

Building rating tools

This manual identifies a number of rating tools to help you incorporate sustainability and energy saving features into your home. Some have been developed by governments, others by industry bodies and private companies.

Nationwide House Energy Rating Scheme (NatHERS)

The rating software tools accredited under the Nationwide House Energy Rating Scheme (NatHERS) are AccuRate, BERS Pro and FirstRate 5. They can be used to assess the thermal performance of the designs of proposed and existing homes and assess the compliance of new home designs

with parts of the energy efficiency requirements in the Building Code of Australia (BCA). They calculate heat gains and losses through the building envelope every hour over a year in a particular location, to determine how much additional heating and cooling may be required to maintain human thermal comfort. The tools can also be used to evaluate hourly temperatures within the building if it operates without heating or cooling.

The distinction between tools that predict the energy use of a building versus tools that rate the actual energy use is important because it determines how the tools can be used. Predictive tools such as the NatHERS tools, which have standardised building occupant behaviour profiles, may be used for regulatory purposes because they enable a comparison of like with like — they can compare the performance of buildings if they are occupied by people who behave the same way. By eliminating the influence of different occupant behaviours, these tools attempt to predict future performance of new or existing buildings.

The NatHERS tools have been shown to be accurate in predicting energy performance given the standardised behaviour profiles. However, because actual occupancy and behaviour vary from the standardised profile,



predictive tools are not always good predictors of actual energy bills.

- **AccuRate** — developed by CSIRO, provides the benchmark for accrediting other software for use with the BCA requirements. To be accredited for use under NatHERS, other software packages are required to give results consistent with AccuRate.
- **BERS Pro** — the user interface of the program is graphics based so the user can select information about the building, climate type and conditions of use from pictures displayed on the screen. BERS Pro was designed by Solar Logic.
- **FirstRate 5** — originally developed by the Victorian Government to cover the majority of houses designed in Victoria. It can be used in most other states and territories.

When used as regulatory tools to assess compliance with the BCA, these rating tools do not include the capacity to calculate the energy use of appliances or the embodied energy of building materials. For non-regulatory uses, the expanded tools AccuRate Sustainability and BERS Pro Plus have additional functionality to allow modelling of water use and other energy impacts such as lighting, hot water and major fixed appliances.

The actual amount of gas or electricity used for heating and cooling is influenced by the behaviour of the occupants, quality of construction and efficiency of appliances, in addition to the thermal performance of the building.

Rating tools are typically computer based due to the thousands of individual calculations necessary. They are based on a calculation engine developed by the CSIRO that enables the prediction of the performance of a building on an hour by hour basis for a whole year. Included in the engine are regional climate data and the thermal properties of all major materials.

The NatHERS tools can model the complex effects of building mass, roof types and many other factors including levels of insulation, air leakage, window size and performance.

The performance of a building can be described in terms of heating and cooling loads, hours of discomfort or hourly variations of indoor temperatures in different parts of the building.

For regulatory purposes, the assessment is expressed as a star rating between 0 and 10: the more stars, the better the performance. Star bands are set for each specific climate zone to allow fair comparison of buildings across climates.

The NatHERS tools can be used in the design process, or to diagnose energy-related discomfort issues. In particular, the predicted hourly temperatures in each zone of the building can be analysed under 'free running' conditions, i.e. without additional heating and cooling being used, including full details for a hot week and a cold week. This feature allows a designer to identify rooms that may perform poorly under certain weather conditions, so that they can be modified to improve comfort. Designers may also vary the energy features of the building to optimise the design.

Accredited assessors

Anyone can buy and use the NatHERS tools, but in most jurisdictions ratings used for assessing compliance with regulations can be issued only by trained and accredited assessors.

These industry assessors not only produce high quality, accurate and verifiable NatHERS ratings, they also add value with energy efficiency related building design advice. As the accuracy of ratings is very dependent on the measurements and assumptions used when building design data is entered into the software, national principles have been developed to facilitate consistency in entry and rating outputs; in some cases jurisdictions require additional input rules to account for local issues. All accredited assessors must abide by these principles. In addition, a certified national training course for assessors (Certificate IV in NatHERS Assessment) has been developed which adds to the robustness and quality of ratings from accredited assessors. Members of assessor accrediting organisations also provide ongoing professional development of their members and randomly audit the ratings to verify compliance with the national principles.

By using an industry accredited assessor you gain an accurate NatHERS rating as well as useful advice on the house design process. Find contact details for accredited assessors in your area from the Association of Building Sustainability Assessors (www.absa.net.au) or the Building Designers Association of Victoria (www.bdav.org.au).

For more information about NatHERS, including links to accredited rating tools, see www.nathers.gov.au.

Building Sustainability Index (BASIX)

The NSW Government's Building Sustainability Index (BASIX) establishes minimum standards for all new dwellings and alterations and additions to existing dwellings throughout the state. BASIX is applied through a NSW planning regulation that sets percentage reduction targets for greenhouse gas emissions and water use for dwellings of a similar size in the same geographical location.

BASIX covers the building envelope thermal performance and a wide range of household energy uses by fixed equipment such as heating and cooling appliances, lighting and hot water.

BASIX is a web-based tool that is available for use by anyone, although users must register and log in. The data that needs to be entered into the program includes the location, size, building materials and design of the building. BASIX analyses this data and determines how it scores against prescribed energy and water targets. The design must pass specific targets — which vary according to location and building type — before a BASIX certificate can be generated. See www.basix.nsw.gov.au.

National Australian Built Environment Rating System (NABERS)

The National Australian Built Environment Rating System (NABERS) Home Rating Calculator is an easy-to-use tool for comparing the energy and water use of an existing home to that of an average household. This web-based tool is available for anyone to use. The website also provides diagnostic tools — Energy Explorer — for further advice.

Because it focuses on the interaction between the occupants and the building rather than the technical potential for that building, the NABERS Home Rating Calculator provides a realistic assessment of how a home is actually performing as used by those occupants. The design of a home is only one factor in its performance: it is also greatly affected by the quality of construction and maintenance, the appliances chosen and how the occupants use the home and the appliances.

A NABERS home rating analyses 12 months of actual energy or water use billing information, and supplies a rating out of 5 stars, with 2.5 stars representing an average household. A 5 star home is very efficient, while a 1 star home has plenty of opportunities to improve!

Glossary and tools

Building rating tools

The NABERS Home Rating Calculator is not a predictive tool. It complements, rather than replaces, other rating systems that focus on the design stage, such as NatHERS. It can be used only for an existing home that has been occupied for 12 months and allows a check on whether the home is performing as well as it has been designed to. It cannot be used to meet the regulatory energy efficiency requirements in the BCA.

NABERS Energy Explorer diagnostic tools can provide insights into the extent to which the behaviour of occupants, selection of appliances and building design influence the amount of energy used.

See www.nabers.gov.au.

Green Star

Green Star was launched by the Green Building Council of Australia (GBCA) in 2003 and is a voluntary environmental rating system for buildings and communities. Green Star certifies ratings only at 4 star (best practice), 5 star (Australian excellence) and 6 star (world leader). Projects under 4 star do not qualify for a certified Green Star rating.

Green Star evaluates the environmental design and construction of new and refurbished buildings and the sustainable planning, design and construction of new communities. The Green Star building rating tools are able to rate all types of buildings except detached residential dwellings.

The Green Star – Multi Unit Residential rating tool assesses the design and construction of high-performance residential developments. It is a holistic rating tool that evaluates not only environmental attributes but also features that affect occupant health and wellbeing, such as indoor environment quality and access to transport.

The Green Star – Communities rating tool assesses and certifies the sustainability of community-level development projects. It evaluates environmental issues – such as minimising energy and water consumption, reducing greenhouse gas emissions, managing waste and reducing dependence on motor vehicles – as well as broader holistic sustainability issues such as economic prosperity and affordability, livability, design, governance and innovation.

The GBCA is developing the Green Star – Performance rating tool to address the performance of buildings in operation. It will provide a series of best practice benchmarks that building owners and managers can use to set targets to increase energy and water efficiency, reduce waste and improve factors that influence productivity, health and learning, such as indoor

environment quality. Green Star – Performance was released in late 2013.

See www.gbca.org.au.

Window Energy Rating Scheme (WERS)

The Window Energy Rating Scheme (WERS) ranks windows for their energy performance in typical housing anywhere in Australia. It will tell you whether a given window is suitable for the climate or not. WERS also compares the performance of window films and windows covered by external fly screens, which provide some shading and insulation.

WERS is managed by the Australian Window Association (AWA), which is made up of over 500 window manufacturers and industry suppliers throughout Australia. A voluntary organisation, it is independent of any one manufacturer and acts as a fair, rigorous and credible system for testing performance claims. It is an accredited member of the Australian Fenestration Rating Council.

The rating of a window for energy performance starts with establishing basic solar, thermal and optical properties of the glazing unit and window frame. These properties are determined by a combination of laboratory measurements and computer simulations. WERS rates the performance of a single window, not the performance of the total number of windows used in a design.

Rated windows in WERS earn from 0 to 10 stars for both cooling (summer) and heating (winter), depending on how they rank against the alternatives. The ratings apply to the effect of the whole window including the relative contributions of glass and frame. The rating information can be used in energy rating tools, such as NatHERS, to estimate the actual impact on performance for any house.

WERS complements existing standards for wind, water penetration and safety (AS 1288 and AS 2047).

Follow these three basic steps when selecting a window using the WERS rating:

- Identify the climate classification for the site (see the map on the WERS website).
- Follow the window selection guidelines for climate type to identify window types that might be suitable.
- Compare the WERS star ratings for the suitable windows with products recommended by local distributors and make a selection based on cost and performance.

For more information see www.wers.net.

Interpreting results

In putting the results of tools in perspective here are some things to consider.

Does the rated performance of an individual building element (e.g. using WERS, insulation value) give a true representation of its performance in the application proposed?

The performance of a building element needs to be considered in context. For example, in a warm climate, an unshaded wall of WERS 5 star cooling rated windows will cause more overheating in summer than a similar sized bank of 0 star rated windows with well designed external shading. This is because effective shading blocks out more radiant heat. An AccuRate, BERS Pro or FirstRate assessment would reveal that the window rating alone does not give the complete picture.

Does the rating system address relative size in assessing the impact?

Not usually. A 400m² home and a 150m² home may have the same star rating. However, the larger home will use more resources and embodied energy in its construction than the smaller home. (Note that tools such as NatHERS, NABERS and BASIX do not consider embodied energy.) It will also require more heating and cooling energy to be comfortable due to its larger volume.

Would options beyond those being rated yield equivalent benefits over the total life cycle?

No rating tool can incorporate every environmental impact but better ratings will generally lead to better environmental outcomes. While accepting the limited breadth of environmental impacts covered by a rating tool, try to also consider those aspects important to the environment that may not be easy to measure. (see *Embodied energy*)

Trade-offs are a part of every home design and construction process so it is necessary to consider what level of thermal comfort is desired and what overall environmental impact is acceptable.

For example, it may be better to build a home from low embodied energy materials but have a slightly lower rating (while complying with the BCA) rather than use a high embodied energy but low maintenance fabric on the building envelope and aim for a higher rating. High ratings in one area may compromise good performance in other areas of environmental impact. Nevertheless, the following should be noted:

- Over the life cycle of a building, the operating energy typically dominates the embodied energy.

- Many 'low embodied energy' solutions may be higher embodied energy than realised. For example, blending cement into mud brick or rammed earth walls dramatically increases their embodied energy. Some low embodied energy systems require high embodied energy foundations or structural components. Features other than the building, such as paved driveways, may add substantial embodied energy. So care is required!
- It is possible to select lower embodied energy products within each material type — e.g. recycled steel reinforcing, bricks made in energy-efficient kilns, concrete that includes blast furnace slag or other 'extenders', and so on.
- Careful design can reduce the amounts of materials required for a given building. And making a building smaller but designing it so it functions better can save a lot of materials and money!

References and additional reading

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Authors

Chris Reidy, Chris Reardon, Geoff Milne

Updated 2013