



AUSTRALIAN WINDOW ASSOCIATION GUIDE SERIES

A GUIDE TO ENERGY EFFICIENCY COMPLIANCE

AN INDUSTRY GUIDE TO COMPLIANCE WITH
ENERGY EFFICIENCY AND THERMAL COMFORT
REQUIREMENTS FOR WINDOWS AND DOORS

VERSION 1

BACKGROUND

FOREWORD

As part of its commitment to raising the built performance standard of windows and doors in Australia, the Australian Window Association (AWA) is pleased to provide this Industry Guide to compliance with the Energy Efficiency/Thermal Comfort requirements for windows and doors.

AUSTRALIAN WINDOW ASSOCIATION

The AWA is made up of over 600 window manufacturers and industry suppliers throughout Australia and overseas. Members of the Association have products tested to Australian Standard AS 2047. When purchasing from an AWA member, buyers can be confident that the products are made to withstand Australian conditions. Non-compliant products may not be suited to Australian conditions.

The aims of the AWA are:

- To promote and advance the awareness of windows as a major architectural component in building design.
- To establish and self-regulate minimum benchmark standards throughout Australia. To facilitate the education and marketing of these standards throughout the industry and wider community.
- To provide a national voice when representing the industry in discussion

and negotiations with government, local authorities, business and trade associations and organisations, and the private sector.

- To promote and encourage ethical conduct and sound business practice in the industry.

The Window Energy Rating Scheme (WERS) is owned and operated by the AWA and provides a scientifically based, fair and credible rating system for the assessment of fenestration products for their energy efficiency performance. WERS is accredited by the Australian Fenestration Rating Council (AFRC) and adheres to AFRC protocols and procedures for the rating of windows and glazed doors. Energy Ratings provided by WERS are third party certified to the AFRC requirements, compliant with the National Construction Code (NCC), and able to be used to meet regulatory requirements.

INDUSTRY GUIDE OBJECTIVE

The objective of this guide is to provide window and door manufacturers, and the wider industry, with a guide to energy efficiency compliance. This guide provides the basic information that is required to provide compliant, fit for purpose window and door products in relation to varying energy efficiency compliance requirements across different jurisdictions.

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DISCLAIMER

This AWA guide has been developed to provide general guidance, awareness and education to AWA members and stakeholders only. It contains information that is correct at the time of publication but may be subject to change by other parties. It should not be viewed as a definitive guide and should be read in conjunction with the National Construction Code (NCC) and the relevant state and territory regulations.

While every effort has been made to ensure the information is accurate, the AWA expressly disclaims all and any liability to any person for anything done in reliance on this publication. No responsibility is accepted by the AWA for any mistakes, errors or omissions in this publication.

RESPONSIBILITIES

THE NATIONAL CONSTRUCTION CODE

The National Construction Code (NCC) is produced and maintained by the Australian Building Codes Board (ABCB) on behalf of the Australian Government and each State and Territory Government.

Under the NCC, the Building Code of Australia (BCA) is a uniform set of technical provisions for the design and construction of buildings and other structures throughout Australia. It allows for variations in climate and geological or geographic conditions.

Under Part 2.6, Section P2.6.1 of Volume 2, a building must have, to the degree necessary, a level of thermal performance to facilitate the efficient use of energy for artificial heating and cooling. To satisfy this requirement aggregate conductance and aggregate solar heat gain through the glazing must not exceed the allowances provided in Part 3.12.2.1 and sealing of windows must meet the requirements in Part 3.12.3.3.

Under Section J of Volume 1, a building, including its services, must have, to the degree necessary, features that facilitate the efficient use of energy. To satisfy this requirement the aggregate air conditioning energy value through the glazing must not exceed the allowances provided in Part J2 and sealing of windows and doors must meet the requirements in Part J3.4.

NOMINATION OF ENERGY EFFICIENCY RATINGS

The nomination of energy efficiency performance ratings for window and door systems is specific to the location, climate, orientation and design of the building. Therefore the nomination of energy efficiency performance values should be provided by the purchaser of the windows system in the form of:

- A set of plans marked with the whole of window U-value and Solar Heat Gain Coefficient for each window system; or
- The relevant complying energy efficiency assessment certificate accompanied by a set of building plans with the windows marked in a consistent manner; or
- The specific window system and glass combination confirmed to meet the specific energy efficiency requirements by the purchaser.

REGULATORY REQUIREMENTS

The NCC has provisions that relate to energy efficiency for all classes of buildings. It may also contain State and Territory variations to these requirements.

These energy efficiency provisions have a significant impact on window selection.

Compliance is achieved through the prescriptive measures found in the NCC, or through performance based solutions using simulation tools such as AccuRate, FirstRate, BERS Pro and BASIX.

In the reports from any of these compliance solutions, it will specify both the window performance for total window U-value (U_w) and total window Solar Heat Gain Coefficient ($SHGC_w$).

U-value (U_w) measures how readily a window conducts heat. It is a measure of the rate of non-solar heat loss or gain through the frame and glass assembly. The lower the U-value, the greater a window's resistance to heat flow and the better its insulating value.

Solar Heat Gain Coefficient ($SHGC_w$) measures how readily heat caused by sunlight flows through the entire window system. $SHGC_w$ is expressed as a decimal between 0 and 1. The lower a window's $SHGC_w$, the less solar heat it transmits.

IMPORTANT NOTE

The NCC also includes specific requirements for Building Sealing in Part 3.12.3.3 or Part J3.4 for windows and doors. This requires that the window system can prove it is capable of efficiently using energy by sealing the building envelope against air leakage. Products that satisfy the requirements of AS 2047 automatically meet these requirements.

ENERGY EFFICIENCY VALUES

Energy efficiency values are required to meet NCC requirements. For the purposes of the NCC, glazing refers to windows, glazed doors and other transparent or translucent elements (such as glass bricks) located in the building fabric.

The NCC requires glazing products to be rated in accordance with the Australian Fenestration Rating Council (AFRC) protocols and procedures. Standard rating of glazing products ensures that a valid comparison can be made between the performance of different products.

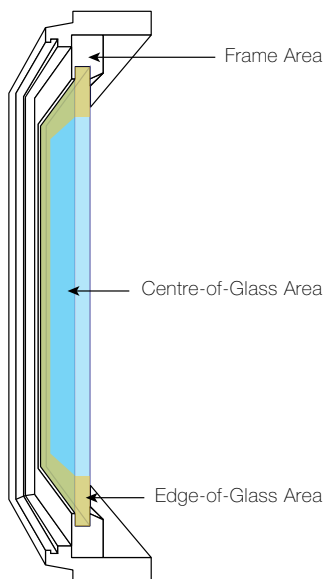


Figure 1 Glazing Elements

It is essential that the glazing elements are rated as a whole system to account for the different thermal properties of glass, any fills, the frame and the impact of the frame on the glass.

Excerpt From the NCC Volume 2

Part 3.12.2.1, requires Total System U-values and Total System SHGCs to be assessed for the combined effect of glass and frames.

Excerpt From the NCC Volume 1

By referring to glazing elements, J2.4 requires Total System U-values and Total System SHGCs to be assessed for the combined effect of the glass and frame.

The Window Energy Rating Scheme (WERS) is accredited by the AFRC - ensuring that WERS ratings are compliant with the NCC.

Performance requirements from energy efficiency reports are provided to the window supplier by the purchaser, who must, in turn, be able to verify and validate that they meet the requirements with their WERS rated products. In some cases, it is easier to select the windows first and supply the performance data to whoever is rating the building.

WARNING

Ensure that window performance ratings have been undertaken in accordance with the protocols of the AFRC and are for the combination of glass and frames. If the performance ratings have not been conducted to AFRC Protocols and certified by an AFRC accredited body or are the performance of the glass only, then they do not comply. Visit www.wers.net or www.afrc.org.au for more information.

METHODS OF ASSESSMENT

The Energy Efficiency regulations in the NCC have a variety of methods of assessment that cover all classes of buildings. Under each of these assessment methods there are varying tolerance requirements for the SHGC, to ensure that window systems are compliant. U-values must be less than or equal to the stated value.

In order to provide compliant glazing it is important to know which method of assessment is being used and the tolerance that will apply. It is the responsibility of the purchaser of the products to provide the required performance of the window systems, using one of the following assessments or an alternative assessment report along with the required star rating.

A quick reference guide to the tolerances that currently apply to each method of assessment can be found on page 14 of this guide.

RESIDENTIAL

There are currently four compliance paths for residential buildings including:

- BASIX
- NATHERS
 - AccuRate
 - FirstRate 5
 - BERS Pro
- NCC Glazing Calculator
- Alternative Solution

COMMERCIAL

There are currently two methods of compliance for commercial.

- NCC Glazing Calculator
- Alternative Solution

BASIX

The BASIX scheme applies to all Class 1, 2 and 10 buildings as well as Class 4 parts of buildings. This scheme only operates in New South Wales and uses either a Do It Yourself assessment or a NatHERS accredited software as a part of the compliance method.

A BASIX Certificate is seen in **Figure 2**. This certificate will either contain a list of glazing requirements or will come with a NatHERS Certificate.

Figure 2 BASIX Certificate

BASIXCertificate

Building Sustainability Index www.basix.nsw.gov.au

Single Dwelling

Certificate number: 4570715

This certificate confirms that the proposed development will meet the NSW government's requirements for sustainability, if it is built in accordance with the requirements set out below. Terms used in this certificate are the same as those used in the BASIX Code of Practice (2016/2017) published by the Department of Planning & Environment. This document is available at www.basix.nsw.gov.au

Created: General
Date of issue: Tuesday, 11 March 2014
To be valid, this certificate must be lodged within 3 months of the date of issue.



Project summary		
Project name	Hardings House	
Street address	25 South Street, Sydney, NSW 2000	
Local Government Area	Hawkesbury Council	
Plan type and plan number	Approved 44/0004	
LGA No.	440004	
Section No.	78	
Project type	residential dwelling house	
No. of loadings	2	

Efficient score		
Water	14	Target 40
Thermal Comfort	Pass	Target Pass
Energy	43	Target 40

Certificate Prepared by

Name / Company Name: Testing Pty Ltd

ABN (if applicable): 11 222 222 444

As all residential work undertaken in New South Wales is conducted through BASIX, the SHGC tolerance of $\pm 10\%$ applies to all work, even if a NatHERS Certificate is supplied.

METHODS OF ASSESSMENT

NATHERS

The National House Energy Rating Scheme is a star rating system (maximum of 10 stars) that rates the design-based energy efficiency of a home. The NatHERS Scheme is administered by the Federal Government and all three of the accredited software programs (AccuRate, FirstRate5 and BERS Pro) report their results in the form of a certificate that can be Accredited or Non-Accredited. In some States, Accreditation is a requirement to perform energy ratings on homes.

Check with the state authority to ensure the certificate is issued by an appropriately qualified person. While accreditation is not required in all states, the AWA always suggests using an Accredited Energy Rater, as they undertake ongoing training and auditing to ensure that they provide the highest level of service.

In the NatHERS accredited software programs thermal performance Assessors can specify windows either as Default Windows or Custom Windows.

Default Windows are selected when the specific window that will be used is not known at the time of rating. The windows that are finally selected for use must be matched to the U-value and SHGC requirements in the report based on the default windows. The tolerance for the SHGC may vary depending on the software used.

Custom Windows are AFRC certified ratings for real windows that are entered into the software program. Using a Custom Window allows for more accurate performance and an easier compliance pathway. There is no tolerance allowed if Custom Windows are used in the ratings. The values must match exactly.

Worked examples are given on page 11 of this guide.

AccuRate

AccuRate is a NatHERS accredited software, developed by CSIRO, used to assess a building for a 6 Star Energy Rating for Class 1, 2 and 10 buildings as well as Class 4 parts of buildings.

FirstRate5

A NatHERS accredited software, FirstRate5 is developed and administered by Sustainability Victoria. It is used to assess a building for a 6 Star Energy Rating for Class 1, 2 and 10 buildings as well as Class 4 parts of buildings.

BERS Pro

BERS Pro is a NatHERS accredited software, developed and administered by Energy Inspection. It is used to assess a building for a 6 Star Energy Rating for Class 1, 2 and 10 buildings as well as Class 4 parts of buildings.

COMMERCIAL AND RESIDENTIAL

There are two methods that can be used for both commercial and residential energy assessment. They are:

NCC Glazing Calculator

This is a spreadsheet developed and published by the Australian Building Codes Board that is a deemed-to-satisfy method of compliance with the NCC.

There are two Glazing Calculators, one for residential and one for commercial. The two differ in their calculation methods.

The NCC Glazing calculator certificate contains the details of the glazing for each storey of a building as each storey is individually assessed.

To learn more about the NCC Glazing Calculator and to download the spreadsheet you can visit www.abcb.gov.au

Alternative Solution

This is a method undertaken by an Environmentally Sustainable Design (ESD) consultant who assesses an individual building against the NCC requirements and produces a report outlining the requirements.

FURTHER INFORMATION

For more information on best practice energy efficient design, guidance is provided by the Australian Government in the publication Your Home. To view the publication visit: www.yourhome.gov.au

To find an Accredited Energy Rater, visit the Australian Building Sustainability Association (www.absa.net.au) or the Building Designers Association of Victoria (www.bdav.org.au).

METHODS OF ASSESSMENT

IDENTIFICATION OF DIFFERENT ASSESSMENT METHODS

NatHERS Certificate: Accredited Rater

An Accredited Energy Rater provides a certificate that contains the NatHERS logo and is in colour. This certificate also includes the Software type (AccuRate, FirstRate 5 and BERS Pro) in the box marked #1.

The box marked #2 identifies the tolerance allowed for this specific job.

Note that the SHGC tolerances can change between different certificates and care should be taken to check this on every version of the certificate.

NatHERS Certificate: Non-Accredited Rater

A Non-Accredited Energy Rater provides a certificate that does not contain the NatHERS logo and is monotone. This certificate also includes the Software type (AccuRate, FirstRate 5 and BERS Pro) as marked #3.

The box marked #4 identifies the SHGC tolerance allowed for this specific job.

Note that the tolerances can change between different certificates and care should be taken to check this on every certificate.

Figure 3 NatHERS Certificate: Accredited Rater.

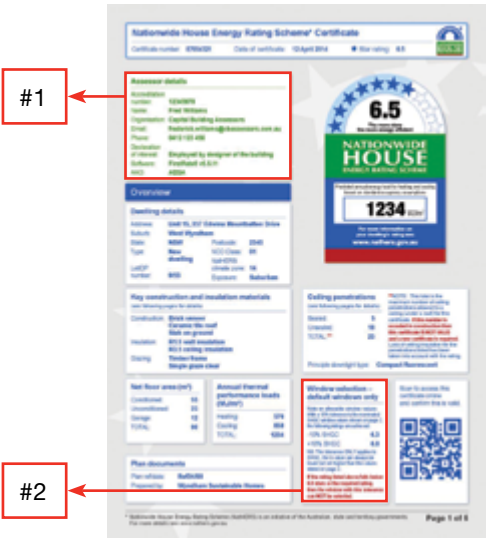
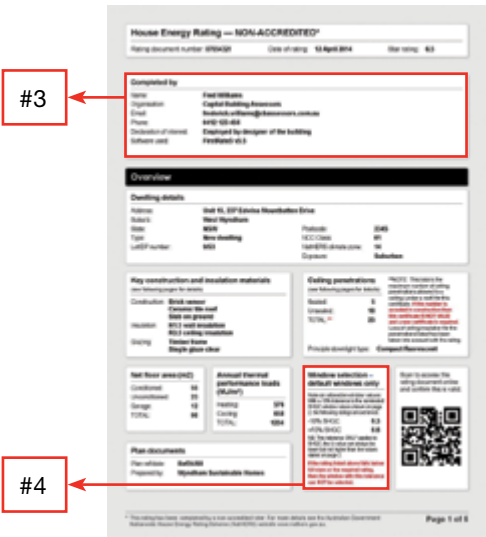


Figure 4 NatHERS Certificate: Non-Accredited Rater.



Example of an AccuRATE NatHERS Tolerance

This is how the specified SHGC tolerance as provided by the AccuRate software program is used to determine the allowable SHGC tolerance of the product.

1. Identify the Software program used by the assessor. This can be found in the area marked #1 in **Figure 3**.
2. Identify the Star rating required by the local regulation. This can be sourced from the client or energy assessor. In this example we will use 6.5 Stars.
3. In the box marked #2 in **Figure 3** and reproduced to the right check both the **+10%** and **-10%** SHGC tolerances to see if they equal or outperform the required rating.
4. In this case, the **-10%** falls below 6.5 stars, while the **+10%** is higher than the required 6.5 stars.
 - As the **-10%** tolerance falls below the star requirement it cannot be used.
 - The allowable tolerance to be used will be a SHGC between the specified value and **+10%** of this value.
5. For example:

$$\begin{aligned} \text{If the specified SHGC} &= 0.66 \\ \text{then 10\% of the SHGC} &= 0.06 \\ \text{and } 0.66 + 0.06 &= 0.72 \end{aligned}$$

which is the maximum (+10%) allowable SHGC tolerance.

Therefore, for a specified SHGC of 0.66 the SHGC for a compliant product must be between 0.66 and 0.72.

Figure 5 Excerpt from an AccuRATE NatHERS Certificate.

Window selection – default windows only

Note on allowable window values:
With a 10% tolerance to the nominated SHGC window values shown on page 2, the following ratings are achieved:

-10% SHGC	6.3
+10% SHGC	6.6

NB: This tolerance ONLY applies to SHGC, the U-value can always be lower but not higher than the values stated on page 2.

If the rating listed above falls below 6.0 stars or the required rating, then the window with this tolerance can NOT be selected.

METHODS OF ASSESSMENT

Example of a FirstRate5 or BERS Pro NatHERS Tolerance

This is how the specified SHGC tolerance as provided by the BERS and FirstRate5 software programs is used to determine the allowable SHGC tolerance of the product.

1. Identify the Software program used by the assessor. This can be found in the area marked #1 in **Figure 3**.
2. In **Figure 6** to the right, the tolerance allowed is specified as **+/- 5% SHGC** tolerance. This defines that the SHGC Must be between **+/- 5%** of the specified SHGC of each product.
3. For example, for a specified SHGC of 0.66 the SHGC tolerance is calculated as shown:

$$5\% \text{ of } 0.66 = 0.03$$

$$\text{Therefore, } 0.66 - 0.03 = 0.63$$

$$\text{and, } 0.66 + 0.03 = 0.69$$

These calculations give the minimum (-5%) allowable SHGC tolerance, 0.63, and the maximum (+5%) allowable SHGC tolerance of 0.69. Therefore, the SHGC of a compliant product must be between 0.63 and 0.69.

Figure 6 Excerpt from FirstRate5 or BERS Pro NatHERS Certificate.



VERIFICATION

A range of items can be supplied by window companies to verify performance claims and enable validation of compliance to standards and regulations. These items should be requested and retained.

They include:

- Performance labels attached to windows. This is a requirement in housing. **Figure 7**, below, illustrates an example of a performance label that conforms to AS 2047:2014 and can have the accredited energy ratings added.
- Compliance certificates: These should only be deemed acceptable if the company providing the certificate is a part of an accreditation scheme, such as the AWA independent third party NATA accreditation scheme. **Figure 8** illustrates an example of a compliance certificate that conforms to AS 2047:2014 and has the provision for energy ratings to be noted.
- Website listings can be a useful source of information to confirm if the company is a member of an industry association that has an accreditation scheme and audit program. The WERS website contains a certified products directory that lists WERS rated products.

Figure 8 Compliance Certificate AS 2047:2014



QUICK REFERENCE GUIDE

RESIDENTIAL

BASIX (NSW Only)	Glazing Calculator
New Build <ul style="list-style-type: none"> U_w must be \leq specified value. SHGC_w must be within $\pm 10\%$ of specified value. 	<ul style="list-style-type: none"> U_w must be \leq specified value. SHGC_w must be within $\pm 10\%$ of specified value.
Alteration and Addition <ul style="list-style-type: none"> U_w must be \leq specified value. SHGC_w must be within -10% of specified value. 	

FirstRate5	BERS PRO
Default Windows <ul style="list-style-type: none"> U_w must be \leq specified value. SHGC_w must be within $\pm 5\%$ of specified value. 	Default Windows <ul style="list-style-type: none"> U_w must be \leq specified value. SHGC_w must be within $\pm 5\%$ of specified value.
Custom Windows No Tolerance is provided. Windows listed on the certificate must be supplied or a re-assessment must be undertaken.	Custom Windows No Tolerance is provided. Windows listed on the certificate must be supplied or a re-assessment must be undertaken.

AccuRate	
Default Windows: Accredited Rater <ul style="list-style-type: none"> U_w must be \leq specified value SHGC_w must be within $\pm 10\%$ of specified value depending on the detail on the front page of the NatHERS Certificate. The certificate will indicate if the default window will achieve the required star rating with a +10% SHGC_w and a -10% SHGC_w. Only if the certificate achieves the required stars on the specific tolerance can it be used to provide a compliant window system. See page 5 for an example.	Default Windows: Non-Accredited Rater <ul style="list-style-type: none"> U_w must be \leq specified value. SHGC_w must be within $\pm 5\%$ of specified value.
	Custom Windows No Tolerance is provided. Windows listed on the certificate must be supplied or a re-assessment must be undertaken.

QUICK REFERENCE GUIDE

RESIDENTIAL
Alternative Solution
An Alternative Assessment Report is conducted by an Environmentally Sustainable Design (ESD) Consultant. The allowable tolerance on the glazing should be defined in the Alternative Assessment Report or should be confirmed by the ESD Consultant for each building.

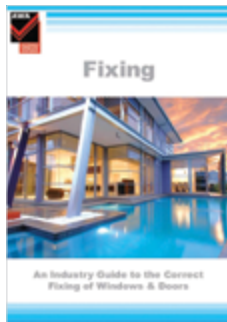
COMMERCIAL
Glazing Calculator
<ul style="list-style-type: none">• U_w must be \leq specified value.• $SHGC_w$ must be within -10% of specified value. <p>Alternatively, verify the tolerances allowed by contacting the ESD (Environmentally Sustainable Design) Consultant or the building surveyor in order to confirm the requirements for compliance.</p>
Alternative Solution
An Alternative Assessment Report is conducted by an Environmentally Sustainable Design (ESD) Consultant. The allowable tolerance on the glazing should be defined in the Alternative Assessment Report or should be confirmed by the ESD Consultant for each building.

AWA GUIDE SERIES

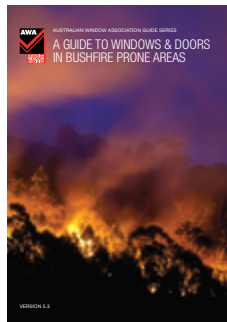
Installation



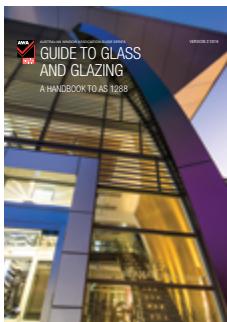
Fixing



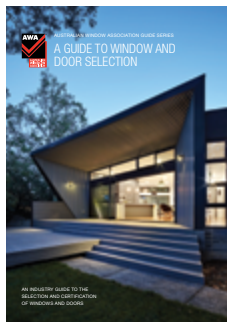
Bushfire Areas



Glass & Glazing



Window & Door Selection



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