

## Residential sustainability measures

This updates *Practice Note 2005-55* issued May 2005.

### 1 Summary

This Practice Note<sup>1</sup> provides advice about Victoria's 5 Star standard, together with options for compliance.

### 2 Background

A Regulatory Information Bulletin and comprehensive cost benefit study were released in August 2002 by the Building Commission, in association with Sustainability Victoria.

This showed that in Victoria, the average energy efficiency rating of new homes was around 2.2 Stars.

The 5 Star standard was introduced in 2004 to:

- Reduce greenhouse gas emissions, with savings estimated to reach 2 million tonnes of CO<sub>2</sub> over 10 years.
- Improve the quality of our houses. A 5 Star house has around half the heating and cooling energy loads of our current houses.
- Promote economic growth. Resources will be transferred from the capital-intensive energy sector to the more labour-intensive building sector, generating new jobs and stimulating economic growth.

### 3 Building and plumbing controls (Mandatory)

#### 3.1 Requirements

For Class 1 buildings, the Building Code of Australia (BCA) provides a number of options to demonstrate compliance. Under the verification methods in the BCA, new Class 1 buildings are required to achieve a House Energy Rating (HER) of 5 Stars, whilst under the Deemed-to-Satisfy provisions of the BCA, new Class 1 buildings are required to comply with the acceptable

construction practice in Part 3.12, except as set out in 3.2 of this practice note.

New Class 1 buildings also require a<sup>2</sup>:

- (i) Rainwater tank connected to all sanitary flushing systems; or
- (ii) Solar water heater system.

Where a solar water heater system is the chosen compliance option and a reticulated gas supply is available for connection to the building, the system must be a gas boosted solar water heater.

Further information is available in the Plumbing (Water and Energy Savings) Regulations 2004. A list of solar water heater systems which meet the requirements is available on the Sustainability Victoria website.

Where applicable, services such as air-conditioning and ventilation systems must comply with the relevant provisions of the BCA.

#### 3.2 Options for Class 1 buildings

Between 1 May 2005 and 30 April 2007, instead of requiring a 5 Star rating and either a rainwater tank or a solar water heater, a new Class 1 building that is of timber floor construction<sup>3</sup>, may be constructed to achieve:

- (i) A HER of 5 Stars; or
- (ii) A HER of 4 Stars and have either a rainwater tank system connected to all sanitary flushing systems or a solar water heater system.

#### 3.3 Alterations

Requirements for alterations to Class 1 buildings are contained in Vic 1.2.2.

Alterations to Class 1 buildings constructed in accordance with the Victorian energy efficiency measures prior to the 5 Star standard, i.e. pre 1 July 2004 are required to have a 3 Star HER or comply with the minimum R-Values in Vic Table 1 of Volume Two of the BCA.

<sup>1</sup> This Practice Note is a referenced document in clause Vic 3.12.0(a) of Volume Two of the Building Code of Australia (BCA) 2006. For this purpose, section 3 is mandatory and the remaining sections are for guidance purposes only.

<sup>2</sup> Plumbing work must comply with the *Plumbing Regulations 1998*. Technical information about these plumbing options can be found on the [Plumbing Industry Commission's website](#).

<sup>3</sup> The entire ground floor of the Class 1 building must be of timber floor construction. A floating timber floor on a concrete slab is not considered timber floor construction.

For Class 1 buildings constructed to the 5 Star standard i.e. post 1 July 2004, future alterations must ensure that the existing HER of the building is maintained i.e. 4 or 5 Star. The HER undertaken prior to when the building was first constructed should be used to determine the HER required for the alterations.

Therefore for alterations and additions, there should not be a need to undertake a HER of the existing house, to determine the requirements that apply to the alterations.

Regulation 608 of the Building (Interim) Regulations 2005 permits the relevant building surveyor to allow partial compliance for alterations to existing buildings, where it is appropriate. When determining whether partial compliance should be permitted, the RBS must consider the requirements necessary to make reasonable provision for the amenity of the building and safety and health of people using the building.

Alterations constructed using concrete panels, cavity brick, earthwall construction, ashlar stone or other masonry walls which have a thickness (excluding any cavity) of not less than 180 mm and where the floor of the building is concrete or masonry in direct contact with the ground are deemed to provide a 3 Star HER for the purpose of Vic 1.2.2(a)(i) of the BCA Volume Two.

Alterations include the construction of satellite habitable buildings such as a sleepout or bungalow and extensions.

### 3.4 Class 2 buildings

For Class 2 buildings, an average 5 Star rating is required for the whole building. Each sole-occupancy unit/dwelling (SOU) is to achieve a rating of at least 3 Stars (refer to 4.1.2). There is no requirement to install a rainwater tank or solar water heater system in a Class 2 building. The BCA requirements for services must also be complied with.

### 3.5 Verification methods

Applicants must use a software package (refer to 6) that complies with the Australian Building Codes Board (ABCB) Protocol for House Energy Rating Software to determine whether the building achieves the required 4 or 5 Star rating.

### 3.6 Application

The 5 Star standard only applies to Class 1 and 2 buildings. Class 3 – 9 buildings must comply with the energy efficiency measures in the BCA.

## 4 Applying the energy standards

### 4.1 Building permit stage

It is the applicant's responsibility to provide the RBS with evidence that the proposed building design will achieve the required Star rating and for Class 1 buildings comply with the solar water heater or rainwater tank requirements.

NatHERS software Star rating levels are not correct for Victoria (refer 6.1). As a result NatHERS ratings must be accompanied by an additional statement from the energy rater showing the area adjustment allowance<sup>4</sup> and fall within the correct Star rating levels set out in Table A in the Appendix to this practice note. Where FirstRate software is used, a suitable report will be generated automatically.

Energy raters must stamp the plans, recording the energy rating and their accreditation number, which are to be submitted for the building permit.

The applicant must separately provide details of any rainwater tanks or solar water heater systems, including size and location of rainwater tanks and the type of solar water heater system to be installed. This will assist the RBS in checking compliance and ensuring that any possible effects on the structure have been considered.

#### 4.1.1 Averaging ratings for Class 2 buildings

The average 5 Star rating for a Class 2 building is determined by finding the average energy load in MJ/m<sup>2</sup> of each SOU, or in the case of FirstRate, the average point score (not the average Star rating). This average rating for the whole of a Class 2 building must achieve the 5 Star rating level set out in Table A in the Appendix. The rating for any SOU in a Class 2 building must achieve the 3 Star rating level set out in Table A.

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<sup>4</sup> Area adjustment allowance details are available on the [Sustainability Victoria website](#).

#### 4.1.2 Ratings of dwellings adjacent to vacant allotments

HERs must include details of existing adjacent buildings and structures on neighbouring allotments, which overshadow windows of the building being rated. However, trees, shrubs and other landscaping are not required to be considered. Note that future construction to the north may have an impact on the HER.

#### 4.2 Occupancy permit stage

During the building process, the RBS may choose to carry out additional inspections to ensure that the dwelling is constructed in accordance with the requirements of the approved HER report.

The RBS may, if necessary, request that the builder provide a statement of compliance regarding sustainability matters. While there is no prescribed format, FirstRate will automatically produce a statement that lists all the energy features and has sections for the builder to detail any changes to these features. Users of NatHERS may produce a suitable report, using that software's Building Data report. A *pro forma* report is available on the Sustainability Victoria website.

Where an application for an occupancy permit has been submitted to the RBS and the only matters not complying relate to energy efficiency, then the RBS has two options:

- refuse to issue an occupancy permit; or
- issue an occupancy permit concurrently with a building notice or order.

Where a rainwater tank or a solar water heater system is installed, the RBS must see a copy of the plumber's compliance certificate issued under section 221ZH of the *Building Act 1993* before an occupancy permit can be issued.

## 5 Compliance Options

### 5.1 Performance-based BCA

The 5 Star standard is implemented through the BCA. The BCA is a performance based building code. Compliance with the BCA can be achieved by complying with the prescriptive requirements or by developing an Alternative Solution, which demonstrates that the proposal meets the relevant performance requirement/s. Building practitioners

choosing to develop an Alternative Solution, should ensure an appropriate assessment method is used. Further information on using the performance-based BCA is contained in [Practice Note 2005-29](#).

### 5.2 Building Appeals Board

The Building Appeals Board (BAB) is an independent statutory body established under the Building Act 1993. The BAB hears appeals and disputes in relation to building control matters and can waive, modify or vary the provisions of the Building Regulations and the BCA based upon the particular case. The BAB can consider provisions relating to the residential sustainability measures in the BCA. Further information on the BAB is contained in [Practice Note 2005-39](#).

## 6 Software

### 6.1 Approved software

Under the BCA Volume Two, a HER must be determined using a thermal calculation method that complies with the ABCB Protocol for House Energy Rating Software. A thermal calculation method is defined as a calculation method that identifies-

- (i) a heating load; or
- (ii) a cooling load; or
- (iii) a heating and cooling load (annual energy load),

based on the sum of hourly loads or an equivalent approach.

The BCA Explanatory Information recommends that contact be made with the appropriate authority, in Victoria's case the Building Commission, for advice on software that meets the Protocol.

Software that currently meet the Protocol include FirstRate (Version 4.05 or later), NatHERS (version 2.32A or later) and BERS (Version 3.2 or later). The use of other software may be accepted by the RBS as meeting the relevant Performance Requirement. It is recommended that such software should not be accepted unless, along with meeting the ABCB protocol, training is available for users that meet the Sustainability Victoria accreditation requirements for energy raters.

As mentioned in 4.1, users of NatHERS should be aware that the Star rating levels are incorrect for Victorian climates, and do not take into account area

adjustment. This will be rectified in AccuRate, which is the replacement for NatHERS. The correct Star rating must be determined manually from the predicted energy load when using NatHERS. Refer to Table A in the Appendix for the maximum annual energy loads for a 3, 4 and 5 Star rating when NatHERS is used in Victoria.

In Victoria, NatHERS second generation energy rating tools will be available from mid 2006. These include:

- the AccuRate software (the NatHERS replacement)
- FirstRate version 5.0 (operating with the AccuRate calculation engine)
- BERS second generation

Information about the second generation rating tools can be obtained from Sustainability Victoria.

The first generation NatHERS tools can continue to be used for regulatory purposes until 30 November 2007. After this date, all ratings must be provided using the second generation energy rating software.

### 6.2 Using rating tools

The standard input assumptions made when rating the energy performance of a house are:

- That all windows have an internal covering installed which provides equivalent performance to a Holland (roller) blind.
- Where software requires the input of the size of gaps around window and door frames, these are assumed to be 'small'.
- That all floors are carpeted, except where alternative floor coverings are specified.

For users of FirstRate, ratings in 'Regulation Mode' will automatically input the first two assumptions. However, areas of carpet and hard floor surface must be entered manually.

### 6.3 Limitations of energy rating software

It is not possible to take into account every feature of dwelling design with the currently approved software, although over 99 per cent of all dwellings currently constructed can be rated in this way. Design features such as:

- earth bermed walls
- trombe walls (utilising masonry or water tanks for storing radiant heat gains)
- solar heated rock storage
- insulating shutters on windows

cannot be rated with the currently approved software.

In addition, where the following window area limits are exceeded, FirstRate 4 ratings may not be within normal accuracy:

- Dwellings with a total window area in excess of 60 per cent of the Net Conditioned Floor Area (NCFA) of the house; and
- Dwellings with a window area in one orientation of greater than 35 per cent of NCFA.

These glazing limitations will not apply to the second generation FirstRate (version 5.0).

In cases where dwellings contain such features or have window areas greater than the limits stated above, NatHERS may be used or an Alternative Solution will need to be provided.

### 6.3.1 Conservatories and other large glazed rooms

Where it is proposed to construct a building with glazing in excess of the limits stated in clause 6.3, the RBS may accept the design if the house energy rater has excluded the room from the rating calculation and if the room:

- Does not exceed 20 per cent of the total floor area of the remainder of the building.
- Is physically separated from the remainder of the building, i.e. any openings must have doors or windows.
- Is thermally isolated from the rest of the building. Walls must be insulated as if they were external. To minimise air leakage from the room to the main house, windows installed in the walls between them must achieve an air leakage of no more than 2 L/s/m<sup>2</sup> of window area, as tested under AS 2047 at 75 Pa pressure difference.
- Does not contain any heating or cooling devices.
- Has openable doors and windows in its external walls equivalent to at least 10 per cent of its floor area.

When completing the rating, if the room has a solid roof this must be entered as a fixed eave if it shades windows in the walls between the house and the room. Furthermore, the rater may consider windows between the main house and the room to be double-glazed if the room meets the requirements listed above and the air leakage of the external windows to the room achieve an air leakage of no more than 5 L/s/m<sup>2</sup> of window area, as tested under AS 2047 at 75 Pa pressure difference.

#### 6.4 Accreditation of energy raters

HERs must be prepared by raters accredited in the use of the rating tool. Energy raters require separate accreditation for each rating tool they use – this includes the second generation rating tools. For instance, to use second generation FirstRate (Version 5), energy raters must seek additional accreditation. Sustainability Victoria manages this accreditation process and provides a list of accredited raters and the specific energy rating tools they are accredited to use on its website.

#### 6.5 Victorian climate zones

The second generation energy tools include 11 climate zones for Victoria, compared to 5 for the first generation rating tools. Melbourne is now divided into 3 climate zones, Tullamarine (climate 60), Melbourne RO (climate 21) and Melbourne Airport (climate 62).

To assist builders who construct homes across metropolitan Melbourne, accredited energy raters and RBS are advised that, when using the second generation energy rating tools, there are two options for the houses to be constructed in climate zones 62 (Moorabbin Airport) and 21 (Melbourne RO):

- either choose the correct climate zone for the postcode in which the dwelling will be constructed; or
- alternatively the 'Tullamarine' climate zone (climate 60) can be chosen as the default climate zone for houses constructed in the Melbourne metropolitan region.

## 7 General information on insulation

### 7.1 Reflective foil insulation products

Reflective foil only provides an insulating effect when it faces an air space, because it works by reducing radiant heat flow across this air space. *If reflective foil does not face an air space it does not have an R value.*

Reflective foil must be used in conjunction with an air space and air must not be allowed to leak from one side of the foil to another. Particular care must be taken during construction, to ensure that all penetrations through the foil and joins are effectively sealed by taping around the joins and penetrations.

Reflective foil product tests often show the R value of the whole building element, whereas bulk insulation tests usually show the R value of the insulation alone. Whole building element R values should be entered into the 'Total R value' field in FirstRate, while insulation product R values should be entered into the 'Insulation R value' field.

### 7.2 Bulk insulation products

Loose fill products will typically settle to provide a lower depth than originally installed, after a few years.

Batt and blanket products can suffer significant degradation of their R-value through poor installation. To maintain the effectiveness of the insulation products, it is recommended that builders ensure that:

- Insulation fits snugly against all framing members and that where gaps exist, off-cuts of batts are used to fill these gaps;
- Bulk insulation is not compressed; and
- Insulation placed near lamps, luminaires and associated transformers is installed in accordance with the electrical safety alert, *Thermal Insulation in Roof Spaces*, published by Energy Safe Victoria.

## 8 Dual water reticulation system

Some new housing estates are close to a source of recycled water and have been provided with a recycled water main, as well as a potable water main. This is often referred to as a 'dual supply' or 'third pipe' system. Typically, the water will come from one of Melbourne's major sewerage treatment plants, but supply is also possible from smaller localised treatment plants. The recycled water must be

supplied by the Responsible Water Authority and must only be used for approved purposes, including toilet flushing and garden watering.

Dual water reticulation systems raise the possibility of using a BCA performance approach to approve a 4 or 5 Star rated house design that uses a dual water reticulation system, rather than a rainwater tank.

This alternative must still comply with the relevant BCA performance requirement (P2.6.1). Clause 1.0.5 of the BCA Volume Two states that this can be achieved by formulating an Alternative Solution that complies with the performance requirement, or is shown to be at least equivalent to the Deemed-to-Satisfy provisions.

Analysis by the Victorian Department of Sustainability and Environment confirms that a dual water reticulation system will provide equivalent or better performance than a rainwater tank, in terms of water conservation, when the systems are connected to domestic sanitary flushing systems. Dual water reticulation systems conserve drinking water more effectively than rainwater tanks, as they are more reliable, regardless of rainfall and are also available for garden use.

## 9 Useful contacts and references

For further information on the 5 Star standard, plumbing standards, or energy efficient design in general, please contact the following organisations:

### Websites

[Building Commission](http://www.buildingcommission.com.au)

[www.buildingcommission.com.au](http://www.buildingcommission.com.au)

[Plumbing Industry Commission](http://www.pic.vic.gov.au)

[www.pic.vic.gov.au](http://www.pic.vic.gov.au)

[Sustainability Victoria](http://www.sustainability.vic.gov.au)

[www.sustainability.vic.gov.au](http://www.sustainability.vic.gov.au)

The Sustainability Victoria site also has details on:

[FirstRate training institutions](#)

[FirstRate software — cost, suppliers and obtaining a demo version.](#)

[Energy Safe Victoria](http://www.esv.vic.gov.au)

[www.esv.vic.gov.au](http://www.esv.vic.gov.au)

[Your Home](http://www.greenhouse.gov.au/yourhome)

[www.greenhouse.gov.au/yourhome](http://www.greenhouse.gov.au/yourhome)

[www.5starhouse.vic.gov.au](http://www.5starhouse.vic.gov.au)

## Appendix

Table A – Software rating levels for NatHERS and FirstRate 4

Climate Zone <sup>7</sup>	Rating Level					
	3 Stars		4 Stars		5 Stars	
	NatHERS maximum annual energy load MJ/m <sup>2</sup>	FirstRate minimum point score	NatHERS maximum annual energy load MJ/m <sup>2</sup>	FirstRate minimum point score	NatHERS maximum annual energy load MJ/m <sup>2</sup>	FirstRate minimum point score
Melbourne and southern coastal Victoria	239	-28	191	-10	147	7
Inland Victoria (e.g. Wangaratta, Wodonga)	335	-33	244	-16	192	0
Cool Inland (e.g. Ballarat, Bright)	351	-25	271	-10	221	5
Warm Inland (e.g. Mildura)	262	-31	189	-14	137	3
Alpine areas	600	-35	413	2	250	34

<sup>7</sup>Climate selection in energy rating tools is derived from the area postcode.