

Design Wind Speeds & Pressures For James Hardie[®] External Claddings

**Only ACCELTM provides James Hardie[®] customers
with the highest level of support.**

WIND LOADING CODES

When any part of a structure or its cladding is being designed, the loading from wind has to be considered. Various factors such as height above ground, terrain conditions, potential shielding and site topography are taken into account in order to determine the design wind speed. The process is documented by Australian Standards **AS/NZS 1170.2: 2002 "Wind Actions"**. The final design pressure that the cladding is subjected to depends on the external pressure coefficients (C_{pe}), which are also specified in this so-called "wind code".

In Australia, **AS 4055: 2006 "Wind Loads for Housing"** was developed from AS/NZS 1170.2 on the basis of certain geometric limitations (summarized below), which enabled the establishment of 10 simplified and rationalized wind classifications, namely the six non-cyclonic categories N1 to N6 and the four cyclonic classifications C1 to C4. James Hardie's cladding designs have generally been based on the wind classifications of AS 4055, which are also used in several important building-related publications in Australia such as the National Timber Framing Code and the TRADAC Manuals and can also be found for many systems in the Northern Territory Deemed-to-Comply Manual. It is known that AS 4055 tends to produce a more conservative outcome (ie greater design forces) than AS/NZS 1170.2.

NOTE

In the use of AS 4055, there are certain limitations placed on the geometry of the building such as an eaves height of no more than 6m, an eaves width of no more than 900mm, a maximum roof height of 8.5m, a building width of maximum 16m, a roof pitch of no more than 35 degrees, and the length of the building not to exceed five times the width.



The information in this supplement and James Hardie's technical literature is only intended for use in relation to the relevant James Hardie products.



DESIGN WIND FORCES

The maximum design gust wind speeds and design pressures of AS 4055 for external general and edge zones (ie within 1200mm of building corners) are presented in Tables 1 & 2.

It is likely that the majority of designs for domestic dwellings in Australia (and New Zealand, which is wholly non-cyclonic and its wind classifications described in AS/NZS 1170.2) will be in the following wind classifications:

- **N2** for non-cyclonic areas (equivalent to the traditional W33N wind classification), which covers most housing in the major cities south of Brisbane as well as Terrain Category 3 suburbia in towns south of Bundaberg.
- **C1 or C2** for cyclonic areas in the northern parts of Australia (equivalent to the traditional W41C or W50C wind classifications).

Table 3 shows for the purposes of comparison how certain commercial buildings designed to AS/NZS 1170.2 would fit into the spectrum of design pressures.

The pressure in the general areas of walling is based on a C_{pe} of either +0.7 or -0.65 and in the edge zones of increased air flow turbulence the coefficient rises to -1.3. This applies to an area within 1200mm from the corners of buildings conforming to the geometric limitations of AS 4055 or generally a width equal to the eaves height of the building if designed to AS/NZS 1170.2.

NOTE

For internal pressures, refer to Section 3 of AS 4055, noting that it is generally based on maximum C_{pi} of -0.3 for non-cyclonic areas and -0.65 or +0.7 for cyclonic areas.



TABLE 1 - COMMON RESIDENTIAL WIND LOAD DESIGN CLASSIFICATIONS

| Design Wind Classification | | Max External Design Pressure Capacity |
|-----------------------------|--|--|
| AS 4055 Wind Classification | Wind Design Assumptions & Location of Building within Australia | Based on Suction Within 1200mm of Building Edges |
| N2 (covers N1) | Wind Region A, TC2, partial shielding or TC2.5 no shielding eg located in southern states capital cities, towns and all rural areas (refer to Figure 2 in code) | Up to 1.25kPa. |
| N3 (covers C1) | Wind Region B, TC2, no shielding eg located in Brisbane, Northern NSW, Gold Coast, Sunshine Coast up Bundaberg, Geraldton WA. | Up to 2.0kPa. |
| C2 (covers N4) | Wind Region C, TC2, no shielding, cyclonic areas eg Darwin and other settlements along Northern Territory and Queensland coastlines above Bundaberg. | Up to 3.0kPa. |

NOTES & DESIGN ASSUMPTIONS:

1. Relatively flat topography (eg T1 and T2) assumed - any adverse topographical effects need to be accounted for to ensure that wind classification remains valid.
2. Internal pressures are to be taken up by internal linings otherwise recalculate design pressure based on $C_{p,n}$.

TABLE 2 - DESIGN WIND SPEEDS & EXTERNAL PRESSURES OF AS 4055: 2006

| Wind Load Classification | SLS Gust Speed (m/s) | ULS Gust Speed (m/s) | Maximum Suction (kPa) at edges based on $C_{pe} = -1.3$ | | Maximum General Suction (kPa) based on $C_{pe} = -0.65$ | | Maximum Pressure (kPa) based on $C_{pe} = +0.7$ | |
|--------------------------|----------------------|----------------------|---|-------|---|-------|---|-------|
| | | | SLS | ULS | SLS | ULS | SLS | ULS |
| N1 | 26 | 34 | -0.53 | -0.90 | -0.26 | -0.45 | +0.28 | +0.49 |
| N2 | 26 | 40 | -0.53 | -1.25 | -0.26 | -0.62 | +0.28 | +0.67 |
| N3 & C1 | 32 | 50 | -0.80 | -1.95 | -0.40 | -0.98 | +0.43 | +1.05 |
| N4 & C2 | 39 | 61 | -1.19 | -2.90 | -0.59 | -1.45 | +0.64 | +1.56 |
| N5 & C3 | 47 | 74 | -1.72 | -4.27 | -0.86 | -2.14 | +0.93 | +2.30 |
| N6 & C4 | 55 | 86 | -2.36 | -5.77 | -1.18 | -2.88 | +1.27 | +3.11 |

NOTE

Serviceability Limit State (SLS) forces are used for designing against deflection; ULS = Ultimate Limit State.

TABLE 3 - ULS DESIGN PRESSURES FOR EXTERNAL CLADDING IN COMMERCIAL & RESIDENTIAL APPLICATIONS

| AS 4055 Housing Wind Load Classification or Commercial Building Description | Design Wind Speed (w return Period) | Effective Site Wind Speed (m/s) | General Areas -Positive (kPa) | General Areas -Suction (kPa) | Edge Zone - Suction (kPa) |
|---|-------------------------------------|---------------------------------|-------------------------------|------------------------------|---------------------------|
| House in N1 | V ₅₀₀ | 34 | +0.49 | -0.45 | -0.90 |
| House in N2 | V ₅₀₀ | 40 | +0.67 | -0.62 | -1.25 |
| 3-storey waterfront hospital in Sydney, Perth, Adelaide, Melbourne etc- | V ₂₀₀₀ | 48 | +0.97 | -0.90 | -1.80 |
| House in N3 | V ₅₀₀ | 50 | +1.05 | -0.98 | -1.95 |
| House in C1 | V ₅₀₀ | 50 | +1.05 | -0.98 | -1.95 |
| 25-storey waterfront block in Sydney, Perth, Adelaide, Melbourne etc- | V ₁₀₀₀ | 58 | +1.41 | -1.31 | -2.62 |
| House in N4 | V ₅₀₀ | 61 | +1.56 | -1.45 | -2.90 |
| House in C2 | V ₅₀₀ | 61 | +1.56 | -1.45 | -2.90 |
| 3-storey waterfront hospital between Coffs Harbour & Bundaberg | V ₂₀₀₀ | 63 | +1.67 | -1.55 | -3.10 |
| House in N5 | V ₅₀₀ | 74 | +2.30 | -2.14 | -4.27 |
| House in C3 | V ₅₀₀ | 74 | +2.30 | -2.14 | -4.27 |
| 25-storey waterfront block between Coffs Harbour & Bundaberg | V ₁₀₀₀ | 76 | +2.43 | -2.25 | -4.51 |
| 3-storey waterfront hospital north of Bundaberg (Darwin, Cairns etc) | V ₂₀₀₀ | 77 | +2.49 | -2.31 | -4.62 |
| House in N6 | V ₅₀₀ | 86 | +3.11 | -2.88 | -5.77 |
| House in C4 | V ₅₀₀ | 86 | +3.11 | -2.88 | -5.77 |
| 25-storey waterfront block north of Bundaberg (Darwin, Cairns etc) | V ₁₀₀₀ | 99 | +4.12 | -3.82 | -7.64 |

NOTE

Internal pressure or suction has not been added as it is assumed that it has been taken up by the internal linings.

Additional installation information, warranties, and warnings are available at www.jameshardie.com.au

Call 13 11 03
www.accel.com.au
www.jameshardie.com.au

THIS TECHNICAL SUPPLEMENT MUST BE READ IN CONJUNCTION WITH THE CURRENT TECHNICAL PRODUCT LITERATURE. JAMES HARDIE BUILDING PRODUCTS MUST BE INSTALLED IN ACCORDANCE WITH THE APPLICABLE TECHNICAL PRODUCT LITERATURE. ALL COMPONENTS AND ACCESSORIES MUST BE INSTALLED IN ACCORDANCE WITH THE RESPECTIVE MANUFACTURER'S SPECIFICATIONS. FOR THE PRODUCT WARRANTY, TERMS AND CONDITIONS REFER TO THE APPLICABLE JAMES HARDIE TECHNICAL PRODUCT LITERATURE