these different floor options to allow further time for slab-on-ground construction practices to change. The new R-values for slab-on-ground floors will usually require some kind of slab insulation for smaller houses and buildings. If these were higher, it would be very difficult and costly for smaller houses and buildings to demonstrate compliance as conventional slab edge and underslab insulation methods would not have been sufficient.

In addition to the new floor R-values, we have also provided a new appendix in H1/AS1 to determine the R-value of common concrete slab floors. This appendix replaces a previous requirement which deemed all concrete slab floors to have an R-value of R1.3.

**TABLE 1.8: Underfloor insulation – Comparison of R-values from consultation to the new minimums**

| Options | Climate zone | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| **Status quo** | R1.3 | | | | | |
| **Option 1. Halfway to international standards** | R1.3 | R1.3 | R1.9 | R1.9 | R2.2 | |
| **Option 2. Comparable to international standards** | R1.9 | R2.2 | R2.5 | R2.8 | R3.2 | R3.6 |
| **Option 3. Going further than international standards** | R2.5 | R2.8 | R3.2 | R3.6 | R4.2 | R4.8 |
| **New minimums for H1/AS1 and H1/VM1 for slab-on-ground floors** | **R1.5↑** | **R1.5↑** | **R1.5↑** | **R1.5↑** | **R1.6↑** | **R1.7↑** |
| **New minimums for H1/AS1 and H1/VM1 for other floors** | **R2.5↑** | | | **R2.8↑** | **R3.0↑** | |

[2] The new version of NZS 3604 is expected to be cited in Acceptable Solution B1/AS1 in 2024.

#### 1.3.2.5. Embedded heating systems – where building elements are specifically heated

The new R-values for elements with embedded heating systems are provided in Table 1.9. The R-values for these elements increase at a similar rate as standard roof, wall, and floors elements.

**TABLE 1.9: Building elements with embedded heating systems – Comparison of R-values from consultation to the new minimums**

| Options | Building element | Climate zone | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 |
| **Status quo** | Heated ceiling | R3.5 | | | R4.0 | | |
| | Heated wall | R2.5 | | | R2.6 | | |
| | Heated floor | R1.9 | | | | | |
| **Option 1. Halfway to international standards** | Heated ceiling | R3.5 | R4.0 | R4.0 | R4.4 | R4.4 | R5.0 |
| | Heated wall | R2.5 | R2.5 | R2.9 | R2.9 | R2.9 | R3.1 |
| | Heated floor | R1.9 | R1.9 | R2.2 | R2.8 | R2.8 | R3.2 |
| **Option 2. Comparable to international standards** | Heated ceiling | R6.0 | R6.5 | R7.2 | R7.9 | R8.4 | R8.9 |
| | Heated wall | R3.1 | R3.4 | R3.6 | R4.2 | R4.6 | R4.9 |
| | Heated floor | R2.8 | R3.2 | R3.7 | R4.1 | R4.7 | R5.3 |
| **Option 3. Going further than international standards** | Heated ceiling | R7.9 | R8.4 | R8.9 | R9.4 | 10.1 | R10.8 |
| | Heated wall | R3.8 | R4.2 | R4.6 | R4.9 | R5.7 | R6.5 |
| | Heated floor | R3.7 | R4.1 | R4.7 | R5.3 | R6.1 | R7.0 |
| **New minimums for H1/AS1 and H1/VM1** | Heated ceiling | **R6.6↑** | | | | | |
| | Heated wall | **R2.9↑** | | | | | |
| | Heated floor | **R2.5↑** | | | **R2.8↑** | **R3.0↑** | |

### 1.3.3. Other changes within H1/AS1 and H1/VM1

To support the change in the insulation levels, the other changes made to H1/AS1 and H1/VM1 post-consultation include:

› The scope of H1/AS1 has been limited to omit curtain walling from the document. Curtain walls require more complicated assessments of thermal performance and are better assessed using H1/VM1 or as an alternative solution.

› We have provided an additional comment in H1/AS1 Paragraph 2.1.1.5 and Paragraph 2.1.4.1 and H1/VM1 Paragraph 2.1.3.1 regarding insulation requirements for windows and slab-on-ground floors to reflect the new requirements for determining the R-values for these elements.

› An additional comment has been added to H1/AS1 Paragraph 2.2.1.1 for designers to consider moisture movement from occupied spaces into a roof space. This includes limiting the air permeability of ceilings, including through ceiling linings and penetrations such as recessed luminaires, electrical and plumbing services and ceiling access hatches.

› An additional comment has been added to H1/AS1 Paragraph 2.3.1.1 and H1/VM1 Paragraph 2.1.1.1 to consider passive features to prevent overheating. MBIE considered feedback on the risks of overheating and consulted with external experts on this subject. It was found that, while still an issue in New Zealand homes, the new R-values proposed did not significantly increase this risk over the status quo. Overheating, itself, is not caused by increased R-values and should be addressed in other ways. For controlling solar heat gains, the size of the building, its orientation, solar heat gain coefficient, available shading, and ventilation provisions need to be considered. Further development is required in this area to adopt measures into the acceptable solutions and verification methods.

› The citation of AS/NZS 4859.1 has been revised to the most recent 2018 version.

› H1/VM1 Subsection D1.6 has been revised to allow modelling software that uses a single thermal zone. All other modelling requirements, including the modelling software requirements of Paragraph D1.3.1, still need to be met. Examples of modelling software that can now be used include Passive House Planning Package (PHPP) used for designing and certifying Passive Houses, and ECCHO which is a simplified version of PHPP used for the New Zealand Green Building Council Homestar ratings.

› Wording for the natural ventilation setpoint in H1/VM1 Paragraph D.3.1.1 has been revised as the use of natural ventilation prior to the use of artificial cooling is only useful if the outdoor air conditions are favourable.

Other items outside of the scope of the consultation have been logged for future consideration in Building Code updates. This includes items regarding revisions to the Building Code clause regulations (Schedule 1 of the Building Regulations 1992) and other acceptable solutions and verification methods.

### 1.3.4. Transition period

The transition period for the new Fifth edition of Acceptable Solution H1/AS1 and Verification Method H1/VM1 will be 1 year. The existing Acceptable Solution H1/AS1 and Verification Method H1/VM1 Fourth Edition Amendment 4 documents will remain in force until 2 November 2022. MBIE will provide information and education to the sector during the transition period. Additionally, as discussed in Section 1.3.2.2, there will be a two-step approach to the adoption of new R-values for windows in climate zone 1 and 2 with the second set of R-values to be adopted by 2 November 2023.

At the end of the transition period, MBIE will be removing the following two guidance documents from building.govt.nz as these will be superseded by the introduction of the new requirements.

› Building Code requirements for house insulation
› Complying with insulation requirements for houses in Northland

### 1.3.5. Next steps for energy efficiency

The next phase of the Building for Climate Change programme will introduce caps on carbon emissions and the operational efficiency of buildings. This will require a more holistic consideration of the building design and higher performing construction methods and materials. We expect that this will lead to better insulated concrete floor slabs, triple glazing for colder climates, and better insulated external walls. It will also result in building thermal performance being optimised to consider the indoor environmental qualities, the shape of the building, size and orientation of windows, airtightness, mechanical ventilation with heat recovery, reduced thermal bridging, and building services (such as heating, cooling, hot water, and lighting).

This work will also look at the introduction of policies and interventions to improve the thermal performance and energy efficiency of existing buildings. The implementation of the Building for Climate Change programme will also include methods to limit and reduce the whole-of-life embodied carbon of building as the reduction of both operational and embodied carbon emissions is important.

# 2. Energy efficiency for large buildings

## 2.1. What we proposed

To make buildings more comfortable and energy efficient, we proposed options to increase the minimum insulation levels for roof, windows, walls and floors for large buildings. The proposed options for minimum insulation levels varied across the country based on the relevant climate zone where the building is located.

The proposed new editions of Acceptable Solution H1/AS2 and Verification Method H1/VM2 were to:

› Lift minimum levels of insulation for large buildings[3] to make them more comfortable and easier to heat and cool.

› Introduce a new climate zone map to better recognise variations in climate around New Zealand, and reflect this in the proposed requirements.

› Provide a clear compliance pathway for these buildings by separating the requirements for large buildings into their own acceptable solution and verification method.

The effectiveness of thermal insulation is measured in terms of thermal resistance or R-values (measured in $m^2 \cdot K/W$). There were three options proposed for the new minimum R-value requirements against the status quo to reduce the total energy required to heat and cool buildings:

› Option 1. 10% reduction in energy use for heating and cooling

› Option 2. 20% reduction in energy use for heating and cooling

› Option 3. 25% reduction in energy use for heating and cooling

## 2.2. What we heard

### 2.2.1. Who submitted on the proposal

There were 211 submissions on this proposal. The breakdown of the submissions based on occupation is provided in Table 2.1.

**TABLE 2.1: Number of submission for proposal 2**

| Occupation | Number of submissions | Percent of submissions |
|---|---|---|
| Architects | 21 | 10% |
| Designers or engineers | 45 | 21% |
| Builders or tradespersons | 8 | 4% |
| Building Consent Authorities | 21 | 10% |
| Building product manufacturers | 33 | 16% |
| Building owners, occupants or renters | 35 | 17% |
| Other submitters including those who did not specify their occupation | 48 | 23% |
| **Total** | **211** | |

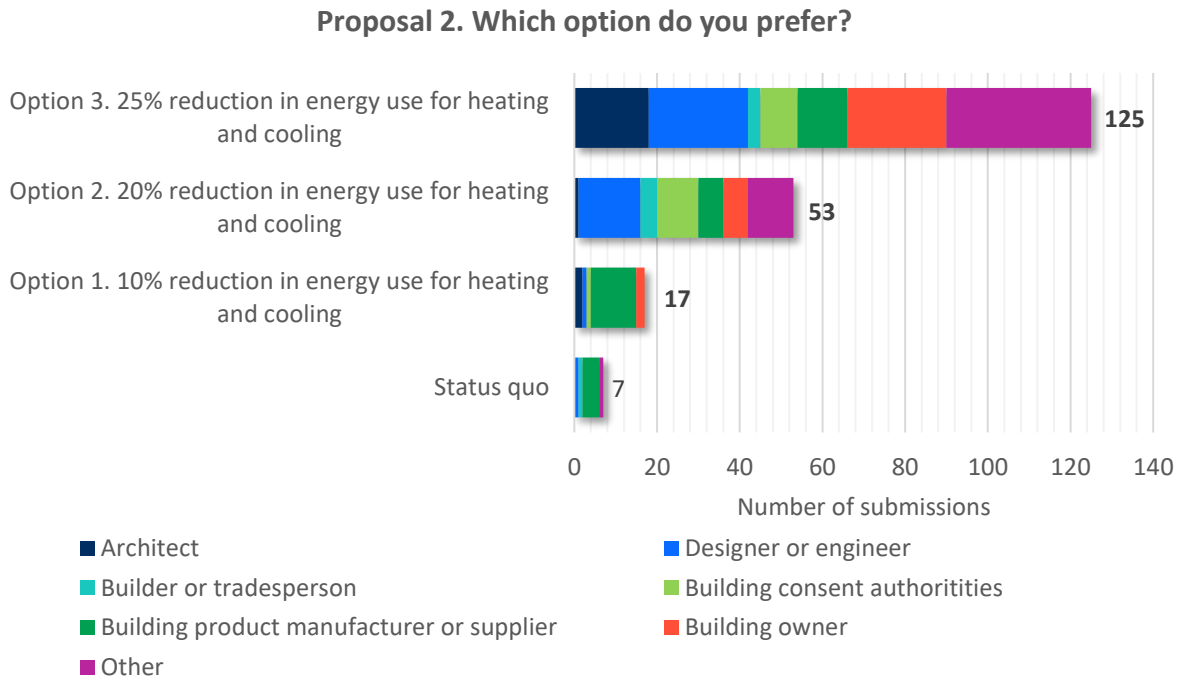
### 2.2.2. What option and how quickly should it come into effect

We received overwhelming support for the changes from all parts of the building and construction sector. Over 96% of responses received preferred increases over the status quo. The breakdown of the preferred options is shown in Figure 2.1.

[3] A large building is defined within the applicable requirements as those with an occupied space of 300 $m^2$. However, housing of any size (including multi-unit apartment buildings) is covered in Proposal 1.

The overwhelming majority were in support of significant improvements to requirements with Option 3 (the most ambitious option) being the preference for 59% of submissions. This support was particularly high amongst architects, designers, and engineers who submitted on the proposal. Compared to Proposal 1 for residential and small buildings, we received stronger support in the submissions on large buildings for higher levels of change to the insulation requirements.

**FIGURE 2.1: Number of submissions supporting each option in the consultation**




When asked how fast the changes should come into effect, the most common response was Option 3 in 12 months with 29% of the submissions selecting this (Table 2.2).

**TABLE 2.2: Proposal 2 – How quickly should this change come into effect for each option**

| Transition period | Percentage of submissions selecting each option and transition period | | |
|---|---|---|---|
| | Option 1 | Option 2 | Option 3 |
| **12 months** | 2% | 9% | 29% |
| **24 months** | 3% | 12% | 22% |
| **36 months or more** | 3% | 6% | 13% |

### 2.2.3. Impacts of the proposed changes

Submissions on this proposal provided similar responses to Proposal 1 in Section 1.2.3. This included recognising that the change was long overdue, that the benefits to energy efficiency also would result in beneficial health outcomes, there was a risk in overheating, and that there are consequential risks of internal moisture caused by inadequate ventilation, airtightness and thermal bridging. Concern was also expressed at the inequity in the increases in construction costs in the proposed insulation settings for the colder climate zones (5 and 6) where the level of change was much higher than other parts of the country.

The need for education and training was also identified for the proposed changes. However, there was less concern that it would take longer to implement larger changes for these buildings. The submissions identified that larger buildings usually employed teams of designers with more expertise in how to achieve higher performance. This is reflected in the higher level of support for option 3 as the preferred option.

## 2.3. What we are doing

### 2.3.1. New climate zones

MBIE is expanding the number of climate zones used in the insulation requirements from 3 to 6 as discussed in Section 1.3.1. This will allow the insulation requirements to better reflect the different temperatures experienced in each zone.

### 2.3.2. New R-values

We obtained a clear mandate for ambitious, achievable change while ensuring the stability of the building and construction sector. MBIE is proceeding with changes to roof, window, wall and underfloor insulation with the new minimum values summarised in Table 2.3 and will continue to work towards implementing carbon emissions caps through a holistic operational efficiency framework.

**TABLE 2.3: Increases in minimum R-values for large buildings**

| Options | Climate zone | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| **Roof** | R3.5↑ | R4.0↑ | R5.0↑ | R5.4↑ | R6.0↑ | R7.0↑ |
| **Window** | R0.33↑ | R0.33↑ | R0.37↑ | R0.37↑ | R0.40↑ | R0.42↑ |
| **Wall** | R2.2↑ | R2.4↑ | R2.7↑ | R3.0↑ | R3.0↑ | R3.2↑ |
| **Underfloor** | R2.2↑ | R2.2↑ | R2.2↑ | R2.4↑ | R2.5↑ | R2.6↑ |

The new requirements will be implemented with a 1 year transition period. This aims to reduce the energy needed for heating and cooling by 23% on average across new large buildings compared to previous minimum status quo requirements (Table 2.4).

**TABLE 2.4: Increases in energy efficiency over status quo for different building types**

| Building type | Climate zone | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| **Healthcare** – A 3 storey low-rise building with clinics occupied 24/7 | 36% | 26% | 34% | 50% | 34% | 36% |
| **School** – A single storey school with group classrooms | 11% | 9% | 10% | 12% | 11% | 11% |
| **Office** – A 5 storey mid-rise office building | 28% | 28% | 24% | 34% | 22% | 26% |
| **Retail** – A single storey big box retail store with a large footprint | 19% | 18% | 19% | 25% | 21% | 20% |
| **Average increases in energy efficiency for heating and cooling** | **23%** | **20%** | **21%** | **30%** | **22%** | **23%** |

A breakdown of the new R-values for each building element is discussed in the following sections. In comparison to the options for public consultation, the new values generally fall within option 2 and 3 for different elements. The new minimum R-values for the new H1/AS2 and H1/VM2 documents have been developed with the following intentions:

› The baseline performance of buildings is raised as a stepping stone to meet future carbon emission caps.

› Current design and construction practices in New Zealand are still able to be used with the new R-values. This addresses concerns in the submissions about the implementation of larger shifts and enables faster transition times with less adverse effects on existing supply chains. The new requirements are also able to be implemented in one year which shortens the timeframe for emission reductions.

› To reduce the disparity and excessive additional costs imposed on the cooler climate zones, the new minimum R-values are slightly higher in climate zones 1 and 2 and lower in climate zones 5 and 6 than proposed in the consultation options. Approximately 60% of New Zealanders currently live in climate zones 1 and 2.

› The R-values have more gradual increases between climate zones than for residential and small buildings. Larger non-residential buildings are more likely than residential and small buildings to use R-value calculation or computer modelling methods to demonstrate compliance as there may be elements of bespoke design in larger buildings. Thus, it is more useful to have more gradual increases in the R-values for each climate zone to reflect the inputs into calculations.

#### 2.3.2.1. Roofs

A comparison of the new roof R-values with the options from the consultation are provided in Table 2.5. The new R-values reflect those of the proposed Option 3 and are the highest level of increase proposed in the consultation. Consideration has been given to optimising the use of roof insulation and roof spaces. For example, R6.0 in a roof may simply be another layer of standard roof insulation which fits easily in the vast majority of large building roof voids.

**TABLE 2.5: Roof insulation – Comparison of R-values from consultation to the new minimums in H1/AS2 and H1/VM2**

| Options | Climate zone | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| **Status quo** | R1.9 | | | | | |
| **Option 1. 10% reduction in energy use for heating and cooling** | R2.4 | R2.6 | R3.0 | R3.2 | R3.6 | R4.2 |
| **Option 2. 20% reduction in energy use for heating and cooling** | R3.0 | R3.8 | R4.2 | R4.5 | R4.8 | R5.3 |
| **Option 3. 25% reduction in energy use for heating and cooling** | R3.5 | R4.0 | R5.0 | R5.4 | R6.0 | R7.0 |
| **New minimums for H1/AS2 and H1/VM2** | **R3.5↑** | **R4.0↑** | **R5.0↑** | **R5.4↑** | **R6.0↑** | **R7.0↑** |

#### 2.3.2.2. Windows

A comparison of the new window R-values with the options from the consultation are provided in Table 2.6. The new R-values sit between Options 2 and 3. The R-values for climate zones 1-4 values are set to the highest specification possible with standard construction and detailing. These settings are achievable with double glazed, non-thermally broken frames. The R-values for climate zones 5 and 6 settings are achievable with double glazing in uPVC or timber frames or triple glazing with thermally broken frames. Feedback from the sector indicated that this is within projected supply capabilities. A single step transition will be undertaken for this change.

To support the new requirements, we have also revised H1/AS2 and H1/VM2 to include a new calculation procedure and table of values for determining the R-values of windows. This is discussed in Section 1.3.2.2.

**TABLE 2.6: Windows – Comparison of R-values from consultation to the new minimums in H1/AS2 and H1/VM2**

| Options | Climate zone | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| **Status quo** | 0.0 | | | | | |
| **Option 1. 10% reduction in energy use for heating and cooling** | R0.17 | R0.21 | R0.25 | R0.31 | R0.36 | R0.39 |
| **Option 2. 20% reduction in energy use for heating and cooling** | R0.21 | R0.27 | R0.31 | R0.36 | R0.39 | R0.43 |
| **Option 3. 25% reduction in energy use for heating and cooling** | R0.31 | R0.36 | R0.39 | R0.45 | R0.53 | R0.62 |
| **New minimums for H1/AS2 and H1/VM2** | **R0.33↑** | | **R0.37↑** | | **R0.40↑** | **R0.42↑** |

### 2.3.2.3. Walls

A comparison of the new wall R-values with the options from the consultation are provided in Table 2.7. The new R-values for climate zones 1, 2, 3 and 4 reflect those of Option 3. The R-values for climate zones 5 sit between Option 2 and 3 and climate zone 6 sits between Option 1 and 2. It was found that R-values above this level in the coldest climate zones would be too onerous for the sector at this time.

Compared to residential and small buildings, large buildings tend to have greater inter-storey spans and therefore deeper wall framing members. Thus, the wall insulation levels are set higher in large buildings without disrupting current construction methods. Typical timber framing for large buildings are at least 140 mm deep and therefore capable of achieving R-values of R2.2 to R3.2.

**TABLE 2.7: Wall insulation – Comparison of R-values from consultation to the new minimums in H1/AS2 and H1/VM2**

| Options | Climate zone | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| **Status quo** | R0.3/R1.2 | R1.2 | | | | |
| **Option 1. 10% reduction in energy use for heating and cooling** | 1.2 | 1.5 | 1.8 | 2.2 | 2.4 | 2.8 |
| **Option 2. 20% reduction in energy use for heating and cooling** | 1.8 | 2.0 | 2.2 | 2.4 | 2.6 | 3.5 |
| **Option 3. 25% reduction in energy use for heating and cooling** | 2.2 | 2.4 | 2.7 | 3.0 | 3.3 | 4.4 |
| **New minimums for H1/AS2 and H1/VM2** | **R2.2↑** | **R2.4↑** | **R2.7↑** | **R3.0↑** | **R3.0↑** | **R3.2↑** |

Many submitters commented on the risks of internal moisture, including interstitial and surface condensation which is one of the key factors considered when setting the proposed R-values. These R-values also consider the prevalence of mechanical ventilation and air-conditioning in large buildings and its reductive effect on internal and interstitial moisture risks due to hygrothermal actions. Most large building have some form of mechanical ventilation or air-conditioning which help moderates interior moisture. However this is not a given as some buildings (such as schools) may have very different internal moisture profiles. Therefore, the insulation values have been limited to ensure minimal additional risk of internal moisture or mould. Healthy, warm, and dry buildings remains a top priority. Further improvements in this area are better assessed when using a holistic building performance modelling methodology as proposed under the Building for Climate Change future operational efficiency framework.

#### 2.3.2.4. Underfloor insulation

The proposed options for underfloor insulation are provided in Table 2.8. The new R-values for climate zones 1 and 2 reflect those of Option 3. The R-values for the other options are closer to Option 1.

To address concerns raised in the submissions around the use of NZS 4214 for determining the thermal resistance of floors, the new H1/AS2 and H1/VM2 will reference ISO 10211: 2017 –"Thermal bridges in building construction — Heat flows and surface temperatures" for determining the thermal resistance for all concrete floors in direct contact with the ground. This new calculation procedure is discussed in Section 1.3.2.4.

**TABLE 2.8: Underfloor insulation – Comparison of R-values from consultation to the new minimums in H1/AS2 and H1/VM2**

| Options | Climate zone | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| **Status quo** | 0.0/R1.3 | | R1.3 | | | |
| **Option 1. 10% reduction in energy use for heating and cooling** | 1.9 | 2.0 | 2.2 | 2.4 | 2.6 | 2.9 |
| **Option 2. 20% reduction in energy use for heating and cooling** | 2.1 | 2.2 | 2.4 | 2.7 | 2.9 | 3.1 |
| **Option 3. 25% reduction in energy use for heating and cooling** | 2.2 | 2.4 | 2.6 | 2.9 | 3.1 | 3.2 |
| **New minimums for H1/AS2 and H1/VM2** | **R2.2↑** | | | **R2.4↑** | **R2.5↑** | **R2.6↑** |

#### 2.3.2.5. Embedded heating systems where building elements are specifically heated

The new R-values for elements with embedded heating systems are provided in Table 2.9. The R-values for these elements increase at a similar rate as standard roof, wall, and floors elements.

**TABLE 2.9: Building elements with embedded heating systems – Comparison of R-values from consultation to the new minimums in H1/AS2 and H1/VM2**

| Options | Building element | Climate zone | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 |
| **Status quo** | Heated roof | R3.0 | | | | | |
| | Heated wall | R2.2 | | | | | |
| | Heated floor | R1.7 | | | | | |
| **Option 1. 10% reduction in energy use for heating and cooling** | Heated roof | R3.6 | R3.9 | R4.5 | R4.8 | R5.4 | R6.3 |
| | Heated wall | R1.8 | R2.3 | R2.7 | R3.3 | R3.6 | R4.2 |
| | Heated floor | R2.9 | R3.0 | R3.3 | R3.6 | R3.9 | R4.4 |
| **Option 2. 10% reduction in energy use for heating and cooling** | Heated roof | R4.5 | R5.7 | R6.3 | R6.8 | R7.2 | R8.0 |
| | Heated wall | R2.7 | R3.0 | R3.3 | R3.6 | R3.9 | R5.3 |
| | Heated floor | R3.2 | R3.3 | R3.6 | R4.1 | R4.4 | R4.7 |
| **Option 3. 25% reduction in energy use for heating and cooling** | Heated roof | R5.3 | R6.0 | R7.5 | R8.1 | R9.0 | R10.5 |
| | Heated wall | R3.3 | R3.6 | R4.1 | R4.5 | R5.0 | R6.6 |
| | Heated floor | R3.3 | R3.6 | R3.9 | R4.4 | R5.0 | R4.8 |
| **New minimums for H1/AS2 and H1/VM2** | Heated roof | **R6.6↑** | | | | | **R7.0↑** |
| | Heated wall | **R2.9↑** | | **R3.0↑** | **R3.2↑** | **R3.4↑** | **R3.6↑** |
| | Heated floor | **R2.9↑** | | **R2.9↑** | **R3.0↑** | **R3.2↑** | **R3.4↑** |

### 2.3.3. Other changes within H1/AS2 and H1/VM2

To support the change in the insulation levels, other changes have been made to H1/AS2 and H1/VM2 post-consultation. These include:

› The scope of H1/AS2 has been limited to omit curtain walling from the document. Curtain walls require more complicated assessments of thermal performance and are better assessed using H1/VM2 or as an alternative solution.

› An additional comment has been added to H1/AS2 Paragraph 2.2.1.1 for designers to consider moisture movement from occupied spaces into a roof space. This includes limiting the air permeability of ceilings, including through ceiling linings and penetrations such as recessed luminaires, electrical and plumbing services and ceiling access hatches.

› An additional comment has been added to H1/AS2 Paragraph 2.3.1.1 and H1/VM2 Paragraph 2.1.1.1 to consider passive features to prevent overheating. MBIE considered feedback on the risks of overheating and consulted with external experts on this subject. It was found that, while still an issue in New Zealand homes, the new R-values proposed did not significantly increase this risk over the status quo. Overheating, itself, is not caused by increased R-values and should be addressed in other ways. For controlling solar heat gains, the size of the building, its orientation, solar heat gain coefficient, available shading, and ventilation provisions need to be considered. Further development is required in this area to adopt measures into the acceptable solutions and verification methods.

› The citation of AS/NZS 4859.1 has been revised to the most recent 2018 version.

Other items outside of the scope of the consultation have been logged for future consideration in Building Code updates. This includes items regarding revisions to the Building Code clause regulations (Schedule 1 of the Building Regulations 1992) and other acceptable solutions and verification methods.

### 2.3.4. Transition period

The transition period for the new first edition of Acceptable Solution H1/AS2 and Verification Method H1/VM2 will be 1 year. The existing Acceptable Solution H1/AS1 and Verification Method H1/VM1 Fourth Edition Amendment 4 documents will remain in force until 2 November 2022. MBIE will provide information and education to the sector during the transition period.

# 3. Energy efficiency for heating, ventilation and air conditioning (HVAC) systems in commercial buildings

## 3.1. What we proposed

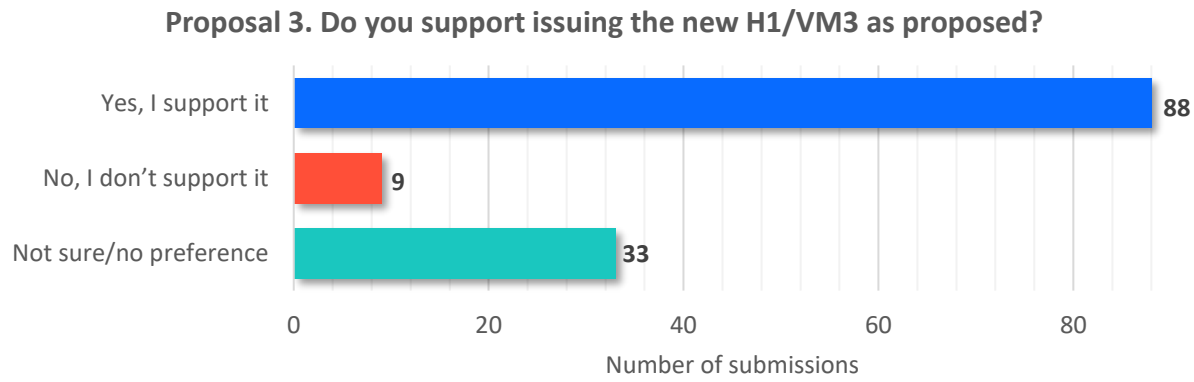
We proposed to issue a new Verification Method H1/VM3 for the energy efficiency of heating, ventilation and air conditioning (HVAC) systems in commercial buildings. Clause H1.3.6 of the Building Code requires HVAC systems in commercial buildings to be located, constructed, installed and able to be maintained to limit energy use. Previously, there was no acceptable solution or verification method for this portion of the Building Code. The new Verification Method H1/VM3 intends to establish a baseline and standardised procedures that will help building designers and building consent authorities demonstrate and verify the compliance of this clause.

HVAC systems in commercial buildings modify temperature, modify humidity, and provide ventilation (or any combination of those as required by the intended use of the space). HVAC systems are one of the biggest energy users in commercial buildings and have a significant impact on a building's greenhouse gas emissions and energy costs. Improving the energy efficiency of HVAC systems can also improve New Zealand's energy resilience and reduce the need for electricity infrastructure upgrades.

## 3.2. What we heard

There was widespread support for the proposal as shown in Figure 3.1. Of the 130 submissions, 88 supported issuing the document and only 9 submissions did not support it.

**FIGURE 3.1: Response from submitters to Proposal 3**




Those submitters that did not support the new H1/VM3 provided the following comments for their position:

› The verification method should be based on energy performance modelling of HVAC systems and should also consider the thermal envelope performance.

› More research evidence needs to be presented to support the effectiveness of the proposed requirements.

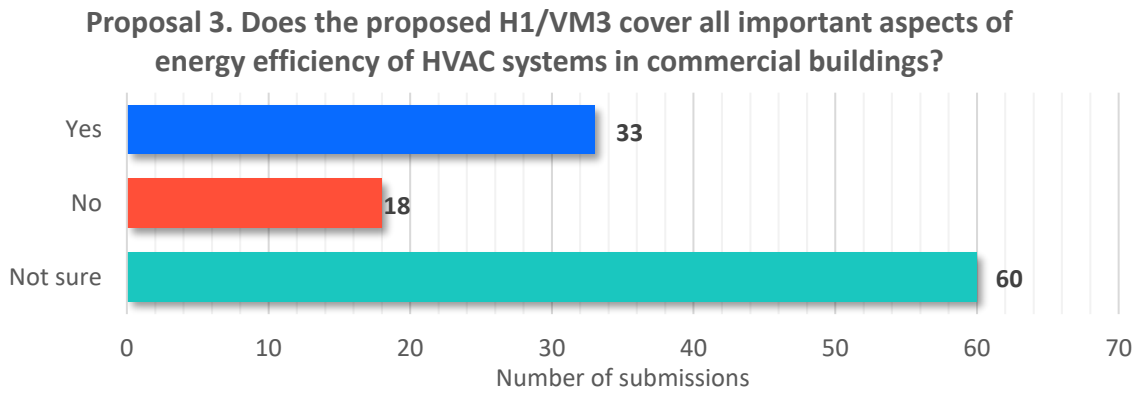
› Modifications are necessary to specific requirements.

› More stringent requirements should be included in H1/VM3 to address climate change mitigation (like eliminating fossil fuels) or cover other building types (like apartments and hospitals) and existing buildings. Note that this was considered outside the scope of the consultation for H1/VM3 as clause H1.3.6 of the Building Code has limits on its application.

Some submitters misunderstood the proposal and interpreted the new H1/VM3 as requiring HVAC systems to be installed in all new commercial buildings. However, the proposed H1/VM3 does not require an HVAC system to be installed and only sets minimum requirements for commercial buildings if HVAC systems are installed.

We also asked if the new verification method covered all the important aspects of energy efficiency for HVAC systems in buildings. A majority of the submissions were unsure (Figure 3.2) and another 33 submissions said yes.

**FIGURE 3.2: Response from submitters to Proposal 3**



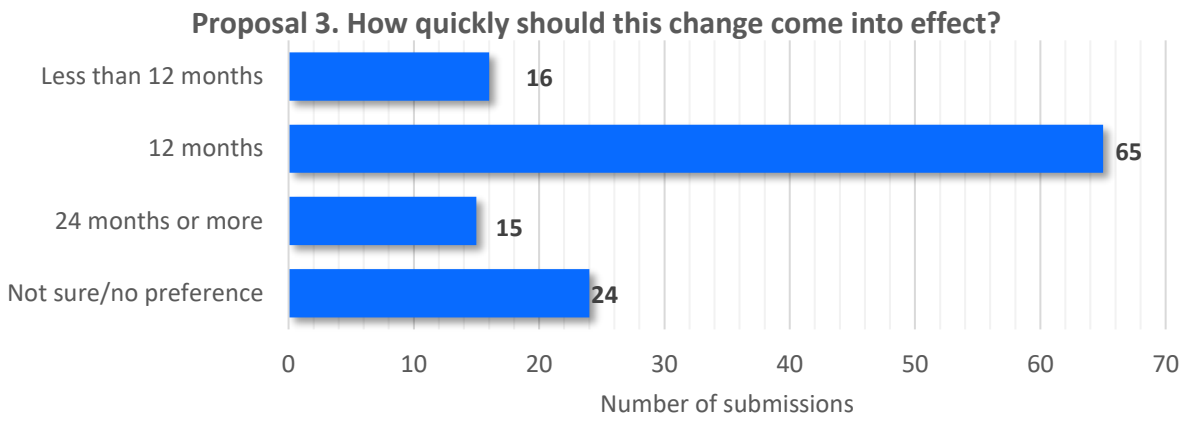

Of the 18 submissions that said no, the additional aspects proposed for the document included:

- Requiring designers to estimate operational carbon emissions.
- Considering passive heat gains and building airtightness as part of the HVAC system performance.
- Encouraging building to the Passive House standard.
- Discouraging fossil fuel heating to better reduce carbon emissions.
- Specifying requirements for low global-warming potential refrigerants.
- Including health and safety aspects such as dust and mould contamination of HVAC systems.
- Providing more detailed prescriptive requirements on certain items such as heat recovery, sub-metering, and commissioning of systems.

In comments about the impacts of the new document, submitters expect the H1/VM3 to achieve improved energy efficiency, reduced operating costs and positive environmental outcomes. Some submitters, particularly designers and building consent authorities, expect that the new verification method will increase compliance costs and require upskilling compared to the status quo where no verification method exists.

When asked how quickly the new document should come into effect, a majority of submitters selected 12 months (Figure 3.3). However, the comments provided did not align with this stated preference and these submissions may have been confused by the phrasing of this question. A period of 12 months would mean that the document could not be accepted as a verification method for building consent applications prior to November 2022. The consultation document recommended an effective date in November 2021.

**FIGURE 3.3: Preferred transition periods for Proposal 3**



## 3.3. What we are doing

MBIE will be issuing the new Verification Method H1/VM3 with an effective date of 29 November 2021. This will be supported with education content on the new document. Additionally, MBIE are removing the existing guidance document "MBIE, Guidelines for energy efficient heating, ventilation and air conditioning (HVAC) systems" from the Building Performance website as it has been replaced with this verification method.

The following modifications to the proposed H1/VM3 have also been made to address comments on specific requirements:

- **Part 2. Air conditioning system control**
  - Rewording the following paragraphs for clarity of the text: 2.2.3.2, 2.2.4.1, 2.2.6.1, 2.2.6.2, 2.2.7.1.
- **Part 3. Mechanical ventilation system control**
  - Providing additional comments for limiting outdoor air flow in Paragraph 3.2.4.1.
  - Rewording Paragraph 3.2.5.1 for clarity of the text .
- **Part 4. Fans**
  - Replacing this section of the verification method in its entirety with a section on fans using a component-based approach. We received specific feedback that this section was based on an outdated methodology and the method introduced in the Australian National Construction Code 2019 was more effective. MBIE discussed this feedback with colleagues at the Australian Building Codes Board. The component-based approach provides a more effective way to regulate the requirements and does not increase the level of stringency over what was consulted on.
- **Part 5. Ductwork insulation and sealing**
  - Providing new requirements and additional comments for ductwork insulation in Paragraph 5.1.2.1.
  - Providing a comment for how R-values could be calculated for Paragraph 5.2.1.1.
- **Part 6. Pumps** – No changes from the proposal.
- **Part 7. Pipework insulation**
  - Providing a comment for how R-values could be calculated for Paragraph 7.1.2.3.
  - Clarifying the requirements for pipework insulation in Paragraph 7.1.2.4 a).
  - Providing additional insulation requirements for systems using steam in Table 7.2.1.2A and 7.2.1.2B.
- **Part 8. Space heating**
  - Removing the list of examples from Paragraph 8.1.2.1 as Paragraph 8.2.1.2 already contains a list for the application of this part.
  - Specifying that Paragraph 8.1.2.2 applies to all heaters instead of 'electric heaters'.
  - Rewording Paragraph 8.2.1.1 for clarity of the text.
- **Part 9. Refrigerant chillers** – No changes from the proposal.
- **Part 10. Unitary air conditioning equipment** – No changes from the proposal.
- **Part 11. Heat rejection equipment**
  - Revising the documents cited in the comment on Paragraph 11.2.1.1 to be the most recent versions.
- **Part 12. Facilities for energy monitoring**
  - Rewording Paragraphs 12.2.1.1 and 12.2.1.2 for clarity of the text.
- **Part 13. Maintenance access**
  - Revising the document cited in the comment on Paragraph 13.2.1.1 to one with more comprehensive information.

Items raised regarding holistic building operational efficiency modelling and climate change have been recorded for future consideration and development of the Building Code.

# 4. Natural light for higher-density housing

## 4.1. What we proposed

We proposed to issue new acceptable solutions and verification methods for G7 Natural Light to adopt new compliance pathways for higher-density housing. The new pathways are more suitable for these types of buildings. As a consequence of the change, the scope of the existing documents were proposed to be limited.

The proposed new acceptable solutions and verification methods included the following:

› Acceptable Solution G7/AS1 Natural light for buildings up to 3 storeys excluding those with borrowed daylight

› Acceptable Solution G7/AS2 Natural light for simple buildings excluding those with borrowed daylight

› Verification Method G7/VM1 Natural light for complex buildings excluding those with borrowed daylight

› Verification Method G7/VM2 Natural light for all buildings including those with borrowed daylight

In the consultation, we also asked whether the existing G7/VM1, based on an outdated methodology from 1984 that is no longer in common practice, should be revoked, amended, or left as is.

## 4.2. What we heard

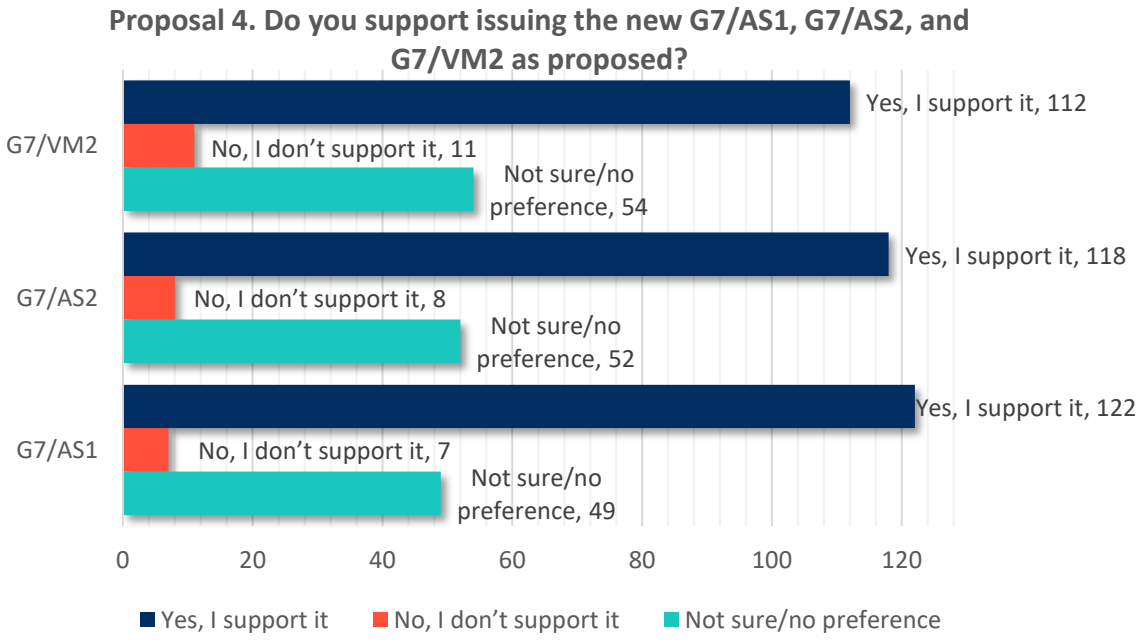
### 4.2.1. General

We received positive comments about introducing clearer pathways for the different typologies of buildings. Approximately 95% of the submissions either supported or had no objections to issuing the G7/AS1, G7/AS2 and G7/VM2 document (Figure 4.1). Submissions that supported the proposal to issue the new documents generally acknowledged that:

› Daylight is needed in buildings to maintain the wellbeing of the occupants.

› There is a need for compliance pathways for higher-density housing.

**FIGURE 4.1: Response from submitters to Proposal 4 for G7/AS1, G7/AS2 and G7/VM2**



Those submitters that did not support the new documents provided the following comments for their position:

› Skylights, solar tubes and sun tunnels should be included in the acceptable solutions G7/AS1 and G7/AS2.

› The acceptable solutions G7/AS1 and G7/AS2 should include other typical situations such as open plan living areas with a kitchen island and attic bedrooms. G7/AS1 should also be permitted for use with top flats, basement flats and apartments.

› Terminology like low density, simple façade, complex façade, double height spaces, and so forth should be better explained or defined in the document. Other submissions suggested changes to other wording in the document.

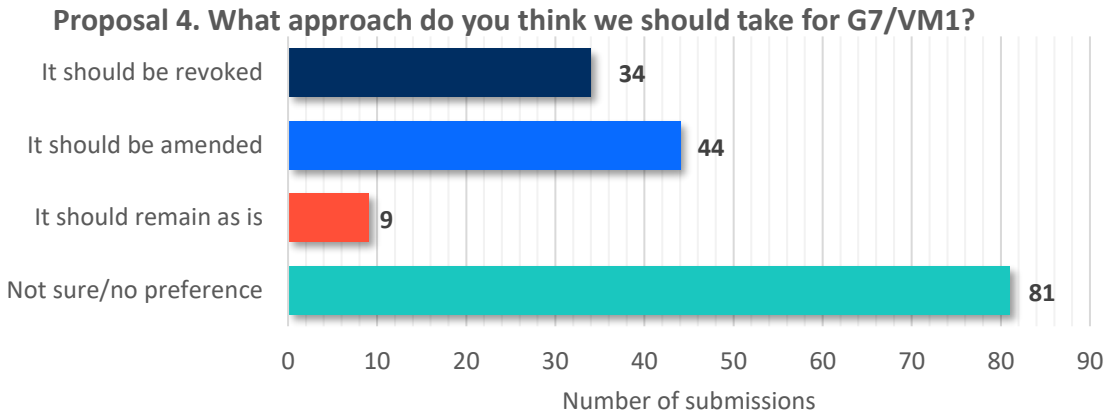
› The proposed solutions in the compliance pathway should be based on climate base daylight modelling. The daylight factor calculation methods should be removed from the proposal.

› Allowing provisions for borrowed light may lead to unliveable spaces.

› Overtime, the reflectance used in design may not be maintained for the use of a space.

For G7/VM1, we received clear feedback that changes to the document were required and 80% of those who responded with a stated preference thought the document should be amended or revoked. However, we received mixed feedback on whether the document should be either amended or be revoked (Figure 4.2).

**FIGURE 4.2: Response from submitters to Proposal 4 for G7/VM1**




There were few comments provided for why the document should be amended. More comments were provided for why G7/VM1 should be revoked. These comments included:

› There have been few or no instances of G7/VM1 being used in practice. Several building consent authorities noted that they had never seen it used for a building consent application. The scope of an amended G7/VM1 would further limit its use.

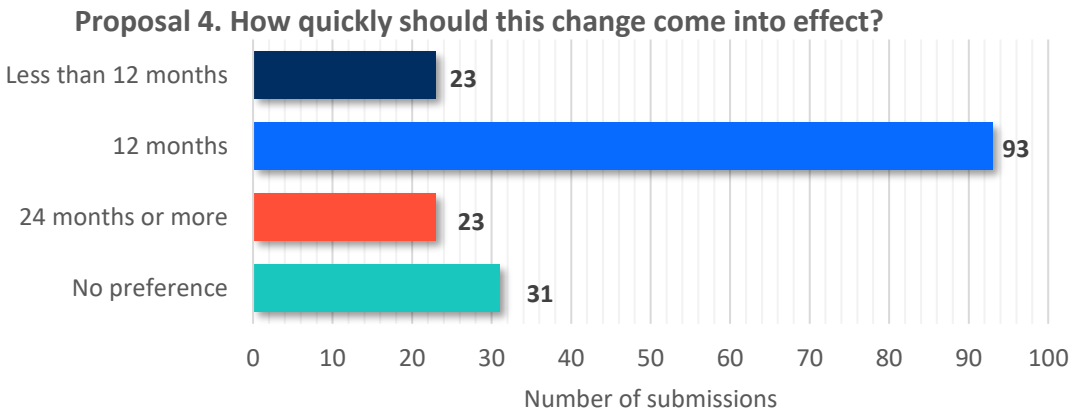
› Several designers and architects stated they are more likely to use the new computer modelling method proposed for G7/VM2 for demonstrating compliance in the future.

› The methodology in G7/VM1 is outdated and obsolete.

› Having two verification methods (G7/VM1 and G7/VM2) is more likely to cause confusion of the compliance pathways.

There was strong support for the transition period of 12 months (Figure 4.3).

**FIGURE 4.3: Response from submitters to Proposal 4 for G7/VM1**




MBIE has also noted a number of submissions for this proposal which were related to the performance requirements within clause G7 of the Building Code. This clause will remain unchanged for this Building Code update cycle. These comments were noted for future consideration, but are out of the scope of this consultation.

## 4.3. What we are doing

MBIE has decided to issue the new G7/AS1 and G7/AS2 with minor changes to the text from the proposal. MBIE has also decided to remove the existing G7/VM1 and replace it with the new verification method based on computer modelling (previously consulted on as G7/VM2 but to be re-named as G7/VM1). The new documents will have a transition period of 1 year.

The new acceptable solutions and verification methods to be published include the following:

› **Acceptable Solution G7/AS1 Natural light for buildings up to 3 storeys excluding those with borrowed daylight, Second Edition** – This acceptable solution is based on the existing G7/AS1 requirements and is suitable for low density, low rise buildings such as detached buildings and attached side by side multi-unit buildings including townhouses.

› **Acceptable Solution G7/AS2 Natural light for simple buildings excluding those with borrowed daylight, First Edition** – This acceptable solution is suitable for simple multi-unit apartment designs with vertical windows in external walls and with no internal rooms that rely on daylight borrowed from another space. The solutions for illuminance include a series of tabulated values that can be used to determine the maximum dimensions of a room based on various factors in the design.

› **Verification Method G7/VM1 Natural light for all buildings including those with borrowed daylight, Second Edition** – It provides the most freedom in the design applications and can be used for all buildings including complex higher rise buildings, and apartments and those that contain rooms that borrow daylight from other spaces. Knowledge of daylight computer modelling practices are required to use this verification method in design.

These documents continue to apply to residential buildings, old people's homes, and early childhood centres as specified in the limits of application of Building Code clause G7.2.

## Proposal 4. Natural light for higher-density housing

Comments on the proposals have been considered with a number of minor changes to the proposed text to improve the consistency and clarity of the documents. These changes include:

**› G7/AS1**

- The following paragraphs have been reworded to clarify the scope of the document: 1.1.1.1, 1.1.1.2, 1.1.1.3, 1.1.2.1
- Paragraph 2.1.2.1 b) and the Appendix B definitions have been revised for consistent use of the term visual light transmittance.
- The Paragraph 2.1.2.1 comment box has been revised as there are other pathways for demonstrating compliance.
- The term ‘clear glazing’ has been replaced with the term ‘transparent glazing’ in Part 3 as the word ‘clear’ may be interpreted as requiring untinted glass. The term ‘transparent’ is used within the corresponding Building Code clause G7.3.2.

**› G7/AS2**

- The wording in Paragraphs 1.1.1.1 and 1.1.2.1 have been revised to clarity the scope of the document.
- Paragraphs 2.1.2.1 and 2.1.2.3 have been reworded fro clarity with an additional comment box provided.
- Table 2.1.4.1 has been revised to better reflect values for typical New Zealand construction. Text and figures in Part 2 have also been revised to reflect the new limitations of the table.
- The term ‘clear glazing’ has been replaced with the term ‘transparent glazing’ in Part 3 as the word ‘clear’ may be interpreted as requiring untinted glass. The term ‘transparent’ is used within the corresponding Building Code clause G7.3.2.

**› G7/VM1**

- The comment for Paragraph 1.1.1.1 has been reworded for clarity.
- The term ‘clear glazing’ has been replaced with the term ‘transparent glazing’ in Part 3 as the word ‘clear’ may be interpreted as requiring untinted glass. The term ‘transparent’ is used within the corresponding Building Code clause G7.3.2.
- The figure within Part 3 has been supplemented with a diagram illustrating the requirements for rooms that rely on daylight borrowed from another space.
- Table C2.4.2 specifying the visible light transmittance of glazing has been removed from the document as it is too restrictive for the number of different glazing options that could be used in daylight modelling software. A new comment has been added to provide indicative values for the visual light transmittance.

# 5. Weathertightness testing for higher-density housing

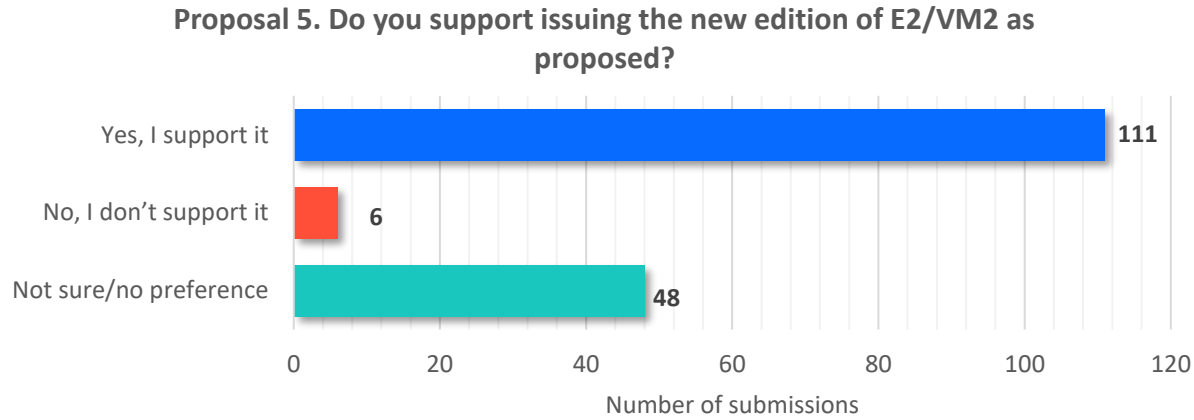
## 5.1. What we proposed

We proposed to issue a new edition of E2/VM2 to reference BRANZ Evaluation Method EM7 Performance of mid-rise cladding systems (version 3, June 2020). This updated version of EM7 is easier for test laboratories, cladding system suppliers, and building designers to use than the previous version. The new version does not significantly change the minimum performance requirements of the test method, and existing tested cladding systems will not need to be retested. Issuing a new edition of E2/VM2 is part of routine maintenance of the verification method. It ensures that users are provided with the most up-to-date information and removes uncertainty in the consent process as new information is available for use.

## 5.2. What we heard

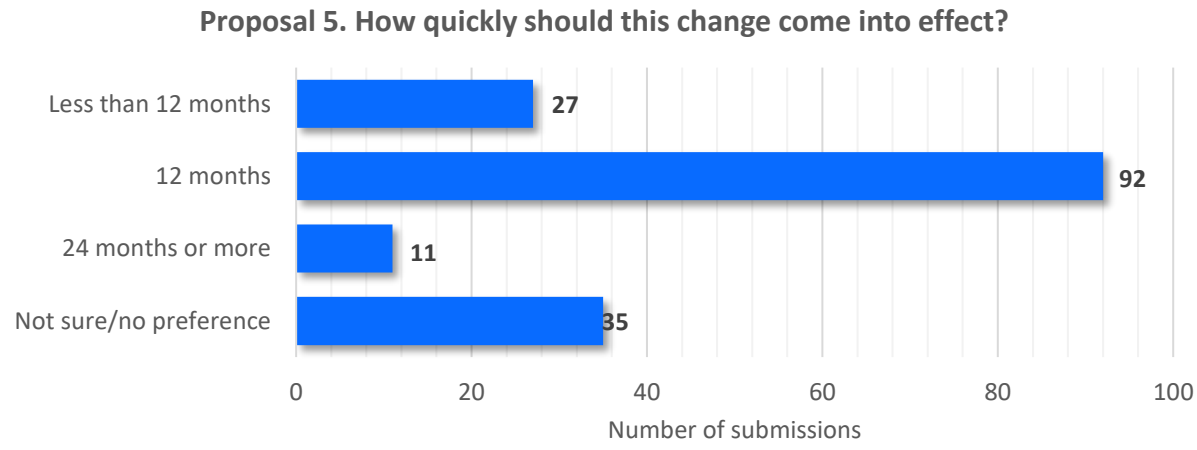
There was widespread support for the proposal. Out of 165 submissions on this proposal, 111 submitters supported the proposal; 6 opposed; and 48 were not sure, had no preference or provided a blank response (Figure 5.1). None of the submissions indicated any compelling reason to change or withdraw the proposal. None provided any evidence that the performance settings within the proposal would result in building failures. Similarly, submissions did not identify any issues that made the proposal difficult to understand, nor any typographical errors. No significant impact or costs for issuing the verification method were identified.

**FIGURE 5.1: Response from submitters to Proposal 5**




There was strong support for the transition period of 12 months (Figure 5.2).

**FIGURE 5.2: Preferred transition periods for Proposal 5**



Items raised in the submission which were outside the scope of the consultation included:

› Providing additional solutions for compliance with E2 External moisture. The proposal for E2 this year related to E2/VM2 whose scope is limited to certain types of cladding systems for buildings with certain characteristics. Some submissions offered other solutions relevant to other cladding or underlay types, other building types, or aligned with practice in certain overseas jurisdictions.

› Providing more holistic solutions for E2 External moisture as its relates to E3 Internal moisture, C1 - C6 Protection from fire, G4 Ventilation, and H1 Energy efficiency. The Operational Efficiency workstream of the Building for Climate Change programme include this type of integration for building performance modelling.

› Changing parts of the regulatory outside MBIE's authority to issue, amend and revoke Acceptable Solutions and Verification Methods, such as compulsory product approval, the role of expert opinion, and inspection procedures.

These items were logged, and where appropriate may be considered in future in Building Code updates

## 5.3. What we are doing

MBIE will be issuing the new edition of E2/VM2 without any modifications to the proposal with a transition period of 1 year. The new edition of E2/VM2 will cite BRANZ EM7 version 3 (June 2020) as the primary means for demonstrating compliance with this verification method. Retesting is not required for wall cladding systems which have already passed testing in accordance with the previous version of E2/VM2.

# 6. Standards referenced in B1 Structure

## 6.1. What we proposed

We proposed to amend referenced standards and documents in the acceptable solutions and verification methods for clause B1 Structure. The amended references include new versions of:

- AS/NZS 4671: 2019 Steel for the reinforcement of concrete (B1/AS1, B1/AS3, B1/VM1)
- AS/NZS 5131: 2016 Structural Steelwork – Fabrication and Erection (B1/VM1)
- AS/NZS 2327: 2017 Composite structures – Composite steel-concrete construction in buildings Amendment 1 (B1/VM1)
- New Zealand Geotechnical Society Inc., "Field Description of Soil and Rock – Guideline for the field descriptions of soils and rocks in engineering purposes", December 2005 (B1/VM1).

Previous versions of these documents are currently referenced by the acceptable solutions and verification methods. The citation of these standards and document contribute to achieving the Building Code Objective B1.1. No other suitable standards specific to the context in New Zealand were identified that could be referenced instead. The recommended option was to update these citations to the newest to reduce confusion between industry practice and compliance with the Building Code. No significant impact or costs were identified for the adoption of these standards and document.

Submitters were asked whether they supported the proposed new version of each individual standard. They were also asked to provide comments on the impacts of the new standards and the proposed transition time of 12 months.

## 6.2. What we heard

There were 92 submissions on this proposal. Submissions were received from building consent authorities, architects, designers/engineers, builders, product suppliers, owners and industry stakeholders. However, 35-38 submissions indicated a preference of "Not sure/No preference" to adopting the different standards. Of the remaining submissions, 100% agreed with the proposed change (refer to Figure 6.1). No significant negative feedback or substantial issues were raised in the comments on the proposal.

There was strong support for the transition period of 12 months (Figure 6.2).

## 6.3. What we are doing

MBIE is proceeding with the referencing the new versions of these standards in the acceptable solutions and verification methods for B1 Structure. The effective date will be 29 November 2021 with a transition period of 1 year. In addition to the proposed modifications to the cited standards, the citation of several other standards in B1/VM1 and B1/AS1 will be modified to replace past versions of AS/NZS 4671 with references to AS/NZS 4671: 2019 to address feedback on the proposal.

**FIGURE 6.1: Response from submitters to Proposal 6**

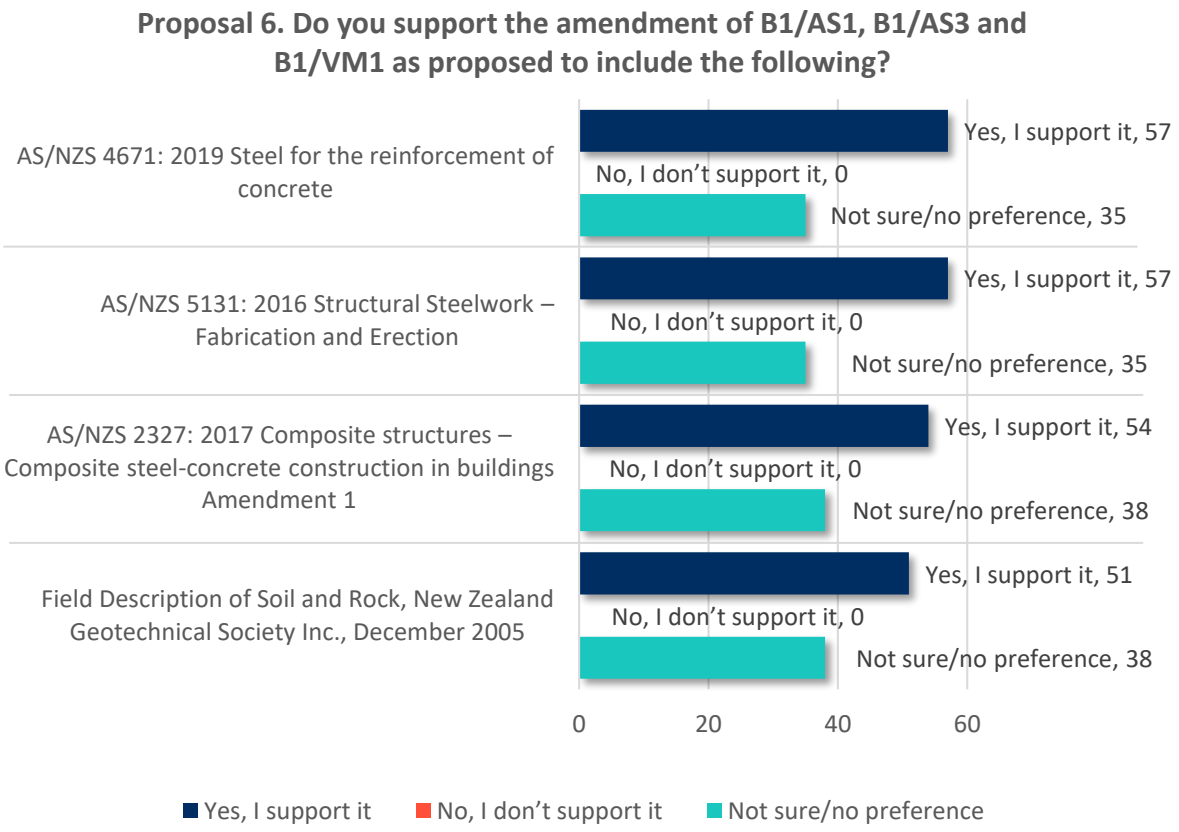
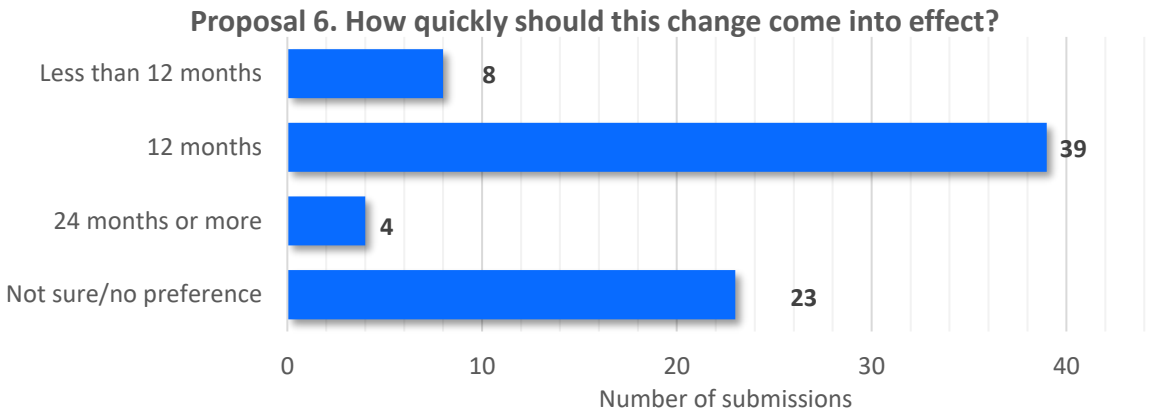



**FIGURE 6.2: Response from submitters to Proposal 6 transition times**



# 7. Editorial changes to Acceptable Solution B1/AS1

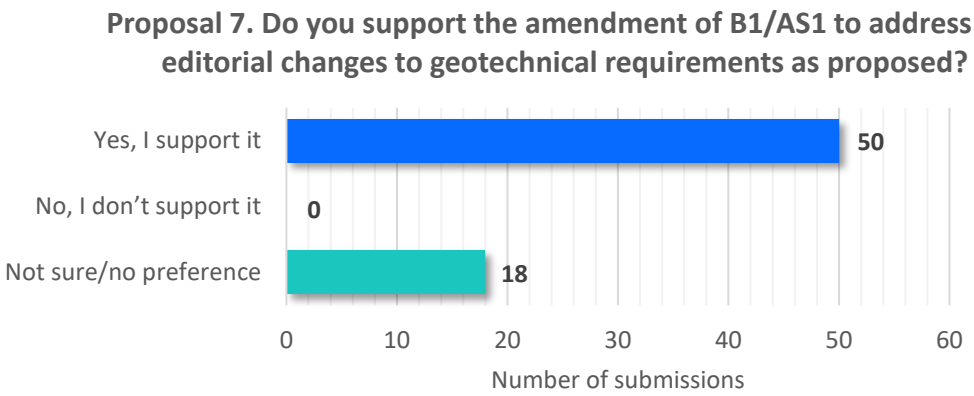
## 7.1. What we proposed

We proposed to amend text within Acceptable Solution B1/AS1 to make editorial changes in regards to geotechnical requirements. This included a formatting issue in Paragraph 2.1.2 and clarification of the term $I_{ss}$ (shrink swell index) used in Paragraph 7.5.13.3. These were intended to be minor clarifications of text with minor to no impact to the level of performance or compliance with the document. The only practicable option identified was to correct the text to provide consistency and clarity in the understanding and interpretation of the acceptable solution. The proposed transition time for this change was 12 months so that it would align with the proposed transition period for new standards to be cited in B1 Structure as discussed in Proposal 6. This was intended to minimise confusion on which documents and what requirements are in effect on what date. Submitters were asked whether they supported the editorial changes as proposed.

## 7.2. What we heard

No significant negative feedback or substantial issues were raised in the comments on the proposal. There were 68 submissions on this proposal. Submissions were received from building consent authorities, architects, designers/engineers, builders, product suppliers, owners and industry stakeholders. However, 18 of the submissions indicated a preference of "Not sure/No preference" to adopting the change. Of the remaining 50 submissions, 100% agreed with the proposed change (refer to Figure 7.1).

**FIGURE 7.1: Response from submitters to Proposal 7**




## 7.3. What we are doing

MBIE is proceeding with the editorial corrections to Acceptable Solution B1/AS1 outlined in the proposal with an effective date of 29 November 2021. The transition period for these changes will be 1 year in order to align with the proposed transition period for new standards to be cited in B1 Structure.

# 8. Other comments received during the consultation

## 8.1. What we proposed

All submitters were provided an opportunity to provide additional feedback outside of the main consultation proposals including feedback on the new look of acceptable solution and verification methods.

The new look of acceptable solution and verification methods was proposed for the release of E2/VM2, G7 Natural Light and H1 Energy Efficiency documents. Instead of one big document, the documents were split out into separate documents for each acceptable solution and verification method to make them more manageable. This split is similar to the current separation of documents used for clauses C1-C6 Protection from Fire.

Along with the improved visual elements, some key features of these documents include:

- a consistent set of heading and numbering formats across all documents; and
- moving references and definitions into standardised appendices at the end of the document; and
- ensuring that all documents start with a consistent statement of their role in the Building regulatory system and the scope of buildings and designs they can be used for; and
- enhanced features such as coloured graphics, hyperlinks and icons; and
- the use of a single column format for text, tables and figures.

Additionally, for the past 6 months, MBIE has been piloting the use of the digital reader tekReader as an alternative to pdf versions of the acceptable solutions and verification methods. The pilot included four of the most viewed documents. MBIE has been collecting feedback on use of this online tool which has informed decisions on the future development of the acceptable solutions and verification methods. You can read more about digitising the Building Code on building.govt.nz.

## 8.2. What we heard

There were 79 other submissions that provided additional feedback on the consultation. Of these comments, 28 were minor comments with 16 expressing positive sentiments on the consultation, submission form or ability to participate in the process. In the other 51 comments, common themes included:

- Suggestions for specific aspects of the Building Code outside the scope of the proposals for 2021.
- Suggestions for the consultation document and submission form.
- Suggestions for the development process of the acceptable solutions and verification methods.
- Statements that the consultation was too long or the consultation period was too short.
- Coordination of Building Code consultations with consultations from other parts of Government.

There were 48 submissions that provided comments on the new look of the H1, G7, and E2/VM2 documents. These were analysed based on common features of the documents and whether the comments expressed positive statements in support of the changes or negative sentiments about the documents (Table 8.1).

Four other submissions provided feedback on how the new format will be introduced across the other Building Code clauses and what education would be required.

**TABLE 8.1: Submissions on the new look of acceptable solutions and verification methods**

| Topics | Number of comments | |
|---|---|---|
| | Positive statements | Negative sentiments |
| **General comments** | 5 | 4 |
| **Usability and readability of the documents** | 15 | 3 |
| **Split up of acceptable solutions and verification methods** | | 3 |
| **Front and end matter of the documents** | 2 | 2 |
| **Individual elements** | | |
| Table and figures | 1 | |
| Defined terms | | 1 |
| Icons | 2 | |
| Hyperlinks | 3 | |
| Colour branding | 2 | 1 |

## 8.3. What we are doing

Feedback on areas outside the scope of this Building Code update will be logged for future consideration. Similarly, items raises on the update process and consultation document will be reviewed for future Building Code update consultations as part of ongoing continual improvement of the process.

MBIE is proceeding with publishing acceptable solutions and verification methods in the new format. The continued roll out of the documents, including tekReader, will be staggered across the Building Code as new content for individual documents is developed. The priority for this roll out will focus on the documents most heavily used and with the largest changes between amendments. This phased roll out is necessary to ensure that new documents have sufficient focus for proofreading when released (to avoid unintended formatting or typing errors) and sufficient support with other digital solutions such as tekReader. The documents will continue to be split up individually by acceptable solution and verification method. MBIE will support the rollout with education material and continued development of the website to aid in navigation to the individual documents.

The new acceptable solutions and verification methods will not be published in papyrus font as suggested in one of the submissions.

# Thank you

Thank you to everyone who provided feedback on the Building Code update. We really appreciate your insights and contributions because it helps us keep pace with modern construction methods, look to address the needs of New Zealanders and ensure buildings are safe, warm, dry, healthy, durable, and sustainable.

You can keep up with future consultations by signing up for our news and updates.

BUILDING PERFORMANCE

**CONTACT DETAILS** PO Box 1473, Wellington 6140 | **T** 0800 242 243 | **E** info@building.govt.nz

For more information, visit **building.govt.nz**

ISBN 978-1-99-100898-5 (online)



BP 7264

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

New Zealand Government