AUSTRALIAN MODERN BUILDING ALLIANCE

Safe and sustainable construction with polymers

Information Sheet 4:

Energy efficiency in the NCC 2022 and beyond

This information sheet provides a summary of energy efficiency performance recommendations made by AMBA for consideration by the Australian Building Codes Board (ABCB) in the development of the National Construction Code (NCC) 2022 and beyond.

Towards low-energy buildings

AMBA made a submission following the ABCB's invitation to provide input to this scoping study and applauds the energy efficiency focus for the NCC 2022 – particularly in relation to domestic buildings.

We support a significant increase in the integration of changes to the NCC that will lead to low-energy buildings, and believe the NCC 2022 should strive for NatHERS 7 Star thermal performance construction.

To further improve energy efficiency in residential buildings:

- there should be a greater focus on air leakage and thermal bridging (where most energy in buildings is currently wasted)
- improvements and compliance to code should be embedded in the NCC 2022.

Contemporary insulation and prescriptive adoption of international best practice is key to achieving this.

NatHERS 7 Star thermal performance

AMBA supports the decision to increase the minimal thermal performance rating in the NCC to NatHERS 7 Star and hopes that the Queensland Government will eliminate existing exemptions for climate zones 1 and 2 in the NCC 2019.

The NatHERS insulation toolbox must be updated to reflect modern insulation materials and their properties – including polyisocyanurate (PIR) or phenolic board and polyurethane spray foam (SPF). These are manufactured in Australia and used internationally to insulate low-energy buildings.

Although NatHERS estimates the potential heating and cooling energy use of a house, a recent CSIRO report notes that the current model in NatHERS for air infiltration underestimates its impact on building energy usage.[1]

While AMBA supports efforts to improve this NatHERS modelling, we acknowledge it is unlikely to be solved before the release of the NCC 2022.

Because of this, we strongly recommend the NCC 2022 adopt prescriptive methods currently used in California to reduce air infiltration (leakage) and building energy use (see *Addressing building sealing (air leakage)* for more).

Addressing building sealing (air leakage)

Airtight construction is the most important pillar of an energy efficient building (thermal bridges and moisture control being the others).[2]

A CSIRO study found that over 50 per cent of houses were excessively leaky beyond the level of assumed airtightness in the NatHERS modelling software.[3]

NatHERS currently only manages air leakages in buildings during the design and post-occupancy phases. It ignores:

- air leakage through building elements/products, and
- gaps that need to be sealed during construction (variable quality of workmanship and cracks/holes that contribute to air leakage).[4]

Addressing the issue of air leakage through building elements/products, traditional fibrous insulation is difficult to install without defects such as air gaps,[5] and as such needs to be used with a separate air barrier such as house wrap.

By comparison, modern insulation materials such as SPF and PIR board insulation are both considered air barriers under Californian prescriptive codes, and don't require the installation of a separate air barrier like fibrous insulation.

AMBA strongly recommends the ABCB consider following California by adopting mandatory use of exterior rigid insulation board on walls in the NCC 2022.

This will provide a continuous layer of insulation external to the frame that simultaneously improves overall thermal performance (more closely aligning it with other developed countries) and reduces air leakage and thermal bridging (see *Addressing thermal bridging* for more).

While the NCC 2019 contains a new target on airtightness (10 ACH_{50}), AMBA recommends the ABCB investigate a more stringent target of 5 ACH_{50}.

This would result in significant energy savings, as the energy demand generated by air leakage is proportional to the reduction in the air infiltration rate.[6]

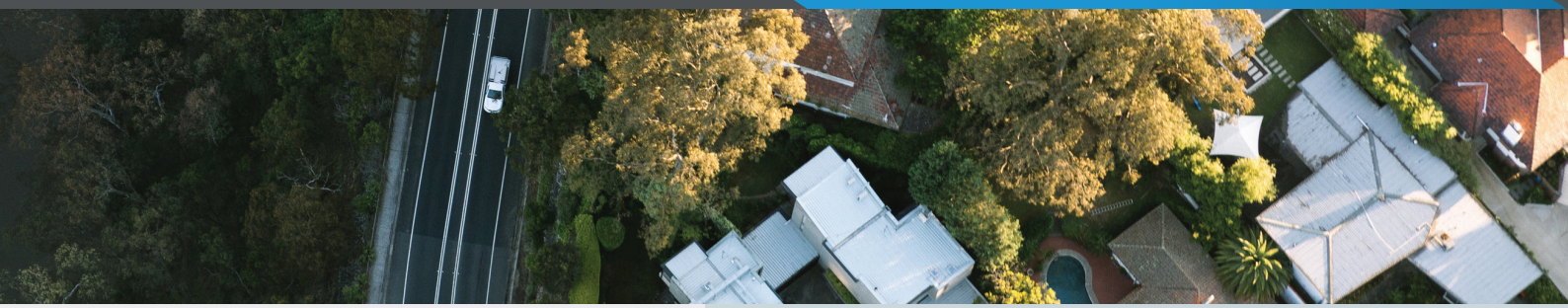
Addressing thermal bridging

Eliminating thermal bridging is a way to lower heating and cooling demand and "improve thermal comfort".[7] It's also important for controlling possible condensation problems, and can be managed by sufficient insulation external to the building's frame.

The NCC 2019 mandates the use of thermal breaks on certain buildings using lightweight metal framing to reduce thermal bridging.

While AMBA applauds this change in the NCC 2019, we recommend that the use of thermal breaks be used on all lightweight buildings, as even timber frames are an order of magnitude higher in conducting heat than rigid insulation board.

If the ABCB mandates the use of exterior insulation board in addition to insulation between wall studs (the proven prescriptive method used by the California Building Energy Standards), it will address both thermal bridging and air leakage issues in our buildings.



‘As built’ versus ‘as designed’

There is a major disconnect between the energy efficiency of Australian homes ‘as designed’ or ‘as planned’ by software such as NatHERS and BASIX, and their true ‘as built’ energy efficiency performance.

This can be related to elements including workmanship (excessive air leakage and poorly installed insulation) and trade-offs on the thermal performance of one building component against another (e.g. windows versus walls).[8]

Consequently, this performance can have a significant negative impact on the NatHERS Star rating of our residential buildings.

For example, a study prepared for the Department of Resources, Energy and Tourism demonstrated that the combination of uncontrolled air infiltration with poorly installed insulation can impact the ‘as built’ NatHERS rating of a building by up to 1.7 stars.[9]

So, while NatHERS is a useful tool providing guidance on optimising the thermal performance of a home, it can’t guarantee that ‘as designed’ equates to ‘as built’ for our homes.

Reasons for this include:

- an outdated material toolbox
- practical limitations to the modelling, and
- a lack of mechanisms to address variable workmanship.

AMBA urges the ABCB to consider improvements to the NCC 2022 to address workmanship in relation to the installation of insulation, air barriers and vapour barriers.

Compliance pathways

While AMBA supports the NCC’s move towards a performance code, we do not support the downgrading of the deemed-to-satisfy compliance pathways for the thermal comfort performance of small buildings, alterations or additions.

We believe that NatHERS ‘as planned’ modelling must first demonstrate it is equal to ‘as built’ through benchmark energy consumption of real buildings before we support this downgrading.

However, we note this is unlikely to happen without a quality control system for the installation of insulation and air barriers.

We therefore recommend the ABCB consider introducing additional deemed-to-satisfy provisions that make it easier for builders to achieve an airtight, energy efficient envelope.

AMBA supports efforts to quantify existing performance requirements in the NCC, and mechanisms to ensure all NCC compliance pathways achieve minimum performance levels where ‘as designed’ equals ‘as built’ (e.g. benchmarking planned against real buildings).

Although AMBA understands the need to develop ‘whole-of-house’ tools to address energy efficiency performance, we caution this may result in expanded compliance pathways that could increase the complexity of the NCC.

We believe we should always first focus on reducing the energy demand of a building by enhancing the efficiency of its envelope before investing in renewables – the German principle of ‘Energiewende’ (energy efficiency first).[10]

The single biggest opportunity for energy saving in a home (space conditioning) is best addressed through the use of insulation in the building envelope, rather than offsetting with onsite renewable energy generation.

This is because the lifetime of solar panels is limited to 15–25 years, and they require regular maintenance. Comparatively, insulation continues to perform for the lifetime of the building (50+ years) without the need for maintenance or replacement.

Summary of recommendations

For the NCC 2022, AMBA:

- supports incremental changes to the NCC leading to low-energy buildings, and the evolution of the NCC to a performance code
- recommends NatHERS 7 Star level as the minimum energy efficiency measure in residential buildings
- believes building envelope performance shouldn't be traded off against services or onsite renewable energy generation
- does not think it is time to downgrade the deemed-to-satisfy compliance pathway to small buildings, alterations or additions
- supports improvements to energy modelling software and the introduction of BASIX heating and cooling limits into NatHERS
- advises an update of the NatHERS toolbox to include contemporary insulation options
- recommends the ABCB investigate a target of 5 ACH_{50} for air leakage and the extension of thermal bridging provisions to all lightweight construction
- urges improvements in the NCC 2022 to address workmanship in relation to the installation of insulation, air barriers and vapour barriers
- recommends the ABCB adopt proven prescriptive methods to reduce air filtration, thermal bridging and energy use – as a minimum, consider adopting the mandatory use of exterior rigid insulation board in the NCC 2022.

References

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