



Industry Bulletin 138

Weatherproofing – Windows and doors

This bulletin provides guidance on the selection and installation of windows and doors. It is intended to assist in improving the standard of design, documentation and building compliance to reduce water penetration into buildings during wind driven rain events.

Following recent cyclone events, Building and Energy's Compliance Directorate identified the following areas of concern relating to weatherproofing:

1. Documentation
2. Wind classification
3. Site exposure
4. Window testing
5. Water penetration resistance testing
6. Doors
7. Labelling
8. Installation

Similar concerns were also identified during inspections of a sample of Class 1 buildings in the Perth metropolitan area.

Applicable building standard

Building legislation in Western Australia adopts the Building Code of Australia, Volumes One and Two of the National Construction Code (NCC), as the applicable building standard.

The NCC is a performance based document. The NCC performance requirements can be met using a performance solution, a deemed-to-satisfy (DTS) solution, or a combination of both.

Note – DTS provisions are prescriptive. They tell you what, when and how to do something. They include materials, components, design factors and construction methods that, if used, are deemed to meet the performance requirements, hence the term “deemed-to-satisfy”.

Refer to [Industry Bulletin 102 – Performance solutions for housing projects](#).

For more information on how to use the NCC refer to the [Australian Building Codes Board](#).

Key areas of concern

1. Documentation

Assessment of referenced documents identified many instances where the NCC compliance pathway used was not nominated.

Note – A certificate of design compliance (CDC) is a declaration by a registered building surveying practitioner that the design of a building complies with the applicable building standard.

The CDC includes plans, specifications and documents that demonstrate compliance. These are known as referenced documents.

Referenced documents must clearly indicate the NCC compliance pathway used, which may be a performance solution; DTS solution; or a combination of both.

2. Wind classification

Australian Standard AS 2047 - Windows and external glazed doors in buildings (AS 2047) requires window selection to suit the design wind speed and pressure for the site and building in which they are to be installed.

Design wind speeds and pressures are established through either AS/NZS 1170 - Structural design actions Part 2: Wind actions or AS 4055 - Wind loads for housing.

An assessment of referenced documents found examples of Class 1 buildings in the Perth metropolitan area where the nominated wind classification was incorrect, being lower than the actual wind classification for the building and its location.

Note – A lower wind classification may mean that the windows selected for the building may not be designed to withstand the wind speeds and pressures that they will be exposed to.

Failure of windows during high wind events can result in the ingress of water and may contribute to the loss of a roof due to sudden increase in internal pressure.

Refer to [Industry Bulletin 124 – Wind classifications](#).

3. Site exposure

For housing, AS 2047 requires windows to meet minimum water penetration resistance test pressures based on the wind rating and site exposure of the building.

AS 2047 defines an exposed site as:

A site where one or more of the following AS 4055 site conditions are met:

- (a) *Terrain category TC2 or less.*
- (b) *Topographic class T3 or greater.*
- (c) *No shielding.*

Note – Any site other than defined above is considered non-exposed.

Generally, it was found that referenced documentation did not contain sufficient information to verify whether sites were exposed. In some instances exposed sites were not nominated.

Not identifying and properly documenting an exposed site may cause the incorrect nomination of water penetration resistance test pressures which may result in windows being selected which are insufficient in resisting water ingress.

4. Window testing

AS 2047 details performance criteria for window assemblies.

Clause 2.3.1 outlines the window performance criteria for housing and stipulates the requirement for testing in accordance with AS/NZS 4420 Windows, external glazed, timber and composite doors – Methods of test Part 1: Test sequence, sampling and test methods.

Note – Class 10 buildings are not required to pass the air infiltration and water penetration requirements.

Clause 2.3.2 outlines the window performance criteria for residential and commercial Class 2 to 9 buildings.

It is essential that the window testing carried out is appropriate for the building classification.

The testing criteria required by AS 2047 includes:

- wind pressures;
- deflection/span ratio;
- operating force;
- air infiltration;
- water penetration; and
- ultimate strength assessments.

Test reports are used to verify the compliance of windows and must:

- be up to date;
- include requirements from current Australian Standards;
- be representative of the installed windows;
- include tests for all the required criteria; and
- confirm compliance with all the required tests.

5. Water penetration resistance testing

AS 2047 clause 2.3.1.6 outlines the performance criteria for water penetration of Class 1 buildings.

Window assemblies are required to be subjected to water penetration resistance testing under the test pressures specified in Table 2.4.

Note – It is important to identify if the site is exposed, as water penetration resistance test pressures for exposed sites are significantly higher than non-exposed sites.

Clause 2.3.2.6 outlines the performance criteria for water penetration of Class 2 to 9 buildings.

The test pressures are required to be calculated at 30 per cent of the serviceability limit state determined in clause 2.3.2.2.

Numerous investigations have been carried out following tropical cyclones.

These investigations found extensive damage throughout buildings due to water penetration caused by wind driven rain through windows and doors. In many instances the maximum wind gust recorded during the cyclone was less than the serviceability limit state required for the region.

The Cyclone Testing Station (CTS) North Queensland study into water damage from Cyclones, Oct 2018, found that:

- during cyclone events, water penetration resistance test pressures may not be sufficient to prevent water ingress through window assemblies; and
- during high winds, weep holes in windows or glass sliding doors, that are designed to allow condensation and minor leakage around seals to pass from the inside to the outside of the building, can permit water ingress. However, covering the weep holes with external rubber strips or baffles can reduce the extent of this issue.

Note – CTS recommends that weep holes in window assemblies are designed to minimise water entry at full serviceability wind pressures rather than the 30 per cent required in clause 2.3.2.2.

It is suggested that window selection in cyclonic regions exceed the minimum NCC requirements in order to have improved outcomes.

6. Doors

Glazed doors are required to be tested and to meet the same requirements as windows.

Investigations also found that many glazed doors, especially in commercial buildings, allowed large quantities of water into the buildings. These buildings experienced wind pressures of less than 70 per cent of their design requirements.

Glazed doors were found to be installed with large gaps, indicating the door assemblies have either not been tested or not installed in accordance with the requirements of AS 2047.

Glazed and non-glazed doors were found to have allowed the entry of wind driven water under seals.

Many doors with a mid-height latch appeared to have bowed at the top and bottom due to wind pressure, allowing water to bypass seals.

To improve the performance of doors it is recommended that:

- doors should open outwards;
- doors should contain a locking mechanism that has more than one fixing point; and
- effective seals should be provided between the door and the frame.

7. Labelling

AS 2047 has specific labelling requirements for window assemblies, including that:

- window assemblies for housing must be labelled;
- timber windows for housing, and window assemblies other than for housing, must be labelled or have a certificate; and
- window labels and certificates must include manufacturer identification, serviceability and ultimate limit state wind pressures, and water penetration resistance.

Investigations in metropolitan and regional areas found a high number of window frame assemblies without labelling at the time of inspection.

Note – it is important that the window assemblies (glass and frame) are correctly labelled and are selected to suit the appropriate site conditions.

8. Installation

Failure to properly consider all installation factors that are not included within the window assembly may lead to the building not performing as required by the NCC.

Other factors/systems to consider when installing window assemblies include, but are not limited to:

- sill height and surface water drainage;
- flashing installation;
- fixings into openings; and
- thermal and structural movement.

Additional resources

[Industry Bulletin 102 – Performance solutions for housing projects](#)

[Australian Glass and Window Association \(AGWA\) resource documents](#)

[Industry Bulletin 124 – Wind classifications](#)

Disclaimer – The information contained in this fact sheet is provided as general information and a guide only. It should not be relied upon as legal advice or as an accurate statement of the relevant legislation provisions.

If you are uncertain as to your legal obligations, you should obtain independent legal advice.

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