

Consultation submission form

Building Code update 2021

Building Code operating protocols



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Thank you..... **Error! Bookmark not defined.**

How to submit this form

How to submit this form

This form is used to provide feedback on proposals found within the consultation documents:

- › Building Code update 2021 – Issuing and amending acceptable solutions and verification methods
- › Building Code operating protocols – Referencing standards and a tier framework to support standards in the Building Code system

When completing this submission form, please provide comments and reasons explaining your choices. Your feedback provides valuable information and informs decisions about the proposals.

You can submit this form by 5pm, Friday 28 May 2021 by:

- › email: buildingfeedback@mbie.govt.nz, with subject line Building Code consultation 2021
- › post to: Ministry of Business, Innovation and Employment, 15 Stout Street, Wellington 6011
or: Ministry of Business, Innovation and Employment, PO Box 1473, Wellington 6140

Your feedback will contribute to further development of the Building Code. It will also become official information, which means it may be requested under the Official Information Act 1982 (OIA).

The OIA specifies that information is to be made available upon request unless there are sufficient grounds for withholding it. If we receive a request, we cannot guarantee that feedback you provide us will not be made public. Any decision to withhold information requested under the OIA is reviewable by the Ombudsman.

Submitter information

Submitter information

MBIE would appreciate if you would provide some information about yourself. If you choose to provide information in the “About you” section below it will be used to help MBIE understand the impact of our proposals on different occupational groups. Any information you provide will be stored securely.

A. About you

Email address:

B. Are you happy for MBIE to contact you if we have questions about your submission?

Yes No

C. Are you making this submission on behalf of a business or organisation??

Yes No

If yes, please tell us the title of your company/organisation.

New Zealand Green Building Council

D. The best way to describe your role is:

- | | |
|--|--|
| <input type="checkbox"/> Architect | <input type="checkbox"/> Engineer (please specify below) |
| <input type="checkbox"/> BCA/Building Consent Officer | <input type="checkbox"/> Residential building owner |
| <input type="checkbox"/> Builder or tradesperson (please specify below) | <input type="checkbox"/> Commercial building owner |
| <input type="checkbox"/> Building product manufacturer or supplier
(please specify the type of product below) | <input type="checkbox"/> Other (please specify below) |
| <input type="checkbox"/> Designer (please specify below) | <input type="checkbox"/> Prefer not to say |

Please specify here.

Proposal 1: Energy efficiency for housing and small buildings

Proposal 1. Energy efficiency for housing and small buildings

To make buildings warmer, drier, healthier and more energy efficient, we are considering options to increase the minimum insulation levels for roof, windows, walls and floors for new housing and small buildings. The options for minimum insulation levels vary across the country so that homes in the coldest parts of New Zealand will need more insulation than those in the warmest parts. As part of this, we are proposing to issue new editions of Acceptable Solution H1/AS1 and Verification Method H1/VM1 for housing and small buildings.

Questions for the consultation

1-1. Which option do you prefer? (Please select one)

- Status quo
- Option 1. Halfway to international standards
- Option 2. Comparable to international standards
- Option 3. Going further than international standards

Is there anything you would like to tell us about the reason(s) for your choice?

NZGBC supports the ambition and intended outcomes of Option 3 (while noting that in the long-term, we must be prepared to go beyond the standards linked to this option). However, we don't believe fixed R-values are the best way to achieve the outcomes sought. By taking this pathway, there is a risk of perverse outcomes. NZGBC would prefer to see a rapid move towards a performance-based approach as detailed in the Building for Climate Change (BfCC) programme (please see responses to 1-3 and 1-4 for further detail).

The *ambition* of Option 3 provides the only acceptable outcomes for New Zealand buildings

Setting a goal of lifting standards only halfway to comparable international standards is completely unacceptable to NZGBC and it should be completely unacceptable to government, to industry and to the New Zealand community.

Forty percent of New Zealand's existing homes are damp and mouldy¹ and according to OECD standards, New Zealand homes are poorly constructed and heated,² and standards are less stringent than those of many other OECD countries. We need, at the very least, to be truly comparable with international standards that are recognised as appropriate and fit for purpose, if we are to build the healthy homes Kiwis deserve. We need to go further than comparable international standards if we want to achieve the energy efficiency that will help us achieve our emissions reduction targets and if we want to reduce energy bills for kiwi households.

New Zealand has much to gain from choosing Option 3, and ultimately, from aiming even higher.

¹ BRANZ Housing Condition Survey 2015

https://www.branz.co.nz/cms_show_download.php?id=a1efff0a2fd9885ecf878ce475631df7025cf3b8

² OECD. Environmental performance reviews – New Zealand 2017 highlights.

https://www.oecd.org/environment/country-reviews/Highlights_OECD_EPR_NewZealand.pdf

Proposal 1: Energy efficiency for housing and small buildings

The description of Option 3 indicates our minimum standards for insulation would be lifted beyond those of comparable countries, but this is only partly true. Analysis in the consultation paper shows that some of the requirements would surpass the requirements of countries used as comparisons (Australia, England, Wales & Ireland, and California).

However, even at Option 3, some of the proposed requirements will barely meet some of these countries' requirements, let alone surpass them. In the analysis of Option 2, it is clear that some of the requirements, particularly for underfloor and wall insulation, will fall well short of the standards required in the comparable climate zones.

There are many reasons why we can't afford to settle for anything less than Option 3. These include:

- New Zealand has an energy equity problem. Too many households must spend high proportions of their incomes heating cold, inefficient homes. If we are serious about tackling poverty and improving the lives of all Kiwis, we must ensure our future housing stock does not shackle households to high energy bills.
- According to health statistics, 20 New Zealand children are dying every year, while another 30,000 are hospitalised from issues related to poor housing.³ We can't afford for our new homes to become the cold, damp unhealthy homes of the future because of a woefully inadequate Building Code.
- New Zealand has a clear and legislated goal of achieving a net zero carbon economy by 2050. If we are to achieve this, we must make drastic improvements to energy efficiency in our homes and reducing carbon emissions related to the housing sector.
- The housing sector represents a huge opportunity for improving energy efficiency and reducing the nation's energy demand. If we significantly improve energy efficiency in new homes, we will help to reduce peak demand, free up energy capacity for new technologies such as electric cars, and reduce the urgency for developing new energy generation.
- While there may be some initial challenges for manufacturers and suppliers, lifting minimum standards will create opportunities to provide the materials we need to achieve better outcomes.

Mismatched policies

NZGBC is surprised and disappointed that the proposals for changes to the Building Code do not align with those of the BfCC programme (please see our response to 1-3 and 1-4 below for further comment).

There is no link between the proposed H1 changes and the proposals outlined in the BfCC Transforming Operational Emissions consultation. The two approaches are fundamentally at odds. The H1 changes are based on fixed R-values whereas the BfCC proposals are performance based (kWh/m² of heating demand). NZGBC has undertaken some preliminary analysis which shows a significant problem arising from the disparate approaches.

³ NZ Herald. *Child deaths linked to unhealthy housing 'unacceptable' – health minister*. 30 August, 2017. <https://www.nzherald.co.nz/nz/child-deaths-linked-to-unhealthy-housing-unacceptable-health-minister/YJ2MZ7Y4WT2FFI7FYSWQQFQKCY/>

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NZGBC has modelled three homes with both Option 2 and Option 3 scenarios based on Auckland conditions. These give an average annual heat demand of 42 and 28 kWh/m² respectively. This is considerably less than the proposed first BfCC cap of 60 kWh/m² meaning that the implementation of BfCC could see an unintended reduction in required insulation. This will inevitably lead to confusion and frustration for industry.

The confusion between the H1 changes and BfCC is further compounded by the wording in this consultation which states that:

*“...Increasing the level of insulation in buildings represents the **first step in the Building for Climate Change programme** of work which will continue to transform housing and construction for New Zealanders.”*

The BfCC Transforming Operational Emissions paper stated that the first step would require that:

“All new buildings must report against operational efficiency requirements at consent and code compliance stages.”

However, there are no proposals in these H1 changes to require modelling of overall heating demand, electricity demand or any of the energy demand metrics in the BfCC consultation.

We understand that MBIE would like to implement quick improvements to the acceptable solutions under the current H1 clauses and that requiring energy modelling would entail changes to the primary legislation. However, this mismatch will provide unnecessary regulatory uncertainty for the industry and needs to be addressed, particularly if the intention is to launch the BfCC’s first step shortly after the H1 changes come into effect.

NZGBC strongly suggests that MBIE publish further proposals that clarify how these immediate changes to H1 will dovetail with BfCC. Please see our response to 1-4 below for further information.

Additional notes regarding the Cost Benefit Analysis (CBA) released to NZGBC through an Official Information Act (OIA) request

The CBA carried out by BRANZ in support of the H1 consultation has a number of areas that we think need improvement before a final decision is made by MBIE on which option to choose:

- 1) **No carbon pricing was assumed in any of the CBA work carried out.** While New Zealand does not currently have a carbon pricing mechanism that would affect the cost of fuel for householders, we do have international commitments to reduce emissions. Therefore, these carbon reductions, if not carried out in the building sector, would have to be made elsewhere in the economy. The BRANZ CBA work is narrowly focussed on the cost benefit to building owner/developers and householders without considering the wider impact on the New Zealand economy. It is a significant omission that the carbon emission reductions and carbon pricing impacts of these policy changes were not quantified in the consultation. A carbon price should be added to the CBA work.
- 2) **While the cost benefit ratios in the analysis were not very high, the important point is that the Net Present Value of many of the individual measures was positive.** These options have a negative marginal abatement cost, reinforcing the point that NZGBC consistently makes: that energy efficiency should be prioritised. The marginal abatement ‘cost’ of some of the R-value

Proposal 1: Energy efficiency for housing and small buildings

improvements was of the order of negative \$500 - \$2000 per tonne, meaning that **New Zealand is saving money while reducing carbon emissions**. This is in stark contrast to the estimated marginal abatement costs of decarbonising the electricity supply. The Ministry for the Environment estimated these costs to be around \$50 - \$500 per tonne.⁴

We note that some of the measures (notably underslab insulation) are shown in the BRANZ analysis to have relatively high cost of carbon. We would like to see further engagement with industry to interrogate these costs and benefits further: i.e. are these the right costs, are there learning rates, different techniques for insulating slabs that would have better payback.

- 3) **Discount rates.** While a 6% discount rate is current Treasury advice, this is a very high rate for policy related to environmental or social benefit by international standards. The UK, by comparison uses a discount rate of 3% for the first 30 years and then declines this further for subsequent years to account for the intergenerational impacts of policy (i.e., future generations don't have a say). At the very least, NZGBC believes MBIE should present a sensitivity analysis with a discount rate of 3%.
- 4) **Learning rates.** Experience from the UK and elsewhere shows that the cost of higher performance buildings reduces with scale.⁵ This is referred to as 'learning rates' in the economic literature. No learning rates were assumed in the modelling.
- 5) **Impact on electrical infrastructure.** The reduction in peak electricity demand brought about from energy efficiency improvements will have a clear impact on the cost/benefit (CBA) of each of the options and must be included in the analysis. Excellent work by the University of Otago shows up to an 80% reduction in peak electricity demand through energy efficiency.⁶ Concept Consulting (for EECA) also quantify the financial benefit of demand reduction on infrastructure.⁷ This is a crucial argument that is totally ignored in the analysis and H1 proposals.

1-2. For your preferred option, how quickly should this change come into effect?

(Please select one)

- 12 months
 24 months
 36 months or more
 Not sure/No preference

Is there anything you would like to tell us about the reason(s) for your choice?

⁴ Ministry for the Environment. 2020. Marginal abatement cost curves analysis for New Zealand – Potential greenhouse gas mitigation options and their costs.

https://environment.govt.nz/assets/Publications/Files/marginal-abatement-cost-curves-analysis_0.pdf

⁵ Zero Carbon Hub, Sweett Group. 2014. Cost analysis: Meeting the Zero Carbon Standard.

https://www.zerocarbonhub.org/sites/default/files/resources/reports/Cost_Analysis-Meeting_the_Zero_Carbon_Standard.pdf

⁶ Jack. M., Stephenson, J., Anderson, B., 2021. Decarbonising NZ's energy system through demand-side intervention – Submission to Climate Change Commission advice consultation.

https://eprints.soton.ac.uk/448287/1/NZCCSubmission_Jack_et_al.pdf

⁷ Concept Consulting Group. 2018. <https://www.eeca.govt.nz/assets/EECA-Resources/Research-papers-guides/Concept-electricity-efficiency-report.pdf>

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NZGBC calls for clear advice from MBIE detailing the plans for implementing the BfCC programme and how the proposed H1 changes will align with this schedule.

The consultation sets out three possible implementation timeframes of 12, 24 and 36 months with the suggestion (alluded to in the consultation document) that the tougher Options 2 and 3 would require longer lead-ins.

NZGBC supports a stepped approach/trajectory and our preferred timeframe depends heavily on the relationship between these proposals and the BfCC proposals. We had expected that the first BfCC cap might be implemented by 2024 at the latest, noting the UN recommendation to halve greenhouse gas emissions by 2030. If the BfCC is to be implemented in a timely manner, then the longer lead-in (36 months) would likely coincide with (or very shortly precede) the first BfCC cap.

Our preferred approach would be:

- a) Option 2 within 24 months, on the proviso that there is clear commitment that this would be shortly followed (i.e., within 12 months) by the first BfCC step (modelling only/no targets) and the second BfCC cap (30kWh/m² heating demand) 12 months after that. It is critical that the H1 section of the Building Code and the BfCC programme should be aligned and clearly “talk to each other” to avoid any confusion and frustration for industry.
- b) Failing the communication of clear timeframes to deliver BfCC, then NZGBC’s preferred approach would be Option 3 within 36 months, with the longer lead in time to allow industry to gear up for the necessary changes in traditional New Zealand housebuilding methods.

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1-3. If there are factors we should consider to progressively phase in your preferred option, please tell us below.

These factors may include material availability or affordability, regional differences in the requirements, different building typologies or other considerations.

As noted in our response to question 1-1, NZGBC favours a rapid transition towards performance modelling as proposed by the BfCC programme rather than fixed R-values.

While addressing insulation is a critical and welcome step for improving the Building Code, NZGBC has concerns that the following issues have not been included in the H1 proposals and we see a real need for further work on these:

- Neither airtightness nor thermal bridges are addressed. These become proportionately more important as insulation levels ramp up.
- Ventilation, interstitial condensation and surface moisture are not addressed. The current proposals risk perverse outcomes if these factors are not considered alongside insulation.
- Other elements such as heating, hot water efficiency and lighting efficiency which also affect energy use and carbon emissions are not mentioned.
- Assessing the risk/mitigating overheating for compact dwellings should also be addressed.

NZGBC notes that these issues may be addressed by the BfCC programme, but the two programmes must be well aligned and able to communicate this. We would appreciate further clarification and/or confirmation of how these issues will be addressed and by which team/programme.

The CBA work carried out by BRANZ for MBIE demonstrates the problems with fixed R-values. The apartment shows very low to negative cost-benefit-ratios: its compact form factor means it inherently has a good thermal performance meaning additional insulation is less beneficial. A performance-based approach would allow more compact typologies such as apartments to have lower insulation levels.

The R-values proposed for Option 3 also increase risk of overheating in compact dwellings such as apartments, and assessing the risk of (or mitigating) overheating is not included in the H1 proposals.

Furthermore, the elemental CBAs (cost benefit of each measure) show wide variation: a performance target (kWh/m²) would allow the market to come up with the most cost-effective package of insulation measures for a particular building which would significantly improve the economics.

While noted in the consultation we would like to reiterate the importance of aligning improvements in insulation levels with changes to the Building Code clauses and Acceptable Solutions/Verification Methods relating to interstitial condensation, surface moisture and ventilation. The current common New Zealand practice, for example, of insulating concrete cladding internally will increase moisture risk if not addressed.

Finally, the thermal modelling carried out by the CBA shows the limitations of improving insulation alone. The modelling did not show significant improvements in comfort levels (% time above a threshold temperature) and this demonstrates the need to improve other aspects of the building code such as thermal bridges, airtightness, insulation and space-heating (both provision and efficiency).

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1-4. Do you support issuing the new editions of H1/AS1 and H1/VM1 as proposed?

H1/AS1: Yes, I support it No, I don't support it Not sure/no preference

H1/VM1: Yes, I support it No, I don't support it Not sure/no preference

Is there anything you would like to tell us about the reason(s) for your choice?

NZGBC strongly suggests that MBIE publish further proposals that clarify how the immediate changes proposed to H1 will dovetail with BfCC.

NZGBC makes the following suggestions for the H1 proposals:

- a) Indicate that the R-values being put forward in these H1 changes will become R-value minimums (i.e., no element to be allowed to drop below these values) in any future updates to the Building Code brought about under the BfCC programme. This is similar to the 'limiting fabric parameters' in the England and Wales (E&W) Building Regulations which have minimum R-values similar to Option 2 as shown in the table below. This would have the effect of not allowing performance to worsen under the BfCC performance-based approach. Under this approach we would recommend Option 2.

Element	E&W minimum R-value average for each element	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
Roofs	5.0	R5.0	R5.4	R6.0	R6.6	R7.0	R7.4
Walls	3.25	R2.4	R2.6	R2.8	R3.2	R3.5	R3.8
Gnd floor	4.0	R1.9	R2.2	R2.5	R2.8	R3.2	R3.6
Window	0.5	R0.39	R0.42	R0.45	R0.49	R0.55	R0.62

- b) Consider how the first BfCC cap could set higher standards, equivalent to the proposed second cap for the warmer New Zealand climates, i.e., 30 kWh/m² in climate zone 1 and 2, and halfway (for example, 45 kWh/m²) for climate zones 3 and 4.

On a related note, the R-values published as being representative of the England and Wales requirements understate the insulation values required. MBIE has published the limiting fabric values. These are the R-values that no element, on average, can drop below.

However, the England and Wales approved document (equivalent to Acceptable Solutions) is performance based and requires the home to have lower heat demand than an equivalent reference home. The reference home has the following R-values (adjusted to account for the 1.15 'fiddle factor' in the UK code and shown compared to the limiting fabric values):

Proposal 1: Energy efficiency for housing and small buildings

	Limiting fabric values for E&W published in the MBIE consultation	Actual required R-values to meet E&W BC compliance
Roofs	5.0	6.7
Walls	3.25	4.8
Gnd floor	4.0	6.7
Window	0.5	0.6

NZGBC also notes the following points relating to R-values for consideration:

- a. Window R-values should be real R_{window} values, not default values based on standard window sizes. The window industry has the WEERS system that allows window suppliers to provide an average R_{window} value for the home and this should be the target. This will disincentivise the use of window suites with excessive framing.
- b. If R1.3 is to be retained for ground floors in the warmer climates, or allowed under the calculation method, this should be the *calculated* slab R-value not the current situation where an un-insulated slab is deemed to satisfy the R1.3 requirement.
- c. Given recent evidence from BRANZ, R-value calculations guidance for walls must be updated to reflect the higher quantities of timber found in practice in NZ walls. A default assumption of 30% should be assumed where no evidence is provided to the contrary.
- d. Higher R-values in non-traditional (non-timber) construction. Options 2 and (especially) 3 may present risks for medium and higher density housing if thermal bridging and interstitial condensation are not addressed. Concrete clad apartment buildings typically have insulation applied to the inside face of the concrete and the risk of interstitial condensation will increase if this practice continues with higher insulation values. We strongly recommend measures are put in place to push developers towards external insulation of concrete and metal frame buildings.

Acceptable Solution

2.1.4.1 Acceptable methods for determining the thermal resistance (R-values) of building elements are contained in NZS 4214.

We would like to see the Building Code migrate from NZS 4214 to the international standards ISO6946 and ISO13370. These would bring the calculations of thermal performance to match the European standards instead of having our own unique New Zealand methods of calculations. The window and glass industry has already changed over to ISO10077-1 and ISO10077-2 for the calculation of window performance (WEERS) and this would make the calculations compatible. Again, we would expect the BfCC programme to harmonise with international standards and this should be done as part of the H1 update.

2.1.4.7 Concrete slab-on-ground floors are deemed to achieve a construction R-value of 1.3 m²·K/W, unless a higher R-value is justified by calculation or physical testing.

The above clause should be removed. R-values for slabs should be calculated according to the international standard.

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

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Amend this to reference the window-to-floor area (WTF) rather than window-to-wall (WTW) area. The ratio of WTF area is more closely linked to thermal performance and reduces perverse outcomes with apartments that often have small external wall areas relative to the floor area.

Appendix D.1

This section on the calculation of window R-values should be re-written to exclude the calculation of window R-values (R_{window}) based on standardised frame sizes. The schedule R-value should be based on the area-weighted R-value of all the glazing in the home as calculated by the WEERS system (this system is fully available to all window suppliers in New Zealand). This would take into account the relatively poor performance of windows with high quantities of framing relative to glazing in the actual home. Remove the performance tables in Subsection D.1.3.

Verification Method

D.1.6 Thermal zones

Noting the BfCC proposals where thermal modelling of homes will become standard (hopefully) we believe that full dynamic multi-zone modelling of homes will be too onerous for the majority of mainstream housebuilders.

MBIE should amend this section to allow simpler single zone models of homes, such as PHPP (and NZGBC's ECCHO tool based on PHPP), that have been shown to be compliant with ASHRAE 140. NZGBC notes that single zone models may not be best placed to assess overheating risk in particular rooms/zones, but they are adequate to assess overall heating and cooling loads. The UK Standard Assessment Procedure is a monthly single zone modelling tool used for compliance with the UK Building Code and is considered to be adequate for homes.

NZGBC implores MBIE to consult with a number of industry stakeholders between now and release of this Verification Method to agree on a 'National Calculation Methodology' for homes that would include thermal demand (heating/cooling) but also overall energy and carbon emissions. This will be required for BfCC and it would be beneficial to align these H1 code changes with that model to allow the sector to quickly get up to speed with modelling homes.

D.2.2 Windows

Amend this to reference the window-to-floor area (WTF) rather than window-to-wall (WTW) area. The ratio of WTF area is more closely linked to thermal performance and reduces perverse outcomes with apartments that often have small external wall areas relative to the floor area.

Proposal 1: Energy efficiency for housing and small buildings

1-5. What impacts would you expect on you or your business from the proposed options?
These impacts may be economic/financial, environmental, health and wellbeing, or other areas.

There will be initial cost implications in implementing the changes we must have for our homes and buildings and the NZGBC recognises that this may be unwelcome for some, especially given the acute pressure New Zealand's housing market is currently under.

Research and experience from other countries that have made improvements to their building standards show that while costs may initially be high when changes to regulations are introduced, they generally fall again once new practices become embedded and when increased demand and supply of new products is brought on by wide-scale change. Research from the UK in 2014 showed that the cost of building to the Zero Carbon Standard for homes roughly halved from cost estimates published in 2011⁸ (please also see our response above at 1-1 regarding learning rates).

The key driver of the proposed changes is to improve energy efficiency of new homes and make them warmer, dryer and easier to heat and cool. While there will be some additional upfront cost involved, lifting the standards of our homes and improving energy efficiency will reduce energy bills over the life of the home. In addition to easing pressure on household budgets, the potential avoided costs in relation to future hospital admissions and ongoing health issues caused by damp, cold homes, as well as the disadvantages to education and employment opportunities that are caused by inadequate housing, are almost incalculable.

The Intergovernmental Panel on Climate Change has set out that the world needs to halve emissions by 2030. As we have set out in our submission, the improvements proposed in the options 2 and 3 present some of the better carbon reduction opportunities for Aotearoa, significantly better than building more renewable generation. The technology for these carbon reduction steps is readily available now and will help free up electricity that other sectors that need it such as the transition to electric vehicles.

⁸ Zero Carbon Hub, Sweett Group. 2014. Cost analysis: Meeting the Zero Carbon Standard.
https://www.zerocarbonhub.org/sites/default/files/resources/reports/Cost_Analysis-Meeting_the_Zero_Carbon_Standard.pdf

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1-6. Is there any support that you or your business would need to implement the proposed changes if introduced?

Yes

No

Not sure/no preference

Is there anything you would like to tell us about the reason(s) for your choice?

NZGBC notes that industry will need reasonable lead-in time and excellent preparation ahead of any changes. There must be regular, clear communication from Government regarding all aspects of the changes and the timeframes in which they are to occur.

An information and training programme should be tailored to each impacted group, including architects, designers, builders, manufacturers and suppliers, and rolled out across New Zealand through a range of mediums to ensure that the changes are both widely understood.

NZGBC welcomes the opportunity to work with Government to assist with information and training opportunities for industry.

Thank you