VICTORIAN BUILDING AUTHORITY

BUILDING PRACTICE NOTE

Energy Efficiency EE 01-2022 | Energy efficiency requirements for building classes 2, 3 and 5-9

Audience

The audience/s for this Practice Note include/s:

- ☒ Architects/ Designers
- ☒ Builders
- ☒ Building Surveyors/ Inspectors
- ☐ Engineers
- ☒ Owner Builders
- ☐ Plumbers
- ☐ Real estate management agents
- ☒ Energy raters

Purpose

This Practice Note provides guidance on the NCC 2022 energy efficiency requirements and on using Verification Method J1V3 as an alternative assessment method for Class 3, 5, 6, 7, 8 or 9 and common areas of Class 2 buildings.

This Practice Note applies only to the NCC 2022 performance requirements. For Practitioners following the performance requirements of NCC 2019, please refer to Practice Note EE-01 Energy Efficiency 2019.

For further information about transitional requirements, please refer Practice Note EE-05 Transitional Energy Efficiency Arrangements.

The content below provides guidance on:

- Energy Efficiency Requirements for building classes 2, 3 and class 5 – 9.
- Deemed-to-Satisfy Provisions.
- DtS Provisions for EV readiness.
- DtS Provisions for solar PV and battery systems.
- Verification methods Building energy analysis software Energy analysis report.
- Energy assessors – qualifications and the experience required.
- Role of the Relevant Building Surveyor (RBS).
- Information to be provided when applying for a building permit.
- Testing and quality assurance.

VICTORIA State Government

Abbreviations & Definitions

The abbreviations and definitions set out below are for guidance only. They are not intended to vary those set out in the Building Act 1993, the Building Regulations 2018 or the NCC.

- **ABCB** – Australian Building Codes Board
- **Act –** Building Act 1993
- **DtS** – Deemed to Satisfy
- **EV** – electric vehicle
- **GHG** – greenhouse gas
- **HVAC** – heating, ventilation and air-conditioning
- **NCC** – National Construction Code 2022
- **PV –** photovoltaic
- **RBS –** Relevant Building Surveyor
- **Regulations** – Building Regulations 2018
- **SOU –** sole occupancy unit (residential dwelling)
- **Standard –** ASI/ASHRAE Standard 140-2007 – Standard Method of Test for the Evaluation of Building Analysis Computer Programs

Background

Energy efficiency requirements for class 3, 5, 6, 7, 8, 9 and the common areas of class 2 buildings are set out in Part J1 of the NCC 2022. The objective of the energy efficiency requirements is to:

- reduce energy consumption and energy peak demand; and
- reduce greenhouse gas emissions; and
- improve occupant health and amenity.

The energy efficiency requirements achieve this by ensuring that buildings facilitate the efficient use of energy for artificial heating, cooling, lighting, and other services without compromising the health and amenity of occupants or the function of the building.

Energy Efficiency Requirements for classes 2, 3 and 5-9 buildings

Compliance with the NCC 2022 Volume One for a class 2 common area and class 3, 5, 6, 7, 8 or 9 buildings is achieved by satisfying the performance requirements. The relevant performance requirements under Part J are:

- J1P1 – Energy Use
- J1P2 - Thermal performance of a sole-occupancy unit of a Class 2 building or a Class 4 part of a building
- J1P3 - Energy usage of a sole-occupancy unit of a Class 2 building or a Class 4 part of a building
- J1P4 – Renewable energy and electric vehicle charging

It should be noted that performance requirements J1P2 and J1P3 are only applicable to an SOU within a class 2 building or a class 4 part of a building. If these parts are not included within the building, then J1P2 and J1P3 do not apply (e.g. a class 5 building has no requirements under J1P2 or J1P3, and complies through the absence of a class 2 SOU or class 4 part).

A building can meet the performance requirements through either:

- a DtS solution;
- a performance solution; or
- a combination of a performance solution and a DtS solution.

All performance requirements (J1P1 to J1P4) need to be satisfied independently in order to achieve a compliant NCC outcome. When considering a performance solution, it is not appropriate to combine performance requirements into a single outcome.

Deemed-to-Satisfy Provisions

Under Section A governing requirements, Clause A2G3(1) states that a solution that satisfies the DtS provisions is deemed to have met the performance requirements. For instance, the DtS provisions specified under Section J2 and J2D2 'application of Section J provides the concise detail of what must be complied with to have a compliant DtS solution.

For a class 2 common area and or class 3, 5, 6, 7, 8 or 9 building, these include:

- **J1P1 Energy Use** – Satisfied through the application of J2D2(1), including compliance with Parts J4, J5, J6, J7, J8 and J9D3
- **J1P4 Renewable energy and electric vehicle charging** – Satisfied through the application of J2D2(4), including compliance with Sections J9D4 and J9D5

Building fabric

The DtS provisions of Part J4 apply to building elements forming part of the building envelope and the definition of envelope is specified in NCC Schedule 1 definitions and includes parts of the building fabric such as the roof, ceiling, walls, glazing and floors that separates a conditioned space or habitable room from the exterior or a non-conditioned space.

The conditioned space definition must also be considered with the phrasing "likely, by the intended use of the space, to have its temperature controlled by air-conditioning". When assessing NCC compliance, an understanding of the use of the space is required to determine if it is likely to be air-conditioned in the future.

DtS Provisions for EV readiness

Performance requirement J1P4 requires that buildings have features that facilitate incorporation of renewable energy and electric vehicle (EV) charging equipment. The requirement of J1P4 is satisfied by a DtS approach when 'J9D4 Facilities for electric vehicle charging stations' and J9D5 'Facilities for solar photovoltaic and battery systems' are met.

J9D4 requires facilities for electric vehicle charging stations for carparks associated with class 2, 3, 5, 6, 7b, 8 and 9 buildings (excluding standalone class 7a buildings). These facilities include:

- Dedicated and labelled electrical distribution boards for EV charging in carparks;
- A charging control system to manage charging in response to total building demand and to manage and schedule.
- Labelled DIN rail space for future installation of metering equipment.

The provisions of J9D4 do not apply to a stand-alone class 7a building.

DtS Provisions for solar PV and battery systems

J9D5 sets out the requirements for buildings to have facilities for solar PV and battery systems. These include requirements for the main electrical switchboard and building roof area such as:

- Two empty three-phase circuit breaker slots and four DIN rail spaces labelled for solar PV and battery systems; and
- At least 20% of the roof area to remain clear for the installation of solar PV.

Not all buildings will require clear roof area for the installation of solar PV, with exemptions listed under J9D5 (2), such as buildings with an alternative generation capacity, shading, roof area less than 55m2, or roof area used for terrace, car park, roof garden or the like. Any use of the exemptions should be appropriately documented to show compliance with J9D5.

There are additional requirements within the NCC, that whilst not directly assessed under performance requirement J1P4 renewable energy and electric vehicle charging, require compliance.

These include energy monitoring as set out in DtS provision J9D3, which requires buildings over certain floor areas have the ability to monitor energy use that including the provision of:

- on-site renewable energy generation
- on-site electric vehicle charging stations and
- on-site battery systems

Structural reliability (as required by B1P1(2) sets out the DtS provision in B1D3, which requires that class 7b buildings allow for an additional permanent roof load of not less than 0.15 kPa to support the addition of solar PV panels.

The structural provisions of Part B are intended to facilitate the future installation of solar PVs in 7b buildings only. This recognises common designs may not have sufficient capacity to resist an increase in the permanent actions from installed solar PVs, and therefore may need additional structural design work prior to installation. The installation of solar PVs, regardless of whether it is a class 7b or any other classification requires an assessment to ensure B1P1 structural reliability is satisfied.

Verification methods

One of the means of demonstrating compliance with Performance Requirement J1P1 involves the use of Verification Methods as an alternative to the DtS Provisions specified within J2D2. There are three Verification methods that satisfy J1P1 in full and are:

- J1V1 NABERS Energy.
- J1V2 Green Star.
- J1V3 Verification using a reference building.

In addition, J1V4 may be used to verify the building sealing component of J1V4(e), but this alone does not satisfy the performance requirement in full.

The use of verification methods is a performance solution and requires compliance with the governing requirements, including the process set out in A2G2. In particular, the performance-based design brief requirements of A2G2(4) must be followed for all verification methods.

An advantage of using verification methods is that it provides flexibility where DtS provisions cannot be met for certain building designs. In addition, the prescriptive nature of the verification methods offer certainty in the interpretation of performance solutions.

The J1V1, J1V2 and J1V3 verification methods utilise ANSI/ASHRAE standard 140 software to model the buildings performance. This includes calculations of annual greenhouse gas emissions and thermal comfort levels. Each of these reference Specification 33 which outlines specific DtS requirements that must still be complied with. Further to this, J1V3 has specifications 34 and 35 that provide modelling parameters and profiles.

When following a verification method, the full clause must be complied with including the specifications as referenced.

Building energy analysis software

The calculation for verification methods J1V1, J1V2 and J1V3 must comply with the ANSI/ASHRAE Standard 140: 'Standard Method of Test for the Evaluation of Building Energy Analysis Computer Programs'. The 2007 edition of the standard must be used for NCC 2022 compliance.

When using the software under the verification methods, appropriate evidence must be provided (e.g. by the software supplier) that demonstrates the building energy analysis software complies with the ANSI/ASHRAE standard 140. The software must:

- be commercially available
- be based on a simulation program with an hourly climate data file
- be capable of computing the annual energy consumption of a building in accordance with the Verification Method of the NCC 2022
- be capable of geometrically describing the building in three dimensions including consideration of the surface azimuth, tilt angle and adjacent structures and features
- provide results comparable to other similar software in accordance with ANSI/ASHRAE Standard 140
- detail the Azimuth, which is a mathematical concept defined as the angle, usually measured in degrees (°), between a reference plane (usually True North) and a point.

The RBS's role is to check that an application contains sufficient information to demonstrate how the software package complies with the testing procedures of the Standard. It is not the RBS's responsibility to seek supporting evidence, it is the applicant or software provider that must provide evidence this testing has occurred, and the software meets the above requirements.

In addition, the RBS needs to be assured the users of the software are technically qualified and well versed in the functionality of the program and the calculation methods employed. An application should include evidence that the user has had appropriate training in the use of the current version of the software.

Energy analysis report

The energy analysis report must include all relevant inputs including load profiles and modelling parameters as set out in the verification methods and associated specifications 33, 34 and 35. This means a mechanical or electrical system that uses energy to provide air-conditioning, mechanical ventilation, heated water supply, artificial lighting, vertical transport and the like within a building. It does not include:

- systems used solely for emergency purposes.
- cooking facilities; and
- portable appliances.

Inputs and outputs must be detailed in the energy analysis report produced to demonstrate compliance with the Verification Method. The outputs must be presented in accordance with the metrics specified in the verification method used, which may include greenhouse gas emissions in kgCO2-e/annum floor area per annum for the appropriate climate region, and thermal comfort levels.

It is the responsibility of the applicant to provide sufficient information that demonstrates conformity with the verification method, and subsequent performance solution. The RBS may seek further information or reject the performance solution if the information is missing within the energy analysis report.

Energy assessor – qualifications and experience required

The Regulations do not prescribe a class of registered building practitioner for persons using building energy analysis software. This does not prevent an energy assessor from preparing a compliant performance solution, including the use of the verification methods. Regardless of who prepares the performance solution, demonstrating NCC compliance is the critical factor.

When preparing a performance solution under Part A2 of NCC 2022 the assessment method must be clearly identified and documented. Part A2 outlines the assessment methods available noting that a single or a combination of assessment methods may be used. For example, an energy assessor may prepare a report under A5G3(1)(e) or (f) as an *appropriately qualified person* outlining how the design fulfils the specific requirements of the NCC.

To use building energy analysis software under the verification methods, the software user must have comprehensive knowledge of the subject matter and the software. This should be thoroughly documented to support the analysis and enable the RBS to assess compliance.

The energy assessor is typically the most appropriate person to confirm compliance, but they cannot issue a compliance certificate under section 238 of the Act. This does not limit the ability for the energy assessor to prepare a performance solution as there is no requirement under the Act mandating the use of section 238 for energy efficiency, and the RBS can assess the performance solution through the process outlined in Part A5 of the NCC.

In instances where the documentation is lacking in detail and does not indicate compliance with the NCC, the RBS may request an applicant seeks independent verification of compliance. This may be through an independent peer review from another energy assessor, or the function of the Building Appeals Board, or a compliance certificate under section 238 of the Act.

Role of the Relevant Building Surveyor

To provide building energy analysis, a person needs to demonstrate to the RBS that they have the relevant qualifications and experience, such as training in the use of the specific software package. It is recommended that this person provides a copy of their professional indemnity insurance, examples of previous projects, reports, and a resume to satisfy the RBS.

The RBS must be satisfied that all requirements of the verification method have been documented and met, through the application of judgement using their qualifications and experience to the specific matters being assessed. If there is insufficient information to show compliance, the RBS may request the advice of other suitably qualified registered practitioners or industry experts in determining the acceptability or otherwise of the verification method report.

Caution should be exercised when relying on compliance certificates under section 238 of the Act, given the energy assessor's role in the use of energy modelling software. The mere presence of a compliance certificate does not equate to compliance, and the RBS must be satisfied with the content in order to meet the good faith test for immunity under section 128 of the Act.

It is inappropriate for the RBS to accept a certificate from a building practitioner who does not have suitable qualifications or experience. The RBS cannot force another registered practitioner to provide a certificate of compliance either and ultimately the RBS is responsible for checking the design as part of the building permit process and it is at the RBSs' discretion on whether to accept a report from a suitably qualified and or experienced person.

Information to be provided when applying for a building permit

The Regulations require a certain amount of information to be provided to the RBS when applying for a building permit. Regulation 25 requires a copy of any computations or report to be provided, if necessary, that demonstrates compliance with the Act and Regulations. For instance, the RBS must ensure they receive the following information regarding energy analysis for compliance with a Verification Method:

- A fully documented performance solution under part A2G2, including the performance-based design brief process outlined within A2G2(4);
- Evidence the software complies and has been tested in accordance with ANSI/ASHRAE standard 140.
- A copy of the input data used that shows compliance with the requirements specified in the verification method.
- A copy of the report provided by the software; and
- the qualifications and experience of the person undertaking the analysis.

Regulation 24(4) states that an application must contain sufficient information to show compliance. It is the applicants' responsibility to provide the RBS with sufficient information that shows compliance with the NCC.

Testing and Quality Assurance

Software Capabilities

The software used must be compliant with the ANSI/ASHRAE standard 140 as specified within the verification methods. This must be capable of addressing all the specific aspects of the verification method used either by direct modelling or by adding in predetermined data and must use the thermal properties of only building products that are available in Australia.

Aspects of thermal modelling, the software must be capable of addressing directly are:

- energy flow through the building envelope, including adiabatic surfaces and thermal storage effects;
- the performance of the air conditioning and ventilation including any plant and equipment using energy input ratios, co-efficient of performance, or efficiency at full and part load
- the control strategies, sequencing of plant and equipment, controlled settings and type of controls;
- the design relative humidity range; and
- the different energy types, e.g. gas or electricity.

Aspects of thermal modelling that may be addressed by adding in predetermined data rather than direct modelling are:

- lighting systems and equipment, provided the calculation includes consideration of the loads, operating profiles, and the distribution of the lighting load between the space load and return air load;
- vertical transport loads;
- supply hot water loads.

Climate Data

The RBS needs to ensure the climate zone used for the analysis is appropriate for the location of the proposed building. Climate data must be based on hourly data derived from Australian meteorological records taken at no more than 3-hourly intervals and adjusted to provide a representative year for the proposed locations.

Where sufficient records are not available, the data may be estimated from other recorded data, provided a reliable method is used to make these estimates. For example, cloud cover records or satellite measurements can be used to estimate solar radiation data in the absence of recorded solar data.

Appropriate climate data based on the Australian Bureau of Metrology records are available in the Predictive Weather Files for building energy modelling data storage from CSIRO.

Other Technical Data Inputs – J1V3 specification 35

Verification Method J1V3 sets out the inputs for calculating the annual greenhouse gas emissions for a reference building. Other technical inputs for calculating the GHG emissions of services in a building must be in accordance with Specification 34 and 35 of NCC 2022 Volume One.

The specification sets out the standard procedure for calculating the annual GHG emissions in a building. It specifies the parameters that must be used for a particular building operation and occupant profiles in the assessment of services including:

- air-conditioning systems;
- artificial lighting;
- lifts; and
- hot water supply.

Although the values used within Specification 35 may not be those actually achieved in the building due to changes in building occupancy, they are considered to be typical and therefore, must be used in a Verification Method J1V3 assessment.

It is not the responsibility of the RBS to provide design advice about the technical input data details of Specification 35. It is the responsibility of the designers, engineers and qualified energy assessors to ensure the appropriate inputs have been used prior to providing the information to the RBS.

If a special purpose building is likely to have the same building characteristics for the complete life of the building and they are different to those listed in Specification 35, those characteristics could be used in another Verification Method developed specifically for that building. It is not the responsibility of the RBS to develop the Verification Method for special-use buildings.

The designers, engineers and qualified energy raters are responsible to ensure the appropriate inputs have been used prior to providing the information to the RBS.

Related Documentation

- Building Act 1993
- Building Regulations 2018
- National Construction Code 2022
- ANSI/ASHRAE Standard 140-2007 Standard method of test for the evaluation of building energy analysis computer programs: https://www.ashrae.org/search?q=ANSI/ASHRAE%20Standard%20140
- ABCB energy efficiency handbook: https://www.abcb.gov.au/Resources/Publications/Education-Training/energy-efficiency-ncc-volume-one
- International Energy Agency BESTEST
- National Construction Code 2022: https://ncc.abcb.gov.au/
- Building Practice Note BP 15 | Certificates of Compliance
- Building Practice Note EE-02-2022 | Applying -NCC energy efficiency measures to existing Class 2 to 9 buildings
- Building Practice Note EE-03-2022 | Energy Efficiency Requirements for New Residential Buildings
- Building Practice Note EE 04 | Energy Efficiency: Alterations to existing residential buildings
- Building Practice Note PS-01 | Documentation and Assessment

List of Amendments

- Updated Copyright and Disclaimer

Document history

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Contact Us

If you have a technical enquiry, please email technicalenquiry@vba.vic.gov.au or call 1300 815 127.

Victorian Building Authority
Goods Shed North
733 Bourke Street
Docklands VIC 3008

www.vba.vic.gov.au

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