

TECHNICAL FACT SHEET

Wind Loads for Commercial and Residential Buildings



AS 2047: 2014 sets out the performance criteria for all windows in all buildings. These requirements fall into two categories based on building type and purpose:

- Clause 2.3.1 Housing
- Clause 2.3.2 Residential and Commercial

The purpose of this fact sheet is to provide general information about wind load requirements for windows in residential and commercial buildings

About Wind Loads

All buildings are subject to the elements of extreme weather which includes high wind speeds. **Wind loads on buildings can be substantial and in many cases will act as one of the most significant forces that the building will be subjected to.**

Wind load is considered to be a dynamic force as it varies greatly in intensity over time. As wind flows around a building, it exerts high pressure on the windward face and low pressure (suction) on the leeward face. Leading edges (corners) experience the greatest force due to wind acceleration.

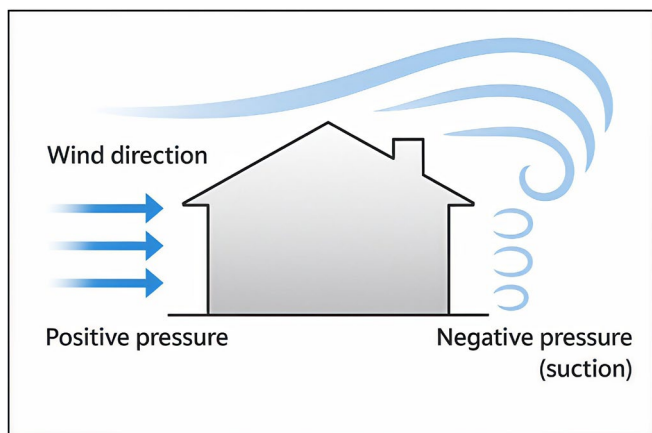


Figure 1: Airflow over a house

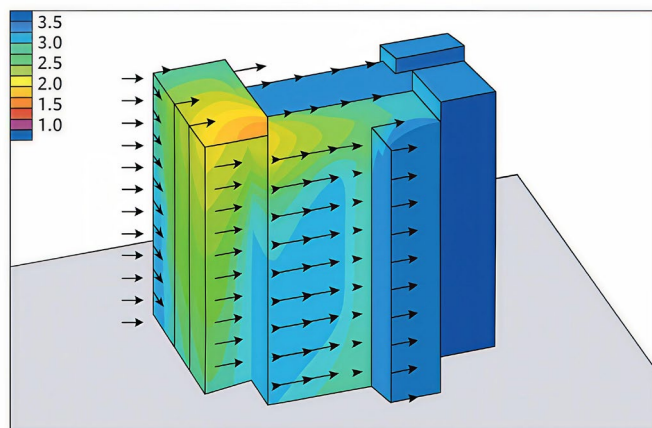


Figure 2: Modelling Wind Loads

Wind Speed and Pressure

Wind speed and wind pressure are closely related, but are not the same.

Wind speed is an expression of the velocity of the air moving past a stationary object. It is most commonly measured in metres per second (m/s).

Site wind speeds are derived from recorded regional wind speed data, the local effects of terrain (height, topography and shielding) and the relevant annual probability of exceedance. Site wind speeds are the predicted speed of wind over the building site, and are determined without consideration of the effects of the building itself (calculated as if the building does not exist).

Wind pressure is the force per unit area exerted over a structure by moving air. The pressure varies with the velocity of the air (both wind speed and direction) and the aerodynamic shape and orientation of the structure. Different parts of the same building experience different wind pressures given the same site wind speed.

Differential wind pressure is the difference in pressure between the inside and outside of a building surface (for example, a window). Pressure is measured in pascals (Pa).

Regulatory Requirements

The National Construction Code (NCC) prescribes that a building must perform adequately under all reasonably expected design actions and withstand extreme or frequently repeated design actions, including the effects of wind loads.

The NCC references Australian/New Zealand Standard (AS/NZS) 1170.2 Structural Design Actions – Part 2 Wind Actions as the primary engineering standard used in the design of buildings to resist wind actions and applies to all buildings constructed in Australia.

The NCC Volume 2 and Housing Provisions (Class 1 and 10 buildings) also reference AS 4055 Wind Loads for Housing which provides a simplified set of requirements specifically for houses that meet certain geometric limitations. House sites are categorised into 6 non-cyclonic regions non-cyclonic (N-ratings) and 4 cyclonic regions (C-ratings) based on geographic location,

topography and the affects of shielding. For more information, refer AGWA Technical Fact Sheet on Wind loads for Housing.

For all other buildings, AS 2047 clause 2.3.2 requires that design wind pressures should be determined in accordance with AS/NZS 1170.2.

Calculating wind loads in accordance with AS 1170.2 is a complex process that requires a comprehensive understanding of the Standard to accurately assess the forces involved in determining the design strength and structural integrity of building components, including windows and doors. Therefore, this task should only be carried out by a suitably qualified professional, such as a licensed builder, engineer, or architect.

Excerpt from AS/NZS 1170.2

1.4 Determination of Wind Actions

Values of wind actions (W) for use in design shall be established. The values shall be appropriate for the type of structure or structural element, its intended use, design working life and exposure to wind action.

The following wind actions, determined in accordance with this Standard (using the procedures detailed in Section 2 and the values given in the remaining sections), shall be deemed to comply with the requirements of this clause:

- (a) W_u determined using a regional wind speed appropriate to the annual probability of exceedance (P) specified for **ultimate limit states** as given in AS/NZS 1170.0, or the Building Code of Australia.
- (b) W_s determined using a regional wind speed appropriate to the annual probability of exceedance for the **serviceability limit states**.

This clause shows that the expression of wind loads in terms of wind speed only are inappropriate.

Wind loads must be expressed in Pascals (Pa) or kilopascals (kPa) for both Ultimate Limit State (ULS) pressures and Serviceability Limit State (SLS) pressures for all building elements including windows and doors.

IMPORTANT NOTE: It is not appropriate to specify an N or C rating on any building other than a house within the geometric limitations prescribed by AS 4055.

QUICK FACT

In accordance with AS 2047, Water Penetration Resistance (WPR) for windows and doors must be specified as no less than 30% of the positive Serviceability Limit State.

Responsibilities

The responsibilities for determining wind loads and compliance are set out in AS 2047.

Excerpt from AS 2047 Appendix C

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

- (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.