



AUSTRALIAN
**GLASS &
WINDOW**
ASSOCIATION

AUSTRALIAN GLASS AND WINDOW ASSOCIATION GUIDE SERIES

A GUIDE TO WINDOW AND DOOR SELECTION

AN INDUSTRY GUIDE TO THE
SELECTION AND CERTIFICATION
OF WINDOWS AND DOORS

VERSION 2

BACKGROUND

Foreword

As part of its commitment to raising the built performance standard of windows and doors in Australia, the Australian Glass and Window Association (AGWA) is pleased to provide this Industry Guide to the selection of windows and doors.

Australian Glass and Window Association

The AGWA is made up of over 1100 Glass Processors, Glaziers, Window Manufacturers and Industry Suppliers throughout Australia and overseas. Members of the Association have products tested to Australian Standard AS 2047 and glaze products in accordance with AS 1288. When purchasing from an AGWA 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 AGWA are:

- To promote and advance the awareness of glass and 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 AGWA 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.

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Industry Guide Objective

This Industry Guide outlines the basic information that needs to be considered and gathered for the selection of suitable, compliant and fit for purpose window and door products for a particular project. This guide can be used as a checking mechanism for certifiers to ensure window and door compliance with the National Construction Code (NCC).

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Disclaimer

While the AGWA has made every effort to ensure that the material within this guide is accurate, the AGWA will not be liable for any mistakes, errors or omissions arising as a result of information contained in this guide.

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 3.0, Section 3.6.0 of Volume 2 of the BCA, performance requirements (P2.1 and P2.2.2) are satisfied if windows are designed and constructed in accordance with AS 2047. For glazed assemblies not covered by AS 2047 compliance to AS 1288 is required.

Under Section B and Section F of Volume 1 of the BCA, performance requirements are satisfied if windows are designed and constructed in accordance with AS 2047. For glazed assemblies not covered by AS 2047, compliance to AS1288 is required.

AS 2047 Windows and External Glazed Doors in Buildings

AS 1288 Glass in Buildings:
Selection and Installation

NOMINATION OF SITE RATINGS

Extract from Appendix C AS 2047:2014

Nomination of window ratings or design wind pressures for each window and door assembly should be as follows:

- (a) For housing, the purchaser should nominate —
 - (i) the window rating;
 - (ii) the window exposure classification; and
 - (iii) whether the window is a corner window when ordering the window assemblies.
- (b) For other residential buildings, the purchaser should nominate the design wind pressures when ordering the window assemblies.
- (c) For commercial buildings, the purchaser should nominate the design wind pressures for the window assemblies when ordering the windows.
- (d) The manufacturer of the window assemblies should verify the window assemblies meet the window rating or design wind pressures as provided by the purchaser.

IDENTIFYING COMPLIANCE

Extract from AS 2047:2014 – Section 8

8.1 GENERAL

Window assemblies for housing shall be labelled in accordance with Clause 8.2. Timber windows for housing and window assemblies for other than housing shall be labelled in accordance with Clause 8.2, or a certificate in accordance with Clause 8.3 shall be provided.

Note: Where windows for housing are supplied as incomplete assemblies, a certificate and a label giving manufacturer’s identification marks, window rating and water penetration resistance should be provided with the window.

8.2 LABELLING

The label shall be so positioned that the window can be identified when viewed in situ.

Each window shall have the following information marked anywhere on the window assembly, except on the glazing (the application of rating labels on fixed glazed timber windows is permitted):

- The manufacturer’s identification mark.
- The Serviceability Limit State wind pressure.
- The Ultimate Limit State wind pressure.
- The water penetration resistance.

8.3 CERTIFICATE

A certificate indicating the manufacturer’s identification, the Serviceability Limit State wind pressure, the Ultimate Limit State wind pressure and the water penetration resistance shall be provided with window assemblies.

When making a statement of compliance with this Australian Standard on a product, packaging or promotional material related to that product, it shall be ensured that such compliance is capable of being verified.

When making a statement of compliance with this Australian Standard on a variation to a tested sample, it shall be ensured that such compliance is capable of being verified.

Figure 1.1 Compliance Certificate

GLASS & WINDOWS AUSTRALIA

COMPLIANCE CERTIFICATE

I, a participating member of the AGWA Accreditation Program, produce a (year) Guarantee against faulty workmanship and materials under the Manufacturer's Warranty, as evidenced by the Warranty Code of Conduct and under the requirements of the annual AGWA Compliance Audit.

The manufacturer certifies that the window and door supplied to:

Delivery address: _____

Delivered on: _____

have been manufactured in conformity with the Australian Glass and Window Standard AS 2047 and Glass Standard AS 1088 including future impact resistance as specified in the order. The window and doors have been manufactured in conformity with NCC energy efficiency and building requirements as specified by the purchaser.

The windows have been manufactured in conformity with:

Housing	U _g (1/3)	U _g (1/2)	U _g (2/3)	U _g (1/3)	U _g (1/2)	U _g (2/3)	Other Construction
<input type="checkbox"/> H1	600	500	500	<input type="checkbox"/> C1	1000	100	U _g _____ Pa
<input type="checkbox"/> H2	800	600	500	<input type="checkbox"/> C2	800	2700	U _g _____ Pa
<input type="checkbox"/> H3	1000	1000	500	<input type="checkbox"/> C3	1000	6000	U _g _____ Pa
<input type="checkbox"/> H4	1200	1000	500	<input type="checkbox"/> C4	1000	10000	U _g _____ Pa
<input type="checkbox"/> H5	1500	1000	500	Note: For other windows, the next highest wind pressure applies.			
<input type="checkbox"/> H6	1800	1000	500				

Energy Performance Ratings, ATRC Results: U_g Value: _____ Solar Heat Gain Co-efficient: SHGC: _____

Building Rating: B1: 1.5 B2: 1.6 B3: 2.0
 C1: 4.0 C2: 4.5 C3: 5.0 (air requirement)

Manufacturing: (new) (AS 1028.8) (rework) (AS 1028.8)

Signal: _____ Date: _____
 Window ID/entry: _____

NATA
 The registration number of this AGWA member is: _____
 Accredited: _____
 Agency Number: _____

The manufacturer certifies that the window and door supplied have been tested in conformity with the requirements of the National Construction Code and the further impact glass tested to the correct opening.

Signal: _____ Date: _____
 Author/issuer: _____

For accreditation details, visit www.agwa.com.au
 Document No. AGWA-CC-0214

SELECTION

WIND LOADS

Every site for every building in Australia should be assessed for wind load requirements according to AS/NZS 1170.2 Wind Actions or AS 4055 Wind Loads for Housing (a simplified document for housing).

The wind loads are a deciding factor for the type of window and door system that will be used as they need to structurally withstand the loads that are present on the site.

The two loads are Serviceability Limit State (SLS) and Ultimate Limit State (ULS). They are given in AS 2047 or calculated from AS/NZS 1170.2 or, if the construction is housing, AS 4055 can be used to obtain the N or C ratings. These site ratings should be calculated and supplied by the site engineer for the project or the architect, designer or builder.

QUICK CHECK

For Housing

What is the N or C Rating for the site?

Other Construction

What are the Serviceability Limit State (SLS) and Ultimate Limit State (ULS) loads for the site?

Table 2.1 Serviceability Strength Test Pressures

Window Rating	Serviceability Pressure, Pa	
	General	Corner Windows
N1, N2	400	600
N3, C1	600	800
N4, C2	800	1200
N5, C3	1200	1800
N6, C4	1600	2500

Table 2.2 Ultimate Strength Test Pressures

Window Rating	Ultimate Limit State Pressure, Pa	
	General	Corner Windows
N1	600	900
N2	900	1300
N3	1400	2000
N4	2000	3000
N5	3000	4500
N6	4000	6000
C1	1800	2700
C2	2700	4000
C3	4000	5900
C4	5300	8000

Note: The pressures are as per AS 4055, rounded to the nearest 100 Pa.

SITE CONDITIONS

Now that the site requirements have been determined we must ensure the windows being selected meet these requirements. Windows need to be tested for a number of conditions that will impact on their performance and durability.

Windows are tested in accordance with the requirements in AS 2047. The tests completed are:

- 1. Structural:** Measures deflection of the window (SLS) @ Span/250.
- 2. Operating Force:** Confirms opening force is within the set limits.
- 3. Air Infiltration:** Measures air leakage through the window or door.
- 4. Water Penetration:** Measures water penetration resistance (WPR).
- 5. Ultimate Strength:** Confirms the window meets ULS requirements.

Windows are tested for combinations of wind loads (SLS and ULS) and WPR for all classes of building types. The performance results dictate where the windows and doors can be used based on the requirements for the type of construction and site.

Table 2.3 Water Penetration Resistance Test Pressures

Window Rating	Non-exposed, Pa	Exposed, Pa
N1, N2	150	200
N3, C1	150	300
N4, C2	200	300
N5, C3	300	450
N6, C4	450	600

QUICK CHECK

For Housing

Do the windows meet the requirements for the N or C Rating given for the site?

Other Construction

Do the windows meet the requirements for the Serviceability Limit State (SLS) and Ultimate Limit State (ULS) loads given for the site?

Is the Water Penetration Resistance \geq 30% of the +Positive SLS load given for the site?

SELECTION

THERMAL COMFORT

The NCC has provisions that relate to energy efficiency for all classes of buildings and there may also be state variations to these requirements. The energy efficiency provisions have a significant impact on window selection.

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

A report or requirement from any of these compliance solutions will specify both the window performance for total window U Value (U_w) and total window Solar Heat Gain Co-efficient (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 assembly.

The lower the U Value, the greater a window's resistance to heat flow and the better its insulating value.

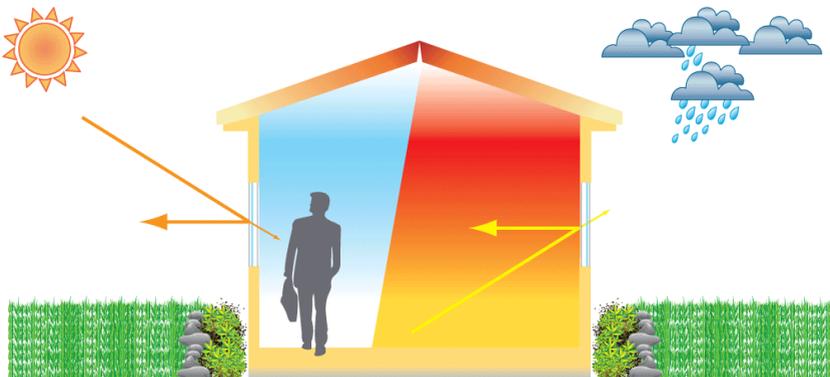
Solar Heat Gain Coefficient (SHGC_w) measures how readily heat caused by sunlight flows through a window.

SHGC_w is expressed as a decimal between 0 and 1. The lower a window's SHGC_w, the less solar heat it transmits.

QUICK CHECK

What are the total window U Value (U_w) and total window Solar Heat Gain Co-efficient (SHGC_w) requirements as specified by the chosen compliance solution?

Figure 2.1 U Value (U_w)

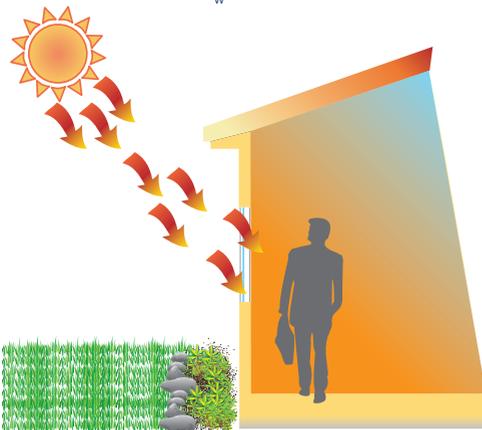


ENERGY VALUES

This is a key step to ensure that the products you are installing meet the NCC requirements. Energy efficiency provisions state that external glazing performance (total window system performance) data must be determined in accordance with the guidelines of the Australian Fenestration Rating Council (AFRC).

The Window Energy Rating Scheme (WERS) is accredited by the AFRC - which means that WERS ratings are compliant with the NCC. Performance requirements from energy efficiency reports are given to the window supplier, who will match or exceed the requirements with their WERS rated products. In some cases, it will be easier to select the windows first then supply the performance data to whoever is rating the building.

Figure 2.2 Solar Heat Gain Coefficient ($SHGC_w$)



WARNING: Ensure window ratings have been done in accordance with the protocols of the AFRC. If it hasn't been done to those protocols then it **does not comply**. Visit www.wers.net for more information.

QUICK CHECK

Do the total window U Value and Solar Heat Gain Co-efficient meet or exceed the requirements as specified?

Substitution of alternative windows during construction is acceptable provided that:

For Housing

1. The U value of the actual window must be equal to or less than the U value of the rated window; and
2. The Solar Heat Gain Coefficient of the actual window must be within 10% of the rated window.*

* The variation in $SHGC_w$ is subject to confirmation within the NatHERS rating tools. The rating must still exceed minimum compliance at the +10% or -10% level.

BASIX provides compliance requirements on each certificate.

Other Construction

The WERS rating for U Value (U_w) must be equal to or less than the energy report requirements. The WERS rating for Solar Heat Gain Co-efficient ($SHGC_w$) must be within -10% of the energy report requirements.

SELECTION

BUSH FIRE ATTACK LEVEL

Many construction sites now fall within bush fire prone areas. This will have a significant impact on the types of windows and glass that must be used.

AS 3959 specifies the requirements to assess the site and building requirements. It is important to give the correct Bushfire Attack Level (BAL) to the window supplier so they can ensure they are providing you with a compliant product. Compliance can be checked through systems either meeting the prescriptive provisions of AS 3959 or via test reports if systems have been tested to meet bushfire requirements.

The AGWA have a useful guide for windows and doors in bushfire prone areas, visit www.agwa.com.au to download.

QUICK CHECK

Does the site have a BAL rating that needs to be met?

Do the windows and doors meet the requirements of the BAL rating? The window manufacturer will have proof of compliance through prescriptive provisions or test reports showing performance levels met.

MATERIALS

There is a need to comply with all of the known material standards and regulations when designing, manufacturing and selecting windows and doors.

Once all of the window specific requirements, including the finishes and hardware have been determined, your window fabricator will be able to provide options.

Considerations should be made for the following conditions:

- Harsh corrosive environments, coastal or industrial.
- Acoustic performance requirements.
- Safety and security.
- UV resistance: Australia has a significantly higher level of UV than many other countries. Materials such as uPVC require higher levels of UV performance.

The more information that is provided the more fit for purpose (and cost effective) the product will be.

QUICK CHECK

Have you considered all of the requirements of the materials you are specifying?

NCC PROVISIONS FOR WINDOWS AND DOORS VOLUMES 1 & 2

Make sure that your windows and doors meet all of these BCA provisions:

a. Section 3.6 and Section B

Products are structurally adequate to meet site requirements for SLS and ULS. Window manufacturers must be capable of verifying performance claims.

b. Section 3.6 and Section F

Products have a water penetration resistance that meets the site requirements. Window manufacturers must be capable of verifying performance claims.

c. Section 3.3.4.9 and Section F

Flashing required to window and door systems to prevent water penetration around the system.

d. Section 3.6.4.6

Manifestation required for glass doors and panels that could be mistaken for a door or unimpeded path of travel.

e. Section 3.7.4.7 and Section G

Bushfire requirements.

f. Section 3.9.2.2 and Section D

Balustrades and barriers. This includes restricted or protected openings.

g. Section 3.12.2 and Section J

Energy efficiency requirements.

h. Section 3.12.3.3 and Section J

Sealing in requirements for window and door systems to stop air leakage (around the systems) which significantly reduces energy efficiency.

QUICK CHECK

Tick off each of these areas of the NCC that have been met by the window and door supplier for a, b, d, e, f and g. Ensure window and door installer fulfils requirements of c and h. An installation and fixing guide is available from the AGWA, visit www.agwa.com.au

SELECTION

VERIFICATION

A range of items should 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 2.3 illustrates an example of performance labels that conform to AS 2047:2014.
- Compliance certificates. These should only be deemed acceptable if the company providing the certificate is a part of some type of accreditation scheme such as the AWA independent third party NATA accreditation scheme. Figure 2.4 illustrates an example of a compliance certificate that conforms to AS 2047:2014.
- Test reports should be requested if there is any doubt about the validity of labels or certificates supplied. Refer to Figure 2.5.
- 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.

QUICK CHECK

Are windows labelled with performance data that meets the site requirements?

If a compliance certificate has been issued, check if the company is a member of an association that has an independent third party accreditation scheme (AGWA member). If they are not, ask for a test report showing window and door performance.

View AGWA and WERS websites for company listings, www.agwa.com.au and www.wers.net.au

Figure 2.3 Performance Label AS 2047:2014

AUSTRALIAN GLASS & WINDOW ASSOCIATION

ABC
YOUR COMPANY LOGO
ACCRED MEMB No. 000

DESIGN PERFORMANCE		ENERGY RATED
N2 GEN SLS 0.4 kPa ULS 0.9 kPa	N2 CNR SLS 0.6 kPa ULS 1.3 kPa	
Water Resistance		
Non Exposed 150 Pa	Exposed 200 Pa	

This manufacturer certifies that this product was designed to conform with AS2047. The design performance has been verified by a NATA accredited test laboratory. This manufacturer is a member of the AGWA Accreditation Program.

Figure 2.4 Compliance Certificate AS 2047:2014

AGWA AUSTRALIAN GLASS & WINDOW ASSOCIATION

COMPLIANCE CERTIFICATE

The manufacturer certifies that the windows and doors supplied to:

Delivery address: _____

Delivered on: _____

have been manufactured to comply with the Australian Glass and Window Standard AS 2047 and Glass Standard AS 1288 including human impact requirements as specified in the order. The windows and doors have been manufactured to comply with NCC energy efficiency and bushfire requirements as specified by the purchaser.

The windows have been manufactured to comply with:

Housing			Other Construction		
SLS Pa	ULS Pa	WPR Pa	SLS Pa	ULS Pa	WPR Pa
<input type="checkbox"/> N1 600	1000	150	<input type="checkbox"/> C1 600	1800	150
<input type="checkbox"/> N2 800	900	150	<input type="checkbox"/> C2 800	2700	200
<input type="checkbox"/> N3 800	1600	150	<input type="checkbox"/> C3 1200	4000	300
<input type="checkbox"/> N4 800	2000	200	<input type="checkbox"/> C4 1600	5300	450
<input type="checkbox"/> N5 1200	3000	300			
<input type="checkbox"/> N6 1600	4000	450			

Note: For corner windows, the next highest rating pressure applies.

Energy Performance Ratings, AFRC Results: U Value, U _____ Solar Heat Gain Co efficient, SHGC, _____

Bushfire Rating: BAL 12.5 BAL 19 BAL 29 not required/specified
 BAL 40 BAL FZ

Methodology: Tested (AS 1530.8) Prescriptive (AS 3959)

Water Company _____ Date: _____

The builder/installer certifies that the windows and doors supplied have been installed correctly in accordance with the requirements of the National Construction Code and the human impact glass located in the correct openings.

Signed: _____ Date: _____
 Builder/Installer

NATA

The inspection services of the AGWA are accredited. Inspection Agency Number: 17710

For accreditation details, visit www.agwa.com.au
 Document No. AGWA-CC-2014

Figure 2.5 Test Report

IAN BENNIE & ASSOCIATES PTY. LTD.
 Building Performance Testing
 A/CN: 107 133 033

TEST REPORT NUMBER 2015-XXX-S1

Test Client: XX Windows

Sample Identification: An XX Sliding Door Window, measuring 2360 mm in height x 2380 mm in width. The sample is detailed in the XX Windows drawings given in Appendix C.

Test Method: Operating Force, Air Infiltration, Water Penetration Resistance and Ultimate Strength test performance requirements to Clause 2.3 of Australian Standard AS2047:2014, and test procedures to Australian Standard AS4420:1996 as detailed in Appendix A.

Test Location: IBA Test Centre Dandenong, Melbourne. **Test Date(s):** 10 November 2014.

Pre-loading: The sample was operated five (5) times prior to the commencement of testing.

TEST RESULTS

Detailed test results are given in the body of the report. Summary results are given below.

Housing ratings:
 Regions A & B General N4
 Corner N3
 Region C +980 Pa and -980 Pa
 Region D +770 Pa and -770 Pa

Residential building ratings:
 Region A +1000 Pa and -1300 Pa
 Region B +1000 Pa and -1020 Pa
 Region C +900 Pa and -980 Pa
 Region D +770 Pa and -770 Pa

Commercial building ratings:
 Region A +970 Pa and -1000 Pa
 Region B +970 Pa and -1000 Pa
 Region C +970 Pa and -980 Pa
 Region D +770 Pa and -770 Pa

† - rating is limited by the maximum water test pressure applied without failure.
 # - rating is limited by the maximum ultimate test pressures applied without failure.

Air Infiltration: LOW rating
Maximum Water Penetration Resistance Pressure: 300 Pa
 IBA Report: 2015-XXX-S1 - Page 1 of 7

1 Lusia Avenue, Dandenong 3175, Victoria, Australia
 Telephone: (03) 9768 3640 International: +613 9768 3640 Facsimile: (03) 9768 3642

INSTALLATION

INSTALLATION REQUIREMENTS

Four key steps to installation of windows and doors:

1. Square and plumb. This will ensure the functionality of the system.
2. Packing. Packing between the window and building frame ensures that the frame remains square and plumb and adds strength to the nail or screw fixing.
3. Fixing. The window or door needs to be fixed to enable the system to withstand the wind loads applicable to the site.
4. Flashing. Windows and doors should be flashed to stop water penetration around the outside of the system. This is the responsibility of the installer.

Problems such as no flashings, smothered or missing weep holes or loss of continuity in the water barrier are prime causes of leaks in window assemblies.

Particular care must be taken when flashing windows for light weight construction.

Consult the window manufacturer and the walling system supplier for details of how to correctly treat penetrations.

There is not one particular detail which is applicable to all lightweight wall cladding materials. However, there are some simple principles which, if followed, should provide a good performing installation that will stand the test of time.

1. A 'Z' shaped metal head flashing extending beyond the width of the window - minimum 25mm; ideal 50mm.
2. The window to be fitted with poly flashing to jambs and sill. Jamb flashing should extend 100mm above and below the window jamb height. The sill flashing to extend to the outside width of the jamb flashings.
3. All flashings must offer weathering overlap i.e. the sarking above the window must overlap the metal head flashing; the head flashing must overlap the window jamb poly flash. The jamb poly flash must overlap the sill poly flash and both jamb and sill poly flash must overlap the wall sarking.
4. There must be provision for drainage below the window and ideally along the bottom of the sheeting for the full length of the wall.

There are many different types of window designs which make it very difficult to create generic installation details to cover all window systems. In most cases, the walling system suppliers provide details for window installation. However, not all cladding manufacturers' details are suited to window weathering and drainage, nor are they aligned with window manufacturers' installation details.

A lot of these wall cladding materials are used in residential applications where traditional finned windows are used. With this window type, the waterproof line of the window is the fin and not the front face of the window.

Sealing or attempting to seal to the front face of the window is destined for failure.

QUICK CHECK

Have installation instructions been given to the installer by the window and door manufacturer?

Does the installer have a copy of the AGWA generic installation and fixing guides?

Severity of exposure to wind is the most important factor in specification and installation. Practices for sheltered situations may fail quickly when exposed to the full force of the wind and rain.

- Top hung products such as bifold doors require structural assessment to minimise deflection.
- Packing is crucial to avoid distortion through settlement.
- Adequate fixings should be used.
- Follow the window manufacturer's installation specification for the appropriate Terrain Category and height of building.

AGWA guides for fixing and installation are available at www.agwa.com.au

WARNING: Incorrect installation of windows and doors can cause significant damage to the building.

CHECKLIST

This quick reference checklist ensures window and door products meet today's requirements when specifying, supplying, selecting, purchasing, certifying and installing.

- ❑ Wind Load Requirements Satisfied
- ❑ Site Conditions Satisfied
- ❑ Thermal Comfort Requirements Satisfied
- ❑ Energy Values Met
- ❑ Bush Fire Attack Level Assigned and Requirements Met
- ❑ Materials Meet All Requirements
- ❑ NCC Provisions Satisfied
- ❑ Validation Documents Available
- ❑ Installation Requirements Satisfied

GUIDES

For more information, download other guides in this series from www.agwa.com.au



Installation



Fixing



Energy Efficiency
Compliance



Glass and Glazing

