

Energy Efficiency EE 01 | Building energy analysis for commercial buildings

Audience

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

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| <input checked="" type="checkbox"/> Architects/ Designers | <input type="checkbox"/> Owner Builders |
| <input checked="" type="checkbox"/> Builders | <input type="checkbox"/> Plumbers |
| <input checked="" type="checkbox"/> Building Surveyors/ Inspectors | <input type="checkbox"/> Real estate management agents |
| <input checked="" type="checkbox"/> Engineers | <input type="checkbox"/> Trades and Maintenance (inc. Electricians) |
| <input type="checkbox"/> Home Owners / Residential Tenants | |

Purpose

This Practice Note provides guidance on the BCA energy efficiency requirements using Verification Method JV3 as an alternative assessment method for Class 3, 5, 6, 7, 8 or 9 and common areas of Class 2 buildings.

The content below provides guidance on:

- Verification Method JV3
- Building energy analysis software modelling method
- Energy analysis report
- Energy assessor - qualifications and experience required
- Role of the Relevant Building Surveyor
- Information to be provided when applying for a building permit
- Testing and Quality Assurance

Abbreviations & Definition

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 National Construction Code.

- **Act** – Building Act 1993
- **NCC** – National Construction Code 2022
- **Regulations** – Building Regulations 2018
- **ABCB** – Australian Building Code Board
- **BCA** – Building Code of Australia Volume One
- **DTS** – Deemed to Satisfy
- **GHG** – Greenhouse gas emission



- **NCC** – National Construction Code 2019
- **Protocol** – ABCB Protocol for Building Energy Analysis Software Version
- **RBS** – Relevant Building Surveyor
- **SOU** – Sole occupancy unit (residential dwelling)
- **Standard** - ANSI/ASHRAE Standard 140-2007 – Standard Method of Test for the Evaluation of Building Analysis Computer Programs

Verification Method JV3

The Building Code of Australia (BCA) National Construction Code (NCC) 2019 Volume One, Amendment 1, contains energy efficiency performance requirements for Class 3, 5, 6, 7, 8 or 9 buildings. One of the means of demonstrating compliance with Performance Requirement JP1 involves the use of Verification Method JV3 instead of the Deemed-to-Satisfy (DTS) Provisions of Parts J1 to J7.

Verification Method JV3 is applicable to Class 3, Class 5 to 9 buildings and common areas of Class 2 buildings. It does not apply to the SOUs of a Class 2 building or a Class 4 part of a building. The advantage of using Verification Method JV3 is that it provides flexibility where DTS Provisions cannot be met for certain building designs.

This verification method assesses the annual Greenhouse gas (GHG) emissions (kgCO₂-e/annum) of the proposed building, comparing it to the annual GHG emissions of a reference building and is provided in a form of a report.

Building energy analysis software modelling method

This method must follow the Australian Building Codes Board (ABCB) Protocol for Building Energy Analysis Software Version. This Protocol describes the essential elements of structural software that can be used for designing in compliance with the DTS provisions as well as general requirements for software documentation, testing, quality assurance and user training.

To meet the Protocol, evidence must be provided by the software supplier that demonstrates the building energy analysis software complies with the Protocol. The Protocol also requires that a training program for users is available for the current version of the software and any subsequent new version, and that trainers be “technically qualified and well versed in the functionality of the program and the calculation methods employed”.

To comply with the ABCB Protocol, 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 BCA
- 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 140-2007 (the Standard)
- 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.



It is not expected that the RBS needs to check a software package against the testing procedures of the Standard. The software provider must provide evidence this testing has occurred, and the software meets the protocol requirements.

Energy analysis report

The energy analysis report must include all relevant inputs for services for the purposes of Section J in NCC Volume One. 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:

- a) systems used solely for emergency purposes
- b) cooking facilities; and
- c) portable appliances

Inputs and outputs must be detailed on the energy analysis report produced in order to demonstrate compliance with the Verification Method and the RBS must check compliance including NCC Specification JVb.

The outputs must be presented in terms of annual energy consumption of the building in MJ/m² of floor area per annum for the appropriate climate region. A distinction must be made as to whether the energy source for the building heating is electric, heat pump, system plant, or gas.

Energy assessor - qualifications and experience required

The Regulations do not prescribe a class of registered building practitioner for persons using building energy analysis software.

BCA Part A2.2 outlines various methods to determine whether a Performance Solution meets the relevant Performance Requirements. Where Verification Method JV3 is used to demonstrate compliance with JP1, the assessment method used would be a combination of Verification Method and expert judgement. This method must be presented and assessed in accordance with PN 63 – Performance Solution Procedures and Documentation.

The BCA defines expert judgement as:

“the judgement of an expert who has the qualifications and experience to determine whether a Performance Solution or Deemed-to-Satisfy Solution complies with the Performance Requirements.”

To use building energy analysis software under Verification Method JV3, the software user must have comprehensive knowledge of building services. The category of registered building practitioner most likely to have relevant qualifications and experience for this task is a mechanical engineer. Mechanical engineers design hydraulics, smoke exhaust systems, fire services, sprinkler systems, heating, ventilation, and air-conditioning systems.

If required by the RBS, a VBA registered mechanical engineer can issue certification in the form of a compliance certificate under section 238 of the Building Act. However, there may be designs where an architect, registered services building designer or other consultant is deemed by the RBS to have the appropriate qualifications and experience, and this person may be accepted under the RBS's discretion as the provider of a Verification Method JV3 report without the additional need for a compliance certificate. Refer to Building Practice Note BP-15 for guidance on section 238 and certificates of compliance.



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 would also be recommended that this person upon request also provides a copy of their professional indemnity insurance, examples of previous projects, reports and a resume to satisfy the RBS.

The RBS must apply their own judgement using their qualifications and experience to the specific matters being assessed when using Verification Method JV3. The RBS may under their discretion request the advice of other suitably qualified registered practitioners or industry experts in determining the acceptability or otherwise of a Verification Method JV3 report.

Registered building practitioners using building energy analysis software for the purpose of Verification Method JV3 and the RBS need to be aware that regulation 265 requires that “a registered building practitioner must perform his or her work as a building practitioner in a competent manner and to a professional standard.”

Regulation 122 outlines the type of practitioners that can issue a Certificate of Compliance – Design and it should be noted that this regulation does not specifically make mention of energy efficiency matters. If the use of the software has been undertaken by a mechanical engineer, it is up to the RBS having regard to the circumstances of a particular project whether to accept a certificate of compliance (if one is offered). The RBS must ensure that the practitioner providing the certificate has the appropriate qualifications and experience.

It would be inappropriate for the RBS to accept a certificate from a building practitioner who did not have the suitable qualifications or experience and the RBS cannot force another registered practitioner to provide a certificate of compliance. The RBS is responsible for checking the design, as part of the building permit process and is the RBS's discretion to accept a report from experienced persons. The RBS has the discretion to request an independent check from a registered building practitioner as part of a peer review if necessary.

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, to show compliance with the Act or Regulations. The RBS should ensure they receive the following information regarding energy analysis for compliance with Verification Method JV3:

- evidence the software complies with the ABCB protocol
- a copy of the input data used. This data is required to ensure the inputs comply with the requirements of Specification JV
- a copy of the report provided by the software
- evidence the software has been tested in accordance with the Standard; and
- the qualifications and experience of the person undertaking the analysis.

In addition, Minister Guideline 05 states “Municipal building surveyors and private building surveyors must only accept appointment as relevant building surveyors in the area of their own competence.”



Testing and Quality Assurance

Any analysis software used must be tested in accordance with the Standard using the International Energy Agency BESTEST. The results should be within the range of results from acceptable comparable programs indicated in the Standard.

While there will be times results will fall out of this range, these are not necessarily incorrect. Differences must be investigated, documented and made known to the RBS. Software suppliers must have a quality assurance program in place and be able to demonstrate its conformity. If encountering a particular analysis software for the first time, the RBS may request evidence of the quality assurance and testing to ensure the software meets the ABCB Protocol.

Software Capabilities

The RBS will need to understand the specific capabilities of the software. The software must be capable of addressing all the specific aspects of the Verification Method JV3 either by direct modelling or by adding in predetermined data.

Software must use the thermal properties of building products that are available only 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; and
- supply hot water loads.

Climate Data

The RBS need 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 the 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 is available in the “Australian Climatic Data Bank for Use in the Estimation of Building Energy Use” which is maintained by ACADS - BSG by agreement with the Australian Government.



Other Technical Data Inputs – Specification JV

Other technical inputs for calculating the annual energy consumption of services in a building must be in accordance with Specification JV in BCA Volume One.

Verification Method JV3 sets out the inputs for calculating the annual energy consumption for a reference building.

The specification sets out the standard procedure for calculating the annual energy consumption of services 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 JV 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 JV3 assessment.

It is not the responsibility of the RBS to provide design advice about the technical input data details of Specification JV. It is the responsibility of the designers, engineers and qualified energy raters 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 JV, 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
- Australian Building Codes Board (ABCB) Protocol for Building Energy Analysis Software
Version: <https://www.abcb.gov.au/Resources/Publications/Education-Training/ABCB-Protocol-for-Structural-Software>
- 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 2019



- Practice Note EE-02: Energy Efficiency: New Residential Buildings
- Practice Note EE-03: Energy Efficiency: Alterations to existing Class 1 buildings
- Practice Note BP-15: Section 238 Certificates of Compliance
- Practice Note PS-01: Documentation and Assessment

List of Amendments

- Updated template
- Updated referenced to other practice notes
- Changed reference of 'draftsperson' to 'building designer' due to Building Legislation Amendment 2023

Document history

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