NCC

Understanding the NCC

First principles Performance Solution using Specification 44

The National Construction Code (NCC) is a performance-based code containing all Performance Requirements for the construction of buildings. To comply with the NCC, a solution must achieve compliance with the Governing Requirements and the Performance Requirements.

The Governing Requirements are a set of rules outlining how the NCC must be used and the process that must be followed. The Performance Requirements prescribe the minimum necessary requirements for buildings, building elements, and plumbing and drainage systems. The performance-based nature of the code gives you flexibility in how to meet the Performance Requirements.

This guide will focus on the compliance options for Performance Requirement H6P1 and the development of a first principles Performance Solution using the benchmarks set out in Specification 44.

Housing energy efficiency

Housing energy efficiency requirements are in Part H6 of Volume Two in NCC 2022. The overall intent of these requirements is to improve the:

- efficient use of energy in housing design and construction, and
- energy usage by key equipment installed in a building.

Part H6 aims to:

a. reduce energy consumption and energy peak demand; and
b. reduce greenhouse gas emissions; and
c. improve occupant health and amenity.

The Performance Requirements for housing energy efficiency in Part H6 are:

- H6P1 Thermal performance
- H6P2 Energy use

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H6P1 Thermal performance

H6P1 covers the thermal performance of a house's fabric. It regulates the maximum (or upper limit) of permitted heating loads, cooling loads and total thermal energy loads of homes. See Schedule 1 for an explanation of these, and other, NCC defined terms.

H6P1 includes 3 sub-clauses:

1. The total heating load of the habitable rooms and conditioned spaces in a building must not exceed the heating load limit in Specification 44.
2. The total cooling load of the habitable rooms and conditioned spaces in a building must not exceed the cooling load limit in Specification 44.
3. The total thermal energy load of the habitable rooms and conditioned spaces in a building must not exceed the thermal energy load limit in Specification 44.

Many factors contribute to heating and cooling loads including insulation levels, solar gain, airtightness and local climate.

H6P2 Energy usage

This Performance Requirement sets the minimum performance level for the energy used by a Class 1 building's domestic services. It includes key fixed appliances such as those for heating, cooling, and lighting, amongst others.

While this guide is not focused on H6P2, it's important to remember that it's mandatory to meet all Performance Requirements in the NCC. So keep this in mind when developing any Performance Solution.

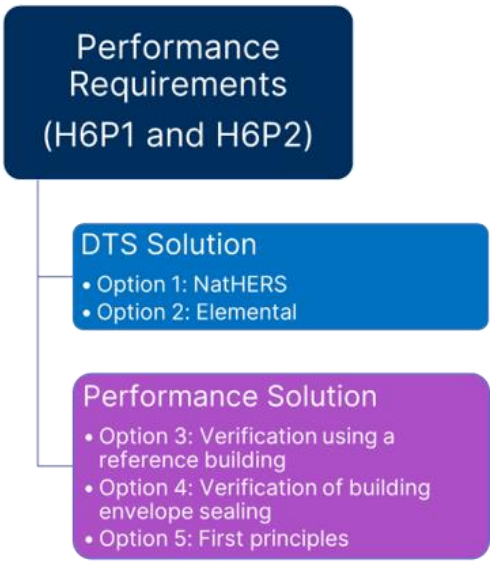
Compliance with the NCC

Compliance with the NCC is achieved by complying with the NCC Governing Requirements and relevant Performance Requirements – in this case H6P1. There are 3 options available to demonstrate compliance with the Performance Requirements:

- a Performance Solution
- a Deemed-to-Satisfy (DTS) Solution, or
- a combination of a Performance Solution and a DTS Solution.

Figure 1 shows the specific compliance options available to meet H6P1. More detailed information can be found in the Housing energy efficiency handbook available from the ABCB website.

Figure 1 Simplified overview of compliance options



DTS Solution

A DTS Solution is a method of satisfying the DTS Provisions. A DTS Solution is achieved by following all appropriate DTS Provisions in the NCC.

There are 2 DTS pathways for complying with the energy efficiency Performance Requirements:

- Option 1 (NatHERS): outlined in Chapter 3 of the handbook.
- Option 2 (Elemental): outlined in Chapter 4 of the handbook.

Performance Solution

A Performance Solution is a method of complying with the Performance Requirements that is not DTS. Unlike the prescriptive DTS Provisions, a Performance Solution is a unique solution providing flexibility in compliance. A Performance Solution can be used for a whole building, a specific element, or a small component.

You can use NCC Verification Methods, or other Assessment Methods to demonstrate that a Performance Solution meets the mandatory Performance Requirements.

Verification Method

A Verification Method is a test, inspection, calculation or other method that determines whether a Performance Solution complies with the relevant Performance Requirement – in this case H6P1.

There are 2 Verification Methods available for demonstrating compliance with the energy efficiency Performance Requirements:

- H6V2 Verification using a reference building: outlined in Chapter 5 of the handbook.
- H6V3 Verification of building envelope sealing: outlined in Chapter 6 of the handbook.

First principles

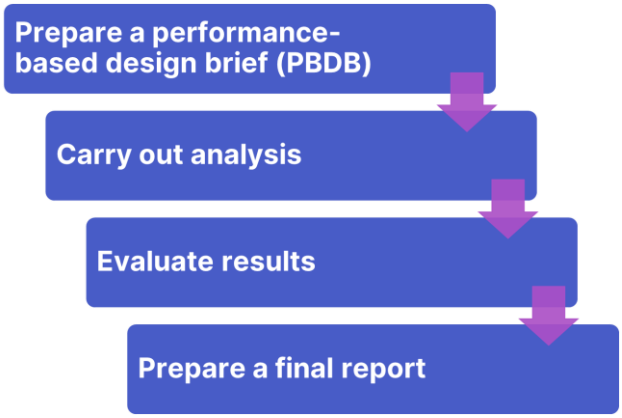
You can also develop a Performance Solution which demonstrates compliance through direct assessment against the Performance Requirements. In this case, you can use the calculations in Specification 44 to develop a Performance Solution that directly references the specified limits.

Performance Solution process

Before we look more closely at Specification 44, let's review the Performance Solution process.

There are 4 steps to developing a Performance Solution. These are outlined in Clause A2G2(4) and illustrated in Figure 2. Each step needs to be completed before moving on to the next.

Figure 2 Performance Solution process A2G2(4)



The performance-based design brief (PBDB) is the key platform for any proposed design and should be developed in collaboration with the project stakeholders. It must include the acceptance criteria for the proposed Performance Solution, which often requires accounting for the location and characteristics of the building. This is where Specification 44 comes in.

Because H6P1 is quantified, it contains measurable benchmarks that should be used in the acceptance criteria for a PBDB for thermal performance.

Specification 44 contains the benchmarked load limits for H6P1. These limits vary based on climate factors and floor area. By defining the load limits based on climate factors, load limits can be determined for any home in any climate.

The quantified heating load limits and cooling load limits in H6P1 were developed with reference to the heating and cooling load limits that were introduced in NCC 2019 as part of the DTS Provisions that form the NatHERS compliance option. The limits have now been generalised for broader use in this Performance Requirement.

H6P1 allows for higher heating loads in cold locations, and higher cooling loads in hot, humid locations. The limits include an area adjustment to avoid unfairly disadvantaging small houses, which are naturally more exposed to outside conditions than large houses because of their higher ratio of surface area to internal space.

Remember, to comply with the NCC, a solution must achieve compliance with the Governing Requirements and the Performance Requirements. Clause A2G2 sets out the rules and the process for developing a Performance Solution. It is a matter for an appropriate authority to determine if a particular design is compliant.

Appropriate authority

A defined term in the NCC, this is 'the relevant authority with the statutory responsibility to determine the particular matter'.
In general, this will be the building surveyor or certifier, or may be a government entity with authority.

You'll find more guidance on Performance Solutions from the resource library on the ABCB website.

Specification 44

Using the calculation method in Specification 44 is not required in most cases, except where a Performance Solution that references the limits is developed using a first principles approach (i.e. direct assessment against the Performance Requirements). Other compliance options are referenced above and outlined in detail in the Housing energy efficiency handbook.

Using the calculations

If you choose to develop a Performance Solution using the Specification 44 benchmarks, you will need to determine what values to use in the calculations. You could refer to other parts of the NCC, such as Specification 45, or another climate data source.

The flexibility of using a Performance Solution means that you are not limited in which data you use – as long as that data is used consistently in all relevant calculations associated with your Performance Solution.

Here are some things to consider:

- Because heating degree hours, cooling degree hours and other terms used in Specification 44 are defined terms in the NCC, any figures you use will need to be in accordance with the definitions in Schedule 1 (all volumes of the NCC).
- Specification 45 (referenced in J1V5) includes information about heating and cooling degree hours, and dehumidification gram hours for various locations across 8 climate zones. As the Verification Method J1V5 (NCC Volume One) does not directly relate to the Performance Requirement H6P1, it could be considered as part of developing the Performance Solution – but it doesn't have to be.
- Remember that it is a matter for the appropriate authority to determine whether a Performance Solution that uses this data is compliant.

The calculations for Specification 44 are outlined below. Each of these is expressed in Megajoules per square meter per annum (MJ/m^2.annum).

Remember to check Schedule 1 for a list of NCC defined terms.

S44C2 Heating load limit (HLL)

The heating load limit is determined by taking the greater of two values: the first is a fixed value of 4 MJ/m^2.annum, and the second is calculated using the formula:

$$((0.0044 \times HDH) - 5.9) \times F_H$$

This formula incorporates 2 variables: the total annual *heating degree hours* (HDH) specific to the building's location, and an area adjustment factor (F_H) for the heating load limit, which can be obtained from Table S44C2 based on the total area of the habitable room.

S44C3 Cooling load limit (CLL)

The formula for calculating cooling load limit incorporates several variables. These include the total annual *cooling degree hours* (CDH) and the total annual *dehumidification gram hours* (DGH), both specific to the building's location. Additionally, the area adjustment factor (F_C) for the cooling load limit is determined using Table S44C3.

$$CLL = (5.4 + 0.00617 \times (CDH + 1.85DGH)) \times F_C$$

S44C4 Thermal energy load limit (TLL)

This is calculated using a formula that considers both the heating and cooling load limits previously calculated, as well as the annual average daily outdoor temperature range (T_r). Each of these elements forms part of the formula stated in this provision for determining the thermal energy load limit for a space.

$$TLL = \frac{19.3HLL + 22.6CLL - 8.4 - 15}{T_r + 10.74}$$

Remember

This information is only relevant to the Performance Requirement H6P1 Thermal performance.
To be compliant with the NCC, you also need to meet the requirements in H6P2 Energy use.