

Residential sustainability measures

Issued May 2007. This updates Practice Note 2006-55 issued May 2006.

1 Summary

This Practice Note provides advice about Victoria's 5 Star Standard, together with options for compliance.

2 Building and plumbing controls

2.1 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 2.2 of this Practice Note.

New Class 1 buildings also require a 1:

- (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.

A list of solar water heater systems which meet the requirements is available on the Sustainability Victoria website.

2.2 Options for Class 1 buildings

Between 1 May 2007 and 31 August 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, 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.

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 the purposes of this Practice Note.

2.3 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.

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 or where the use of the deemed to satisfy provisions in accordance with Part 3.12 is maintained. If a HER was undertaken prior to when the building was first constructed it should be used to determine the HER required for the alterations. There may be a need to undertake a HER which covers the dwelling as a whole including the alterations and/or additions. This will ensure that the star rating has been maintained for the house once the building work is completed.

It is not appropriate to use a HER to determine the rating of the home and then assess an extension using the DTS provisions. An alteration or addition must be assessed using the particular tool (HER software or DTS) for which the building was assessed prior to when the building was first constructed.

¹ 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](http://www.plumbingindustry.com.au).

2.3.1 Regulation 608

Regulation 608 of the Building Regulations 2006 (the Regulations) applies to alterations to an existing building and requires that building work to alter an existing building must comply with the Regulations. There is a threshold measure whereby the remainder of the existing building must also comply with the Regulations if the proposed alterations, together with any other alterations completed or permitted within the previous 3 years, represent more than half the original volume of the building.

Regulation 608 also provides that the relevant building surveyor (RBS) has discretionary power to consent to partial compliance with the Regulations. This does not mean that the RBS can allow non compliance. When considering partial compliance the RBS must take the following into account:

- (a) the structural adequacy of the building; and
- (b) the requirements necessary to make reasonable provision for-
 - (i) the amenity of the building and the safety and health of people using the building; and
 - (ii) avoiding the spread of fire to or from any adjoining building.

The RBS may only consent to partial compliance in respect of the extension, if the floor area of the extension is not greater than the lesser of:

- (a) 25% of the floor area of the existing building; or
- (b) 1000m².

Section 28 of the Building Act 1993 and regulations 502, 503, 609 and 1011 provide the RBS with other discretionary powers related to partial compliance.

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.

Additions including satellite habitable buildings such as a sleepout or bungalow should be constructed to achieve a HER of 5 stars or meet the provisions of Part 3.12 of the BCA.

2.3.2 Regulation 608 – What is reasonable?

When deciding whether to permit partial compliance under regulation 608, the RBS should consider how reasonable full compliance would be in a particular instance, along with the likely cost and benefit.

The Macquarie Dictionary defines “reasonable” as “agreeable to reason or sound judgment”. The RBS should apply their own judgement (using their qualifications and experience) to the specific matters being assessed. In some instances the RBS will need to seek the advice of other suitably qualified practitioners or industry experts in determining the acceptability or otherwise of a specific building, element of construction or use².

The energy efficiency provisions have been developed on a basis of saving energy and long-term cost effectiveness for the building owner. On the same basis, when determining whether a dispensation from the energy efficiency provisions should be granted, it may be reasonable to ask “Is it cost effective?”

2.4 Deemed to satisfy provisions

It is not possible to address all potential situations involving existing Class 1 buildings where Part 3.12 has not been applied prior to the building being first constructed.

2.4.1 Building fabric

Where a building is being extended, the fabric of the extension should fully comply with the BCA fabric provisions. Partial compliance may be considered where the extension is relatively small. Where the new work includes replacement of existing elements, such as roof cladding, wall cladding or wall lining, compliance with the BCA fabric provisions should be achieved. However, if the roof cladding, wall cladding or wall lining is only being repaired, then it may be unreasonable to require this to be removed, solely to install new insulation.

2.4.2 External glazing

Where an existing building is being extended, the glazing in the extension should comply with the BCA glazing provisions. However, this is complicated by the fact that the glazing provisions are determined on the basis of the whole storey. This means that the

² In addition, Minister’s 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.”

existing glazing also needs to be considered. In some cases, it may be unreasonable for new glazing in an extension to compensate for the poor performance of existing glazing. In this instance, it would be reasonable to determine compliance by applying the performance of the new glazing uniformly to the whole storey but only require the complying glazing to be installed in the extension.

If all the existing glazing in a building is being replaced, then the new glazing should comply with the current BCA glazing provisions.

Shade is integral to glazing performance. However, there may be site constraints or planning requirements that prevent external shading being added to an existing building. In such instances, the required performance level may be achieved by unshaded glazing, but only by using costly materials. It would therefore be “reasonable” to allow a reduced level of glazing performance, where such constraints on shading exist.

2.4.3 Building sealing

An extension of one or more new rooms should be sealed in accordance with the BCA sealing provisions. If an existing room is being extended, the need for sealing may depend upon its condition. Sealing of an existing room is an all-or-nothing matter. If the existing part is not sealed – having large areas of unsealed louvred glazing, for example – then there may be little benefit in sealing the new part. In the case of a new extension to an existing unsealed building, a practical approach may be to accommodate the different amounts of sealing in the new and existing parts of the building by installing sealed doors between the two parts. The final decision should be based on the relative size of the extension and the extent to which the existing part is unsealed.

2.4.4 Air movement

The BCA air movement provisions generally require two openings in a room, or a breeze path through to another room. In the case of some extensions, it may not be possible to comply with these requirements – for example, where there is insufficient room for the two openings to be installed in the external wall and the existing building does not have complying breeze paths.

2.4.5 Services

Victoria does not call up Part 3.12.5.0 of the BCA. Plumbing work must comply with the *Plumbing Regulations 1998*. Technical information about these provisions can be found on the [Plumbing Industry Commission's website](#).

2.5 Class 2 and 4 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. 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.

A Class 4 part of a building must achieve an energy rating of not less than 4 stars.

2.6 Verification methods

Applicants must use a software package (refer to Part 5) 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. The BCA 2007 references Protocol for House Energy Rating Software, version 2005.1 and 2006.1. Analysis software can meet either protocol.

2.7 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 Volume One of the BCA.

3 Applying the energy standards

3.1 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 5.1). As a result NatHERS ratings must be accompanied by an additional statement from the

energy rater showing the area adjustment allowance³ 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.

3.1.1 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/m² 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.

3.1.2 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.

3.2 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.

4 Compliance Options

4.1 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 2006-29.

4.2 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 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 2006-39.

³ Area adjustment allowance details are available on the [Sustainability Victoria website](http://www.sustainability.vic.gov.au).

5 Software

5.1 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 for House energy Rating Software.

The BCA 2007 references two protocol versions. Version 2005.1 sets out the requirements for first generation HER software and Version 2006.1 sets out the requirements for second generation software. HER software which complies with either protocol is acceptable until such time that Protocol Version 2005.1 is removed from the BCA.

Software that currently meets Version 2005.1 Protocol includes, 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. The protocols require that a training program must be available for users. The training program must be for the use of the current version and any new version of the software as well as an understanding of the basic principals of residential building thermal performance. Evidence of training must state the software name and version.

As mentioned in 3.1, 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 will be 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, second generation energy rating tools will include:

- the AccuRate software (the NatHERS replacement)
- FirstRate5 (operating with the AccuRate calculation engine)
- BERS second generation

Information about the house energy rating software can be obtained from Sustainability Victoria (www.sustainability.vic.gov.au).

The first generation HER tools can continue to be used for regulatory purposes while they meet the minimum protocol requirements as required by the BCA.

5.2 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.

5.3 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 version 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 FirstRate5.

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.

5.3.1 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/m² 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/m² of window area, as tested under AS 2047 at 75 Pa pressure difference.

5.4 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 FirstRate5, 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.

5.5 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.

6 General information on insulation

6.1 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.

6.2 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.

7 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 sewage 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 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.

8 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

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

www.pic.vic.gov.au

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

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

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

www.greenhouse.gov.au/yourhome

www.5starhouse.vic.gov.au

Appendix

Table A – Software rating levels for NatHERS and FirstRate version 4

Climate Zone ⁷	Rating Level					
	3 Stars		4 Stars		5 Stars	
	NatHERS maximum annual energy load MJ/m ²	FirstRate minimum point score	NatHERS maximum annual energy load MJ/m ²	FirstRate minimum point score	NatHERS maximum annual energy load MJ/m ²	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

⁷Climate selection in energy rating tools is derived from the area postcode.