ABCB

Summary of changes

Energy efficiency and condensation management

NCC 2022 public comment draft (stage 2)

2021

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Introduction

This document provides background information on the proposed NCC 2022 energy efficiency and condensation management provisions. This information is provided to inform and support public comment.

This is the second tranche of NCC 2022 public consultation (referred to as Public Comment Draft 2 or PCD2). The first tranche was released in May/June 2021 and covered all other proposed changes to NCC 2022.

The proposed NCC provisions in PCD2 include:

- new residential energy efficiency provisions (covering Class 1 buildings, Class 2 sole-occupancy units and Class 4 parts of buildings)
- amendments to the commercial energy efficiency provisions (covering Class 2 common areas, Class 3 buildings and Class 5 to 9 buildings)
- amendments to the condensation management provisions for both residential and commercial buildings.

In relation to the proposed residential energy efficiency provisions, further information about corresponding changes to the Nationwide House Energy Rating Scheme (NatHERS) can be found on the NatHERS website: nathers.gov.au.

Energy efficiency

Overview

The energy efficiency provisions in the National Construction Code (NCC) support the sustainability objective of the Australian Building Codes Board (ABCB), which is outlined in its Intergovernmental Agreement signed by the nine Australian Governments.

After a major stringency increase for commercial buildings in NCC 2019, in mid-2019, Building Ministers directed the ABCB to develop enhanced residential energy efficiency provisions informed by the former COAG Energy Council's Trajectory for Low Energy Buildings policy. This work supports the Australian Government's commitment under the Paris Agreement to reduce greenhouse gas emissions, and the National Energy Productivity Plan. These policies all include a focus on the role that buildings play in reducing emissions, improving energy productivity, reducing household energy bills, helping to transition to greater use of renewable energy and zero emissions vehicles.

To instigate this work, the ABCB released a scoping study for public comment from late July to early September 2019. The results of this consultation were later published in an outcomes report.

The scope of changes proposed for the NCC 2022 residential energy efficiency provisions included:

- a stringency increase in the thermal performance of homes to the equivalent of a 7-star NatHERS energy rating (current level is equivalent to 6-stars NatHERS)
- introducing a whole-of-home approach with an annual energy use budget for the regulated equipment in the home (i.e. space conditioning, heated water, lighting and swimming pool & spa pumps).

For the whole-of-home approach, the draft provisions for Class 1 buildings are based on a level of stringency equivalent to 70 per cent of the annual energy usage of these benchmark appliances:

- a 4.5-star heat pump for heating and cooling, rated under the 2012 Greenhouse and Energy Minimum Standards (GEMS) determination;
- a 5-star instantaneous gas water heater, rated under the 2017 GEMS determination; and
- a lighting power density of 4 W/m2.

The provisions for Class 2 sole-occupancy units (SOUs) and Class 4 parts of buildings are based on 100 per cent of the energy usage of the benchmark appliances in the Class 1 provisions.

This less stringent approach is considered more appropriate for Class 2 SOUs and Class 4 parts of buildings given the difficulty that can be encountered in installing on-site renewable energy systems (as part of the compliance solution) on those buildings.

The proposed residential energy efficiency changes for NCC 2022 have been subjected to regulation impact analysis. The results of this analysis are published in a separate Consultation Regulation Impact Statement (CRIS), which will be released later during the public comment period and have a different closing date for submissions.

The NCC is Australia's performance-based building and plumbing code. It sets the minimum technical requirements for the construction of new buildings (and new building work in existing buildings). As a performance-based code, a building, plumbing or drainage solution will comply with the NCC if it satisfies the relevant Performance Requirements. That is to say that the Performance Requirements set the compliance level and there are a number of optional compliance pathways that can be used to demonstrate compliance with the Performance Requirements, such as Deemed-to-Satisfy (DTS) Provisions, Verification Methods and Performance Solutions.

The residential energy efficiency provisions proposed for NCC 2022 include changes to both the Performance Requirements and compliance options.

Changes to the energy efficiency provisions for commercial buildings are also proposed for NCC 2022, although these are not as significant as the changes proposed for residential buildings. The following sections describe the key elements of the proposed NCC 2022 energy efficiency provisions for both residential and commercial buildings in more detail.

Quantification of Performance Requirements

For Class 1 dwellings in NCC Volume Two, the two current Performance Requirements, P2.6.1 Building fabric and P2.6.2 Services, have been quantified. They take into account the proposed overall stringency increase and the introduction of whole-of-home requirements. This was completed under the ABCB's separate Quantification of Performance Requirements project. Background information on this project can be found on page 7 of Public Comment Draft 1.

DTS elemental provisions

The most significant changes appearing in the proposed residential energy efficiency provisions in PCD2 are in relation to the DTS elemental provisions. These changes are designed to:

- align with 7-star NatHERS thermal performance

- introduce the whole-of-home annual energy use budget
- address legacy issues, such as thermal bridging.

Alignment across NCC compliance pathways is important to achieve consistent building outcomes. For residential energy efficiency, NatHERS star ratings are used as a benchmark for determining the minimum requirements. This is why stringency increases for residential buildings are often expressed as NatHERS star increases. For example, 5 stars to 6 stars in 2010.

However, NatHERS is a dynamic simulation tool while the DTS elemental provisions are prescriptive requirements, which presents some challenges for alignment. For example, as a 'recipe' approach, the elemental provisions specify a minimum R-Value for a typical wall or roof. However, this is not a limitation of NatHERS. A 7-star NatHERS energy rating represents the overall design with different elements combining to achieve the 7 stars.

To align the DTS elemental provisions to NatHERS, the proposed building fabric requirements are derived from over 35,000 parametric NatHERS runs with over 5,000 variations to building element properties in each climate zone. The parametric runs were simulated to identify the range of conditions to achieve a 7-star energy rating. Deriving the requirements in this way helps to ensure a consistent performance level between the DTS elemental provisions and NatHERS energy rating for most typical construction types in Australia. The typical construction types are based on the CSIRO's portal data of NatHERS assessed dwellings. Importantly, the provisions are also determined using the updated NatHERS climate files and star bands.

Many existing building fabric factors in NCC 2019 have been retained in the proposed changes, such as roof/wall colour and roof ventilation. However, they are updated to better align with a 7-star NatHERS level. New factors proposed for NCC 2022 include wall heights, sub-floor walls and a set of new glazing considerations that represent improved design and alignment with NatHERS.

An updated glazing calculator for Class 1 and Class 2 buildings separately is provided[1] for the updated glazing provisions with newly introduced factors.

DTS NatHERS compliance pathway

In general, there is a one-star increase for target NatHERS star ratings under the proposed changes for NCC 2022, reflecting the overall proposed stringency increase.

[1] See the Related Documents section of the NCC 2022 Consultation Overview page

Under the proposed changes, Class 1 dwellings will be required to achieve 7-stars NatHERS and the corresponding heating and cooling load limits. The existing credits in climate zones 1 and 2 have been retained for a dwelling with an outdoor living area and/or at least one permanently installed ceiling fan, but with the target NatHERS rating increased by one star. For example, a dwelling with an outdoor living area previously needed to achieve 5.5 stars under NCC 2019. It will need to achieve 6.5 stars under the proposed NCC 2022 changes. Similarly, Class 2 dwellings will be required to achieve an average of 7 stars and minimum of 6 stars to reflect the one-star stringency increase.

It is worth noting that the NatHERS Administrator has updated its climate files and re-calibrated its star bands for implementation in 2022. Consequently, the heating and cooling load limits have been updated in the ABCB Standard[2].

In addition to NatHERS ratings, other supplementary DTS Provisions required in NCC 2019 will still apply to the NatHERS compliance pathway under the proposed NCC 2022 provisions. The NatHERS Administrator is also proposing to incorporate thermal bridging measures that align with the thermal bridging requirements in the proposed NCC 2022 DTS elemental provisions.

The NatHERS Administrator is also working on expanding NatHERS beyond thermal comfort to incorporate whole-of-home requirements to align with the proposed NCC 2022 provisions. A reference to the future NatHERS whole-of-home software is included in PCD2.

Further information about proposed NatHERS changes to support NCC 2022 can be found on the NatHERS website.

Thermal bridging

In NCC 2019 it was clarified that thermal bridging must be considered when calculating Total R-Values for commercial buildings. NCC 2022 extends this requirement, in part, to residential buildings.

Thermal bridging occurs when a framing member has a lower thermal resistance (R-Value) than the insulation placed in between them. The impact of the thermal bridging depends on the area of the framing and the difference in the R-Value of the frame and the insulation. Throughout the world, energy efficiency regulations and house energy ratings take into account the bridging of thermal insulation by structural framing members when setting minimum building fabric performance requirements. Steel frames without thermal bridging mitigation can be particularly susceptible to the effects of thermal bridging.

[2] See the Related Documents section of the NCC 2022 Consultation Overview page

Note, the thermal bridging mitigation measures proposed for NCC 2022 do not seek to totally eliminate thermal bridging by all framing. Instead, it proposes to reduce the thermal bridging of steel frames so the total R-Value of an element with steel framing is:

- no less than 95% of that for a timber-framed element for insulation R-Values of R3.0 or less
- no less than 90% of that for a timber-framed element for insulation R-Values above R3.0.

This differential approach reflects the diminishing returns of insulation at higher R-Values.

Air movement and ceiling fans

Air movement is allowed for in the proposed NCC 2022 residential energy efficiency provisions in two ways. Firstly, by requiring a minimum number of ceiling fans in climate zones where this reduces the need for artificial cooling. Secondly, by adjusting the glazing target for summer solar heat gain to allow higher solar heat gains when windows with a greater openable area are used. The latter provides a more significant bonus for air movement than provided in NCC 2019.

The benefits of air movement provided by higher areas of openable windows in the DTS elemental provisions are proposed to be increased compared to NCC 2019. This is intended to reflect the benefits of air movement found in NatHERS simulations. Ceiling fans also enhance comfort in summer by providing air movement. NatHERS ratings show use of ceiling fans leads to significant cost-effective increases to star rating in hot climates, and smaller, but still cost-effective improvement in warm climates. As such, it is proposed that ceiling fans be required in the bedrooms and living areas of dwellings in climate zones 1, 2 and 3, and in the living areas of dwellings in climate zone 5.

Whole-of-home approach

A holistic approach is proposed for residential buildings by introducing a collective energy use budget for air-conditioning, heated water system, lighting, and swimming pool and spa pumps. This ‘whole-of-home’ approach enables trading between the efficiency of the equipment to achieve the annual energy use budget. On-site renewables may also be installed to offset the energy consumption of the equipment, but not the building fabric.

To determine if the combination of appliances selected needs to be supplemented with on-site renewable energy, the efficiency factors of potential appliance combinations are published in a new ABCB Standard referenced in the NCC. The ABCB will also provide a simple whole-of-home

calculator[3] to assist in quickly determining the requirements. Details of the whole-of-home modelling assumptions and the methodology used to create the proposals are also provided as supporting information for PCD2.

Class 2 sole-occupancy units (SOUs)

New DTS elemental provisions and a Verification Using a Reference Building (VURB) pathway for the SOUs of Class 2 buildings is proposed. As with the changes for Class 1 dwellings, the building fabric thermal efficiency for Class 2 buildings is based on a 7-star NatHERS rating equivalence. The draft provisions also propose introducing an annual energy use budget for the SOUs of Class 2 buildings.

The annual energy use budget approach is the same as Class 1 buildings, although not as stringent. The proposed VURB pathway is similar to the existing J1V3 pathway for commercial buildings. It will allow a Class 2 building to show compliance via a single energy model while ensuring that no one SOU has an unacceptable heating or cooling load.

Changes for commercial buildings

Minor changes are being proposed in Section J for Class 3 and 5 to 9 commercial buildings. These changes do not represent any change in stringency. Rather, they are intended to clarify some of the existing provisions introduced to NCC 2019 and, in some instances, better align the NCC with referenced documents.

Distributed energy resources (DER)

New provisions are being proposed to enable Class 2, and 5 to 9 buildings to be easily retrofitted with DER. DER include photovoltaic (PV) panels, battery storage systems and electric vehicles (EV). The changes are intended to “future proof” buildings for retrofitting DER, which in many instances are likely to become business-as-usual equipment for commercial buildings in future. The provisions do not require EV charging equipment, but are designed to make it much easier to install such equipment as EVs become more common over the coming decades.

[3] See the Related Documents section of the NCC 2022 consultation Overview page

Summary of changes to Volume Two and Housing Provisions

The proposed changes to the energy efficiency provisions for Class 1 buildings are set out in Table 1. Table 1 includes some key questions for which views are being sought. Responses to these specific questions would be appreciated in addition to any general comments on the draft provisions.

As part of the restructure of NCC 2022, energy efficiency DTS elemental provisions in Volume Two are included in the Housing Provisions. Further information about the restructure of NCC 2022 can be found on pages 2 to 6 of the NCC 2022 PCD1 Supporting Information.

Table 1 Summary of proposed energy efficiency changes for Class 1 buildings

NCC Reference	Changes and commentary
Part H6 Energy efficiency H6O1 and H6F1 Objectives and Functional Statements	The Objectives and Functional Statements are expended to reflect the policy intent outlined in the Trajectory. Please note that the Objectives and Functional Statements are explanatory information, that is non-mandatory and informative.
H6P1 Building fabric H6P2 Energy usage	The existing Performance Requirements for Class 1 dwellings in Volume Two, P2.6.1 building fabric and P2.6.2 Services, were quantified to account for the overall stringency increase and the whole-of-home requirements.
H6V2 Verification using a reference building (VURB)	The VURB has been updated to reflect the stringency increase under the proposed DTS elemental provisions. Operating schedules for heating and cooling, thermostat settings, and maximum occupancy are included to provide more clarity for modelling. The Class 1 VURB only covers the building fabric requirements. This is different to the VURB for Class 2 SOUs (Volume One). To satisfy the whole-of-home requirements, DTS elemental provisions, H6P2 or other whole-of-home options can be used.

Specification 42 Using house energy rating software	Due to the restructure of the NCC undertaken for improved useability, the NatHERS compliance option is in Specification 42 in PCD2. As previously mentioned, the proposed requirements for heating and cooling loads are updated to reflect the one-star stringency increase. Credits for outdoor living areas and ceiling fans are retained with a one-star increase. NatHERS whole-of-home software is included in PCD2 for potential referencing. **Consultation question** Should the credits in climate zones 1 and 2 be kept to reward a dwelling with an outdoor living area and/or having at least one permanent ceiling fan installed?
Housing provisions (DTS elemental provisions) Part 13.2 Building fabric	Newly proposed insulation requirements have a different structure to the current NCC 2019 provisions. Instead of specifying minimum R-Values to cover all cases, a broad range of building element properties and R-Values (to produce acceptable performance) are presented in a series of look-up tables. This will save practitioners from needing to calculate the Total R-Values themselves. **Consultation question** The proposed insulation requirements can be simplified by reducing the number of options provided in the look-up tables. However, that means other compliance options, such as NatHERS, VURB or a Performance Solution, need to be used in those circumstances. Would it be preferable to simplify the tables with less combinations for options?

13.2.3 Roof	Under the new structure of these provisions, minimum R-Values for roof insulation are listed in tables for two types: pitched roof with flat ceiling and flat roof for the 8 NCC climate zones. Minimum R-Values are determined by factors including roof ventilation, reflective insulation, under-roof insulation and solar absorptance in the look-up tables. There is a cap for solar absorptance values in climate zones 1 to 5 at 0.64 for roofs. However, higher solar absorptance values can still be used for cold climates. 13.2.3 requires mitigation of thermal bridging in steel-framed roofs. Several options are available to demonstrate that thermal bridging is mitigated, through either: meeting a minimum Total R-Value for a flat ceiling below a pitched roof, or meeting a minimum Total R-Value requirement for the roof in a flat, skillion or cathedral roof, or adding insulation between ceiling framing elements, adding a thermal break strip over the ceiling framing, or adding a continuous layer of insulation above or below the ceiling framing. The thermal bridging mitigation requirements are in addition to the existing thermal break requirements of Clause 13.2.3(6).
13.2.4 Roof lights	The roof light provisions are updated to align with the changes made to the roof light provisions in NCC 2019 Volume One.
13.2.5 External walls	The proposed wall insulation requirements focus on providing solutions based on the thermal mass of the wall. The wall insulation requirements are based on the dominant construction type for the climate zone:

	• brick veneer walls in climate zones 2, 4, 5, 6 and 7 • concrete block walls in climate zones 1 and 3; • framed lightweight walls in climate zone 8. Provisions for a second wall type with a different level of thermal mass are also provided. For example, framed lightweight walls are provided in climate zones 1 and 3. Minimum R-Values for different wall types in each climate zone are provided in look-up tables, in consideration of factors including solar absorptance, length of overhangs and wall height. There is a cap on solar absorptance values in climate zones 1 to 5 of 0.7 for walls. However, higher solar absorptance values can still be used in cold climates. Allowance for wall height is a new factor proposed for NCC 2022 which affects thermal performance. A higher wall is less shaded by a given overhang than a wall with a lower height. Similar to the thermal bridging requirements for roofs, for walls, thermal bridging requirements for steel-framed dwellings can be met by either achieving total minimum R-Values calculated in accordance with AS/NZS 4859.2 or by applying one of the thermal bridging mitigation options listed in the mitigation options tables. The thermal bridging mitigation requirements are in addition to the existing thermal break requirements of Clause 13.2.5(5).
13.2.6 Floors and subfloor walls	Proposed suspended floor insulation requirements are included in look-up tables showing subfloor wall height, whether reflective foil is installed under the floor and subfloor wall insulation.

	The most commonly used floor construction in Australia, as shown in CSIRO data, is waffle pod slab floors. It is the dominant floor construction in the cooler climates of Victoria and the ACT. In cooler climates, the use of a waffle pod slab instead of a concrete slab-on-ground will improve the NatHERS rating by around 0.4 stars. Hence, it is proposed to acknowledge the benefits of waffle pod slabs by requiring waffle pods in climate zone 6 to 8 under the DTS elemental provisions. The thermal bridging requirements for steel-framed walls can be met by either achieving total minimum R-Values calculated in accordance with AS/NZS 4859.2 or by applying one of the thermal bridging mitigation options listed in the tables. **Consultation question** Is the option for reflective foil installed under floors practical? If no, what are the concerns and alternatives?
Part 13.3 External glazing	The proposed external glazing, in general, uses the same structure and methodology as the current glazing provisions, but is modified to be better aligned with 7-stars NatHERS by introducing a set of new glazing factors: • level factor • bedroom factor • frame factor • hard floor surface factor • window openability . Winter and summer performance of glazing is calculated individually in the current requirements. The proposed new changes clearly separate winter and summer performance requirements.

	Winter and summer exposure factors are also updated to be better in line with 7-stars NatHERS.
Part 13.5 Ceiling fans	The existing air movement requirements in NCC 2019 are redundant in the new provisions. The air movement requirements are restructured and are included in the proposed changes to the glazing and ceiling fan requirements. Instead of air movement requirements, minimum ceiling fan requirements are proposed for bedrooms and daytime habitable spaces in climate zones 1 to 3, and in daytime habitable spaces in climate zone 5. **Consultation question** The modelling results show the benefits for having at least one ceiling fan in bedrooms for climate zones 1 to 3. A small bedroom may not be able to accommodate installing a ceiling fan. Hence, the proposed minimum ceiling fan requirements do not apply to a bedroom less than 10 m^2. However, this might favour small bedrooms unintendedly. Should at least one ceiling fan be installed if a room can accommodate it, even for floor areas less than 10 m^2?
Part 13.6 Whole-of-home energy usage	New Part proposed for NCC 2022 which requires the net equivalent energy usage of a building to not exceed a given allowance.
13.6.2 Net equivalent energy usage	Net equivalent energy usage is the overall energy usage of heating, cooling, heated water systems, and swimming pool and spa pumps (if applicable), minus installed capacity of PV. Various combinations of heating, cooling and heated water systems are included in the referenced whole-of-home energy efficiency factors Standard.

	The whole-of-home energy usage allowance for Class 1 dwellings is based on 70% of the benchmark appliances options (refer introduction). When calculating the net equivalent energy usage and the allowance, floor area adjustment factors account for different size of dwellings to provide a level playing field.

Summary of changes to Volume One

The proposed changes to the energy efficiency provisions in Volume One of the NCC are set out in Table 2. Table 2 also includes some key questions for which views are being sought. Responses to these specific questions would be appreciated in addition to any general comments on the draft provisions.

Table 2 Summary of proposed changes for energy efficiency for NCC Volume One 2022

NCC Reference	Changes and commentary
J1P2 (New building fabric of SOUs of a Class 2 building or a Class 4 part) and J1P3 (Energy usage of SOUs of a Class 2 building or a Class 4 part)	These two new quantified Performance Requirements are specific to the SOUs of a Class 2 building or a Class 4 part. They mirror the new quantified Performance Requirements proposed for Class 1 buildings in Volume Two in setting minimum standards for both the envelope of an SOU and the regulated equipment.
J1P4 (New Performance Requirement: Renewable energy and electric vehicle charging)	This new Performance Requirement requires buildings to have features to support the ease of retrofit of PV, EV charging equipment and energy storage equipment. They are supported by a new set of DTS Provisions in Part J9.
J1V1 (formerly JV1 NABERS)	This expands the number of building classifications that can utilise the NABERS methodology to demonstrate compliance with Section J.
J1V2 (formerly JV2 Green Star)	This aligns the NCC with current Green Star modelling methodologies, and reduces conflicts between the Green Star and J1V3 modelling requirements.
J1V5 (New VURB for Class 2 buildings)	A new pathway specifically for Class 2 buildings (both common areas and SOUs). It is based on the VURB pathway J1V3. Its intent is to allow for a single energy model for a Class 2 building to be used to demonstrate compliance. **Consultation question** Are the protections for individual SOUs sufficient?

NCC Reference	Changes and commentary
	The method prescribes that no single SOU can achieve a heating or cooling load more than 120% of J1P2. This sets a lower limit on envelope performance similar to the existing NatHERS pathway that requires that no SOU can achieve less than a 6-star NatHERS rating.
Specification 34 (formerly JVb Modelling parameters for VURB)	Changes to clarify some modelling parameters used to define the energy use of buildings following the VURB pathway.
Part J3 (New elemental provisions for Class 2 building or a Class 4 part)	These new provisions provide a DTS Provisions for Class 2 SOUs or Class 4 parts of buildings. They are based on alignment with a 7-star NatHERS benchmark for an individual SOU. These provisions align closely to the proposed provisions for Class 1 buildings for envelopes and appliances, with the following key differences: 1. The whole-of-home energy use stringency is set to allow compliance with less (if any) reliance on the use of PV panels. 2. The minimum thermal resistance performance for walls are on the basis of Total R-Value, not added material (bag) R-Value. 3. The only DTS pathway available for floors is for a concrete slab-on-ground. **Consultation questions** How many DTS wall-glazing compliance pathways should be made available? At present two are available: a combined whole-of-façade metric based on Total Façade U-Value and Façade Solar Admittance and separate values for opaque and glazed elements. The intent is to cater to both small (e.g. two storey walk ups), and large Class 2 buildings. Is it necessary to include solutions for timber-framed floors for Class 2 buildings?

NCC Reference	Changes and commentary
	Only concrete slab and Total R-Value solutions are presented for the SOUs of Class 2 buildings.
J4D7 (formerly J1.6 Floors)	Sets the minimum thermal resistance level for floor constructions for the common area of a Class 2 building and Class 3 to 9 buildings. When developing NCC 2019, it was not considered cost beneficial to increase the minimum R-Value requirement from the NCC 2016 level. However, a change the methodology by which thermal resistance was calculated to better account for the impact of soil and sub-floor airspaces, as well as the impact of the building's geometry was recommended. This change introduced an unintended consequence for buildings with a low floor area to perimeter ratio, which would commonly require under slab insulation to comply via the DTS. This is difficult to justify given the reduction in energy costs does not offset the increased cost of the insulation. The exceptions are Class 3, Class 9c or a Class 9a ward area buildings in climate zone 7 and all buildings in climate zone 8, where the addition of insulation was found to be cost-effective.
Part J9 (formerly J8 Energy monitoring and on-site distributed energy resources)	Updates include: 1. Clarifying electricity meters installed in buildings with a floor area greater than 2,500 m^2 for purposes of recording electricity consumption of an SOU are not required to provide sub-metering capability. 2. Expanding where sub-metering is required to include collecting the energy data related to the use of DER such as PV, EV and battery storage systems as part of the broader energy data consumption. 3. Introducing new provisions designed to make retrofit of DER equipment over the life of a building easier. These provisions require space to be left on electrical distribution boards for DER circuit breakers and for cable trays to connect distribution boards to car park spaces in Class 2

NCC Reference	Changes and commentary
	buildings. Class 2 buildings will also be required to install charge control devices to ensure EVs will only be charged when there is available electrical capacity in the building. Without this requirement, Class 2 buildings would be required to size their electricity supply to support 100% of car parking spaces being used to charge EV at times of peak demand. This would at least double the required electrical supply capacity for the building. **Consultation question** Are existing fire safety provisions sufficient for carparks where EVs are parked? EVs present a different type of hazard should they be involved in a fire within the building. ABCB Investigation has found that based on the available evidence (see report: Hazard Assessment of the impact of Electric Vehicles, available on request), the risk profile of a car park filled with 100% EV is equivalent to a carpark filled with 100% of conventional vehicles. On this basis no changes to existing fire safety provisions are proposed for carparks at this time. The ABCB will continue to monitor this issue as further information arises.
Specification 36 (formerly J1.2 material properties)	Specification 36 (previously Specification J1.2) provides thermal resistance values (R-Values) for commonly construction materials. It allows NCC users to calculate the thermal resistance of the building fabric when developing a DTS Solution for Part J4. An update is needed to Specification 36 because the airspace R-Values to align with AS/NZ 4859.2 (2018). The existing values in Specification 36 are based on an airgap average temperature of 10°C and temperature difference of 15°C between internal and external conditions. This does not reflect typical Australian conditions. AS/NZ 4859.2 (2018) uses a maximum temperature difference of 10°C. Updating the values by using the current AS/NZS 4859.2 (2018) method will remove the inconsistency between

NCC Reference	Changes and commentary
	the Specification and Standard. Thermal properties for medium-weight autoclaved aerated concrete were also added.
B1P1 (A new allowance for the addition of PV)	This makes explicit that a notional allowance of 0.15 kPa should be included when designing roof structural systems. This allows for the installation of PV without jeopardising the structural integrity of a roof. Note, this requirement will not mean all roofs will be able to accommodate PV without modification. In some instances the points of connection between roof sheets and trusses will need to be reinforced as part of the installation of PV panels.
Definition of a "reference building"	The thermal comfort requirement for buildings using the J1V1, J1V2 and J1V3 pathways is set at an absolute level (i.e. it must be ensured "*in the proposed building, a thermal comfort level of between a Predicted Mean Vote of -1 to +1 is achieved across not less than 95% of the floor area of all occupied zones for not less than 98% of the annual hours of operation of the building*"). However, the definition of a reference building in Schedule 3 reflects that the thermal comfort level of the proposed building need only be better than the reference building in order to comply. This definition creates ambiguity on how to meet the requirement. To reduce this ambiguity, it is proposed the reference to thermal comfort be removed from the definition.

Example metrics for use with Specification 44

This section provides information that can be used to interpret Specification 44 of the NCC 2022 public comment draft stage 2. Specification 44 contains the methods of calculating heating load limits, cooling load limits and thermal load limits for Performance Requirements H6P1 and J1P2.

Note that compliance with Performance Requirements H1P1 and J1P2 can be shown without completing the calculations in Specification 44. These compliance pathways include the Deemed-to-Satisfy elemental provisions, Deemed-to-Satisfy NatHERS compliance pathway, Verification Methods and simpler Performance Solutions including the "comparison with the Deemed-to-Satisfy Provisions" Assessment Method.

Example metrics

The following metrics are based on the Typical Meteorological Year weather files for building energy modelling provided by CSIRO. By using these metrics as inputs to the formulas provided in Specification 44, practitioners can determine heating load limits, cooling load limits and thermal load limits for these weather files.

A practitioner may complete a Performance Solution by demonstrating that these limits are not exceeded. Note that a practitioner may independently calculate these metrics (and the associated heating load limits, cooling load limits and thermal load limits) for any suitable weather file.

Table 3 Example metrics for use with Specification 44

No.	Name	Assumed cooling thermostat set point	Annual heating degree hours	Annual cooling degree hours	Annual dehumidification gram hours	Annual average daily outdoor temperature range
1	**Darwin**	26.5	0	15,770	15,364	8.38
2	**Pt Hedland**	27.1	859	16,540	8,011	12.35
3	**Longreach**	27.1	6,002	14,634	505	14.98
4	**Carnarvon**	25.9	2,260	4,810	1,023	9.45
5	**Townsville**	26.5	595	6,392	5,843	8.21
6	**Alice Springs**	27	11,767	13,149	125	15.29
7	**Rockhampton**	26.1	3,283	6,717	1,701	10.77
8	**Moree**	26.2	13,986	7,291	151	13.82
9	**Amberley**	25.6	10,958	4,483	290	13.88
10	**Brisbane**	25.5	4,744	2,228	1,415	8.90
11	**Coffs Harbour**	25	7,137	1,309	231	8.49
12	**Geraldton**	25.4	6,846	6,365	10	12.00
13	**Perth**	25.4	11,024	6,084	0	11.96
14	**Armidale (old Tamworth)**	23.8	33,374	1,039	9	10.79
15	**Williamtown**	25.1	11,713	2,802	276	10.58
16	**Adelaide**	25	13,066	5,132	0	9.54

No.	Name	Assumed cooling thermostat set point	Annual heating degree hours	Annual cooling degree hours	Annual dehumidification gram hours	Annual average daily outdoor temperature range
17	**Sydney RO (Observatory Hill)**	24.8	7,079	1,466	129	7.77
18	**Nowra**	24.7	14,813	2,801	56	10.37
19	**Charleville**	26.8	11,284	9,580	230	13.64
20	**Wagga**	25.4	24,833	4,678	0	12.69
21	**Melbourne RO**	24.2	14,494	2,416	0	8.32
22	**East Sale**	23.6	27,229	1,259	0	11.16
23	**Launceston (Ti Tree Bend)**	23.5	30,952	833	0	10.48
24	**Canberra**	24.3	35,153	2,863	0	13.15
25	**Cabramurra (old Alpine)**	22.9	65,831	78	0	7.12
26	**Hobart**	23.2	28,542	451	0	8.13
27	**Mildura**	25.4	19,003	6,300	11	13.15
28	**Richmond**	25	15,607	3,917	60	12.59
29	**Weipa**	26.3	4	12,144	12,565	8.25
30	**Wyndham**	27.2	126	26,975	9,184	12.61
31	**Willis Island**	N/A	N/A	N/A	N/A	N/A

No.	Name	Assumed cooling thermostat set point	Annual heating degree hours	Annual cooling degree hours	Annual dehumidification gram hours	Annual average daily outdoor temperature range
32	**Cairns**	26.3	268	6,411	6,030	7.58
33	**Broome**	27	624	14,749	14,083	10.18
34	**Learmonth**	26.7	1,646	14,048	958	13.56
35	**Mackay**	26.1	976	3,183	5,214	6.42
36	**Gladstone**	25.9	568	4,307	3,543	8.20
37	**Halls Creek**	26.9	611	19,571	2,109	12.62
38	**Tennant Creek**	27	1,171	18,644	1,747	11.33
39	**Mt Isa**	26.8	3,060	15,813	1,797	12.75
40	**Newman**	28	6,286	15,240	645	14.36
41	**Giles**	27.2	6,259	13,082	81	12.42
42	**Meekatharra**	27.7	6,883	12,766	67	12.43
43	**Oodnadatta**	27.5	8,352	13,845	18	13.47
44	**Kalgoorlie**	26.1	13,048	7,763	31	12.72
45	**Woomera**	26.3	11,754	8,434	3	12.15
46	**Cobar**	26.6	13,663	7,616	101	11.88
47	**Bickley**	25	15,664	4,015	34	10.60
48	**Dubbo**	25.8	20,431	5,332	36	13.78
49	**Katanning**	24.6	21,496	3,566	14	12.08

No.	Name	Assumed cooling thermostat set point	Annual heating degree hours	Annual cooling degree hours	Annual dehumidification gram hours	Annual average daily outdoor temperature range
50	**Oakey**	25	15,392	3,979	40	13.57
51	**Forrest**	25.3	15,294	8,410	14	14.79
52	**Swanbourne**	24.7	6,322	3,332	63	9.28
53	**Ceduna**	24.7	14,061	5,212	53	12.40
54	**Mandurah**	24.9	6,081	3,131	2	8.17
55	**Esperance**	24	11,009	1,884	0	9.06
56	**Mascot (Sydney Airport)**	24.9	6,357	1,596	110	7.37
57	**Manjimup**	23.8	20,910	2,531	0	10.63
58	**Albany**	23.5	16,131	932	0	9.06
59	**Mt Lofty**	22.5	41,095	1,626	0	6.74
60	**Tullamarine (Melbourne Airport)**	23.8	23,496	2,764	0	9.71
61	**Mt Gambier**	23.3	28,263	1,776	0	10.36
62	**Moorabbin**	23.9	20,249	2,291	0	8.72
63	**Warrnambool**	23	27,285	1,406	1	9.31
64	**Cape Otway**	23.1	19,279	960	3	5.34
65	**Orange**	23.6	40,325	1,192	2	11.12

No.	Name	Assumed cooling thermostat set point	Annual heating degree hours	Annual cooling degree hours	Annual dehumidification gram hours	Annual average daily outdoor temperature range
66	**Ballarat**	23.5	37,873	2,585	2	10.75
67	**Low Head**	23	26,047	80	0	7.20
68	**Launceston Airport**	23	39,444	456	0	10.47
69	**Thredbo (Village)**	22.5	61,209	147	0	8.71

Condensation management

Overview

The condensation management provisions of the NCC aim to decrease risks of condensation and water vapour to the health and amenity of occupants of residential buildings. The condensation management requirements apply to Class 1 buildings, Class 2 SOUs and Class 4 parts of buildings.

The proposed NCC 2022 condensation management provisions build upon the initial condensation management provisions introduced into NCC 2019.

Changes are predominantly applied to thecondensation management sections of NCC Volumes One and Two and the ABCB Housing Provisions. Changes have also been applied to the "Verification of building envelope sealing" Verification Methods in the energy efficiency sections of NCC Volumes One and Two.

Proposed changes

The proposed changes to the condensation management provisions are set out in Table 4.

Table 4 Summary of proposed changes for condensation management in NCC 2022

NCC Reference	Changes and commentary
NCC Volume One F8V1 NCC Volume Two H4V5	This Verification Method provides an optional pathway for demonstrating whether an external wall complies with the condensation requirements. The major changes are: • New references to sections of the standard "AIRAH DA07" to provide further detail on input assumptions for use with the Verification Method. • New failure criteria for the analysis are included: "a mould index of greater than 3, as defined by Section 6 of AIRAH DA07".
NCC Volume One F8D3(2)	Sarking-type materials and secondary insulation layers on the outside of primary insulation in an external wall are required to be vapour permeable in climate zones 4 to 8, where:

NCC Reference	Changes and commentary
ABCB Housing Provisions 10.8.1(2)	• A minimum vapour permeance of 0.143 µg/N.s is specified in climate zones 4 and 5 (equivalent to a Class 3 or Class 4 Vapour Control Membrane as defined by AS 4200.1) • A minimum vapour permeance of 1.14 µg/N.s is specified in climate zones 6, 7 and 8 (equivalent to a Class 4 Vapour Control Membrane as defined by AS 4200.1)
NCC Volume One F6D4(1) ABCB Housing Provisions 10.8.2(1)	Minimum flowrates appropriate for continuously operating exhaust systems have been added.
NCC Volume One F6D4(2) ABCB Housing Provisions 10.8.2(2)	Exhaust from a kitchen, kitchen range hood, bathroom, sanitary compartment or vented clothes dryer is required to be discharged outside of the building.
NCC Volume One F6D4(3) ABCB Housing Provisions 10.8.2(3)	Exhaust systems in bathrooms or sanitary compartments that that are not naturally ventilated (e.g. not provided with windows) are required to be interlocked with the room's light switch and run for at least 10 minutes after the light switch is turned off.
NCC Volume One F6D4(4) ABCB Housing Provisions 10.8.2(4)	To ensure the effective operation of exhaust systems, wet areas with exhaust systems that are not naturally ventilated are required to be provided with make-up air via a door undercut or in accordance with AS 1668.2.
NCC Volume One F6D5 ABCB Housing Provisions 10.8.3	To provide an escape path for water vapour, roofs in climate zones 6, 7 and 8, except those that are subject to Bushfire Attack Level FZ, require a roof space with a height of at least 20 mm and evenly distributed ventilation openings. The required total area of ventilation openings depend on the pitch of the roof and are not required in tiled roofs with a sufficiently permeable sarking (equivalent to a Class 4 Vapour Control Membrane as defined by AS 4200.1).

NCC Reference	Changes and commentary
NCC Volume One J1V4 NCC Volume Two H6V3	This Verification Method provides an optional pathway for demonstrating compliance with the building sealing requirements of the energy efficiency sections of the NCC. The major changes are when a home is found to achieve an air change rate of less than 5 air changes per hour at 50 Pa reference pressure: • Continuous mechanical ventilation is required to be provided to the home. • Solid-fuel and gas combustion appliance are required to be provided with additional ventilation.
Schedule 3	A new defined term for “vapour permeance” is included, referencing the required method of assessing vapour permeance (the ASTM-E96 Water Method at 23 °C), the same test method required by the NCC reference document AS 4200.1.