

TERRAÇADE TL™ :

STRUCTURAL PERFORMANCE FOR AUSTRALIA



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STRUCTURAL PERFORMANCE

PERFORMANCE FOR EARTHQUAKE AND CYCLONES

THIS LEAFLET IS DESIGNED AS AN ADDENDUM TO THE TERRAÇADE TL™ DESIGN MANUAL FOR AUSTRALIA. IT SHOULD BE USED IN CONJUNCTION WITH THE INFORMATION GIVEN IN THE TERRAÇADE TL DESIGN MANUAL.

SUPPLY AND TESTING STATEMENT

Austral Bricks Terraçade TL system has been tested to AS/NZS 4284 (Testing of building façades) for structural performance and has passed the deflection criteria under serviceable limit state. In addition, extensive cyclone testing has been conducted to AS 4040.3 (Methods of testing sheet roof and wall cladding - Resistance to wind pressures for cyclone regions). Terraçade TL has been cyclone rated to 3.6 kPa and has been tested to an ultimate limit state wind pressure of 3.85 kPa. Copies of the test reports are available on the Austral Bricks Terraçade website www.terraçade.com.au

Austral Bricks has received system and structural advice from Connell Wagner (Australia) Pty. Ltd. and they have also provided engineering guidance on the structural and cyclone testing.

EARTHQUAKE PERFORMANCE

(Statement supplied by Connell Wagner)

The Terraçade TL system has been checked for compliance with AS 1170: Part 4 Earthquake loads.

From analysis of AS 1170.4 the derived acceleration imparts a load which is less than 50% of the cladding self weight. When such loads are compared to the system's allowable wind pressures it is evident that the wind load is by far the dominating load case.

As the Terraçade TL system develops small forces from the action of inertia during seismic events, the horizontal directions of movement are accommodated by the inherent strength of the system. No further action is therefore necessary to resist such movements, and the system is acceptable to AS 4100: 1998 Steel Structures.

Movement however in a true vertical direction does require restraint against the tiles lifting directly off the rail system under such an action.

For installation in earthquake prone areas, the Terraçade TL system requires an anti-lift block or trim installed along its top edge to ensure tiles under the action of vertical seismic events, are unable to detach from their supporting rail.

When the anti-lift block or trim is installed the system is suitable for installation against earthquakes in earthquake prone areas. However this precaution does not alleviate the system's requirements for installation against wind load.

CYCLONE PERFORMANCE

The Terraçade TL system has been successfully rated for cyclone performance to 3.6 kPa during testing to AS 4040.3 (Methods of testing sheet roof and wall cladding - Resistance to wind pressures for cyclone regions).

For installation in cyclone regions, the Terraçade TL system requires an anti-lift block or trim installed along its top edge to ensure that the uppermost tiles are unable to detach from their supporting rail. The system was tested at Ian Bennie & Associates with an anti-lift trim in place. The system's requirements for installation against wind load are not alleviated by this precaution.

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ALLOWABLE PRESSURES

The allowable pressure tables have been revised since the publication of the Technical Manual (version 1) due to the extensive cyclone testing conducted on the system. As such, the Allowable Pressure tables in this leaflet supersede those given in the Terraçade TL Technical Manual.

The allowable pressures have been calculated for both the standard (galvanised rails) and the coastal (stainless steel) versions; the pertinent table should be referred to for a particular project. The allowable pressure tables have been characterised by a particular span configuration. The pressures listed refer to the span configuration directly above it.

Note: The allowable pressures specified in the span configuration tables below should be used in accordance with the fastener table specifications given in the Terraçade TL Technical Manual. Design documentation should accommodate the allowable pressures and fastener specifications for a particular project.

ALLOWABLE PRESSURES FOR THE STANDARD SUSPENSION RAIL (GALVANISED STEEL)

SPAN CONFIGURATION									
1	2	3	4	5	6	7	8	9	10
ULTIMATE WIND PRESSURE (kPa):									
0.17	0.52	1.01	1.36	2.22	2.38	3.75	3.75	3.75	3.75
MAXIMUM REACTIONS (permissible) kN:									
0.18	1.02	0.98	0.96	1.60	1.66	1.72	1.82	1.94	0.90

ALLOWABLE PRESSURES FOR THE COASTAL SUSPENSION RAIL (STAINLESS STEEL)

SPAN No. :									
1	2	3	4	5	6	7	8	9	10
ULTIMATE WIND PRESSURE (kPa):									
0.10	0.40	0.60	0.80	1.31	1.40	2.51	2.51	2.51	2.51
MAXIMUM REACTIONS (permissible) kN:									
0.10	0.45	0.40	0.45	0.50	0.60	0.65	0.65	0.65	0.31

* Note: The arrows in the allowable pressures tables indicate the fastener locations and the distance noted is the span (mm) between the fasteners.

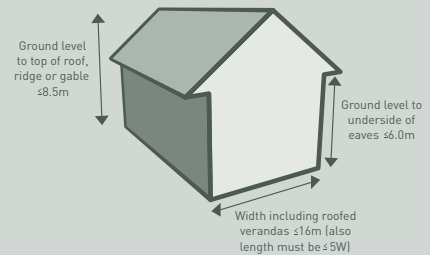
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SYSTEM PERFORMANCE FOR WIND LOADS

PART A – DETERMINING SPAN CONFIGURATIONS USING THE HOUSING CODE

The following wind load requirements on Terraçade TL only apply to buildings that comply with Australian Standard AS 4055 (Wind loads for housing). In general, AS 4055 applies to houses that are within the dimensions shown in the diagram to the right. However, the applicability of AS 4055 and subsequent compliance of individual projects should be verified.

Leading engineers at Connell Wagner have considered the wind pressure requirements for Terraçade TL and have derived the following procedure for determining the minimum span configurations required for buildings complying with AS 4055.



STEP A1: WIND PRESSURE REQUIREMENTS

Identify the wind class applicable to the particular project in accordance with AS 4055. The wind pressure requirements applicable to Terraçade TL have been determined by Connell Wagner and are given in Table A1. Please note that there is an additional installation requirement (refer to Page 02) when Terraçade TL is installed in cyclone regions (wind classes C1-C4).

TABLE A1: Wind Pressure

Wind Class	General Pressure (kPa)
N1	0.69
N2	0.96
N3	1.50
N4	2.23
N5	3.29
N6	4.44
C1	1.50
C2	2.23
C3	3.29
C4	4.44

Note: A superseded version of AS 4055 used permissible wind speed categories to indicate required performance. No relation to this version has been included to reduce confusion as only ultimate wind speeds are quoted in the current version. The wind class should be quoted as N1-N6 or C1-C4.

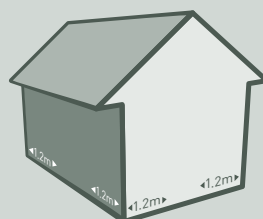
STEP A2: WIND PRESSURES AT BUILDING CORNERS

Corners of buildings experience higher wind pressures than the rest of the building. Check whether any Terraçade TL is being installed within 1.2 metres (see below diagram) of the building's corners.

The wind pressure requirements determined for building corners by Connell Wagner are given in the table below.

TABLE A2: Wind Pressure for building corners

Wind Class	Corner Pressure (kPa)
N1	1.04
N2	1.44
N3	2.25
N4	3.35
N5	4.93
N6	6.66
C1	3.00
C2	4.47
C3	6.57
C4	8.88



STEP A3: SPAN DETERMINATION

Minimum span configuration requirements (for buildings complying with AS 4055) have been determined for the Terraçade TL system in accordance with the procedure outlined by Connell Wagner. The allowable pressure tables (refer to page 03) were used to determine the minimum span configuration requirements for the wind pressure determined. These requirements are summarised in Tables A3 and A4.

The span number given in the tables indicates the lowest span number that the system must be installed at. For example Span 4 indicates that a span configuration of 1200 mm – 600 mm – 1200 mm is required (refer to span diagram on page 03), any lower numbered spans, such as Span 3 which is 600 mm – 1200 mm – 1200 mm, cannot be used.

Tables A3 applies to the Standard Version (galvanised rails), whilst Table A4 applies to the Coastal Version (stainless steel rails). The tables include both the general installation and the building corner installation requirements.

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Example:

A typical project has been determined to have a wind class of N1. If the standard version (galvanised rails) is required then using Table A3 the required span is Span 3 for general areas and Span 4 at the corners. It should be noted that these spans are based on two different configurations of 1200 mm – 1200 mm – 600 mm for a three metre length. It may be worthwhile for the project to specify the higher rated Span 4 for the entire project to simplify installation.

Note: It is important to remember that particular projects that require the coastal version (stainless steel rails) should use Table A4.

Note: The span configurations determined should be specified along with the fastener requirements (refer to the Terraçade TL Design Manual) in all project documentation.

Note: Terraçade TL standard (galvanised) and coastal (stainless steel) rails that are cut to lengths of less than 1.8 m should always be installed at 600 mm centres.

Note: If a span configuration is 'N/A' for a particular wind class it may be worthwhile to use the analysis technique in Part B AS 1170.2. The scope of the wind pressure analysis performed in this housing section is limited and more detailed analysis is performed in Part B.

STANDARD VERSION:

TABLE A3: Minimum Installation Requirements for the Standard Suspension Rail (Galvanised Rails)

Wind Class	Minimum Span Configuration Requirements	
	General Installation	Building Corner Installation
N1	Span 3	Span 4
N2	Span 3	Span 5
N3	Span 5	Span 6
N4	Span 6	Span 7
N5	Span 7	N/A
N6	N/A	N/A
C1	Span 5	Span 7
C2	Span 6	N/A
C3	Span 7	N/A
C4	N/A	N/A

COASTAL VERSION:

TABLE A4: Minimum Installation Requirements for the Coastal Suspension Rail (Stainless Steel Rails)

Wind Class	Minimum Span Configuration Requirements	
	General Installation	Building Corner Installation
N1	Span 4	Span 5
N2	Span 5	Span 7
N3	Span 7	Span 7
N4	Span 7	N/A
N5	N/A	N/A
N6	N/A	N/A
C1	Span 7	N/A
C2	Span 7	N/A
C3	N/A	N/A
C4	N/A	N/A

*N/A equals Not Available

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PART B – DETERMINING SPAN CONFIGURATIONS USING THE STRUCTURAL DESIGN CODE

The following wind load requirements on Terraçade TL only apply to buildings that comply with Australian Standard AS/NZS 1170.2 (Structural design actions, Part 2: Wind actions). The applicability of AS/NZS 1170.2 and subsequent compliance of individual projects should be verified.

AS/NZS 1170.2 identifies four main wind regions pertinent to Australia as shown in the map below.

Leading engineers at Connell Wagner have considered the wind pressure

requirements for Terraçade TL and have derived the following procedure for determining the minimum span configurations required for buildings complying with AS1170.2.

Note: Shielding was not considered in the analysis.

Note: Topography can affect wind pressure if a building is located high on a steep slope or escarpment. Austral Bricks should be contacted in such circumstances.

WIND REGION MAP FOR AUSTRALIA



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STEP B1: WIND REGION

Identify the wind region that the project is located in. If the wind region has not been specified, it should be determined in accordance with AS/NZS 1170.2. The map on page 06 indicates the wind regions for Australia. It is important to note that regions C and D are affected by cyclones and Terraçade TL installed in these regions has an additional installation requirement (refer to Page 02).

STEP B2: HEIGHT

Determine the height above ground level to which the Terraçade TL will be installed. AS/NZS 1170.2 outlines the method of determining reference heights. The wind pressure requirements have been categorised by specific limiting heights. Always select the limiting height that is larger or equal to the project installation height.

STEP B3: TERRAIN CATEGORY

Identify the terrain category for the project. The terrain will affect the wind flow that a project is subjected to. The four terrain categories defined in AS/NZS 1170.2 are:

- **Category 1:** Very few or no obstructions and an exposed open terrain.
- **Category 2:** Limited and well-spread obstructions in an open terrain. Typical terrains include grasslands and water surfaces.
- **Category 3:** Numerous low (3-5 m) obstructions that are closely spaced. A typical terrain is a suburban housing estate.
- **Category 4:** High number of large and tall (10-30 m) obstructions that are closely spaced. A typical terrain is a large city centre.

Note: The terrain category should be determined in accordance with AS/NZS 1170.2 and obstructions should have permanence during a wind event.

STEP B4: WIND PRESSURE

A wind pressure table (Table B1 on page 08) has been provided as a reference. The wind pressure for an individual project can be determined from the table using the information determined in the preceding steps.

Example:

A typical project in a suburban area of Brisbane (i.e. Terrain Category 3, Region B) is installed to a height of 4m. For this case using the limiting height of 5m, the ultimate wind pressure for Terraçade TL in general use is 1.34kPa (using Table B1 on page 08).

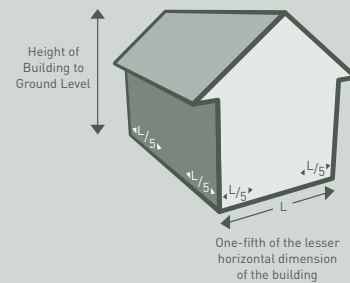
STEP B5: CORNER WIND PRESSURE

Building corners experience higher wind pressures than the rest of the building. Check whether any Terraçade TL is being installed on the building corner. The length of the corner region is either the same as one-fifth of the shortest wall length or is the height of the building, whichever is

smaller (refer to below diagram).

Example:

A building has wall dimensions 5 metres x 10 metres and has a building height of 4 metres. The shortest wall length is 5 metres. Therefore, one-fifth of the shortest wall length is one metre. As one-fifth of the shortest wall length (one metre) is less than the building height of four metres. The corner dimension in this case extends one



metre from the building corners.

When Terraçade TL is installed in this corner region, a different span configuration may be required at the corners. A wind pressure table (Table B2 on Page 08) has been provided as a reference for the wind pressure at the building corners.

Example:

A typical project in a suburban area of Brisbane (i.e. Terrain Category 3, Region B) is installed to a height of 4m. For this case using the limiting height of 5m, the ultimate wind pressure for Terraçade TL in general use is 1.34kPa (using Table B1 on page 08) and the ultimate wind pressure on a corner is 1.75kPa (using Table B2 on page 08).

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TABLE B1: Ultimate Wind Pressure (kPa) for Terraçade TL in Specific Terrain Categories (TC)

Wind Region	Limiting Height (m)	Terrain Category 1	Terrain Category 2	Terrain Category 3	Terrain Category 4
A	3	1.19	1.01	0.84	0.68
	5	1.34	1.01	0.84	0.68
	10	1.52	1.22	0.84	0.68
	15	1.64	1.34	0.96	0.68
	20	1.72	1.42	1.07	0.68
B	3	1.91	1.61	1.34	1.10
	5	2.15	1.61	1.34	1.10
	10	2.45	1.95	1.34	1.10
	15	2.62	2.15	1.54	1.10
	20	2.76	2.27	1.72	1.10
C	3	2.33	2.33	1.84	1.84
	5	2.60	2.60	1.84	1.84
	10	2.88	2.88	2.28	2.28
	15	3.30	3.30	2.60	2.60
	20	3.68	3.68	3.18	3.18
D	3	3.76	3.76	2.97	2.97
	5	4.19	4.19	2.97	2.97
	10	4.65	4.65	3.68	3.68
	15	5.32	5.32	4.19	4.19
	20	5.93	5.93	5.12	5.12

TABLE B2: Ultimate Wind Pressure (kPa) at Building Corners for Terraçade TL in Specific Terrain Categories (TC)

Wind Region	Limiting Height (m)	Terrain Category 1	Terrain Category 2	Terrain Category 3	Terrain Category 4
A	3	1.55	1.31	1.09	0.89
	5	1.74	1.31	1.09	0.89
	10	1.98	1.58	1.09	0.89
	15	2.13	1.74	1.25	0.89
	20	2.24	1.84	1.40	0.89
B	3	2.48	2.10	1.75	1.43
	5	2.79	2.10	1.75	1.43
	10	3.18	2.53	1.75	1.43
	15	3.41	2.79	2.01	1.43
	20	3.59	2.96	2.24	1.43
C	3	3.03	3.03	2.40	2.40
	5	3.38	3.38	2.40	2.40
	10	3.75	3.75	2.97	2.97
	15	4.29	4.29	3.38	3.38
	20	4.78	4.78	4.13	4.13
D	3	4.89	4.89	3.87	3.87
	5	5.45	5.45	3.87	3.87
	10	6.04	6.04	4.79	4.79
	15	6.92	6.92	5.45	5.45
	20	7.71	7.71	6.66	6.66

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STEP B6: SPAN DETERMINATION

Minimum span configuration requirements (for buildings complying with AS/NZS 1170.2) have been determined for the Terraçade TL system in accordance with the procedure outlined by Connell Wagner. The allowable pressure tables (refer to page 03) were used to determine the minimum span configuration requirements for the wind pressure determined. These requirements are summarised in Table B3-B6 on pages 10 and 11.

The span number given in the tables indicates the lowest span number that the system must be installed at. For example Span 4 indicates that a span configuration of 1200 mm – 600 mm – 1200 mm is required (refer to span diagram below), any lower numbered spans, such as Span 3 which is 600 mm – 1200 mm – 1200 mm, cannot be used.

Tables B3 and B4 apply to the Standard Version (galvanised rails). Tables B5 and B6 apply to the Coastal Version (stainless steel rails). The minimum span configuration requirement for general installations of Terraçade TL is given in Table B3 for the Standard Version and Table B5 for the Coastal Version. When Terraçade TL is installed on a building corner (refer to Step B5) refer to Table B4 for the Standard Version and Table B6 for the Coastal Version.

Example:

A typical project has been determined to be:

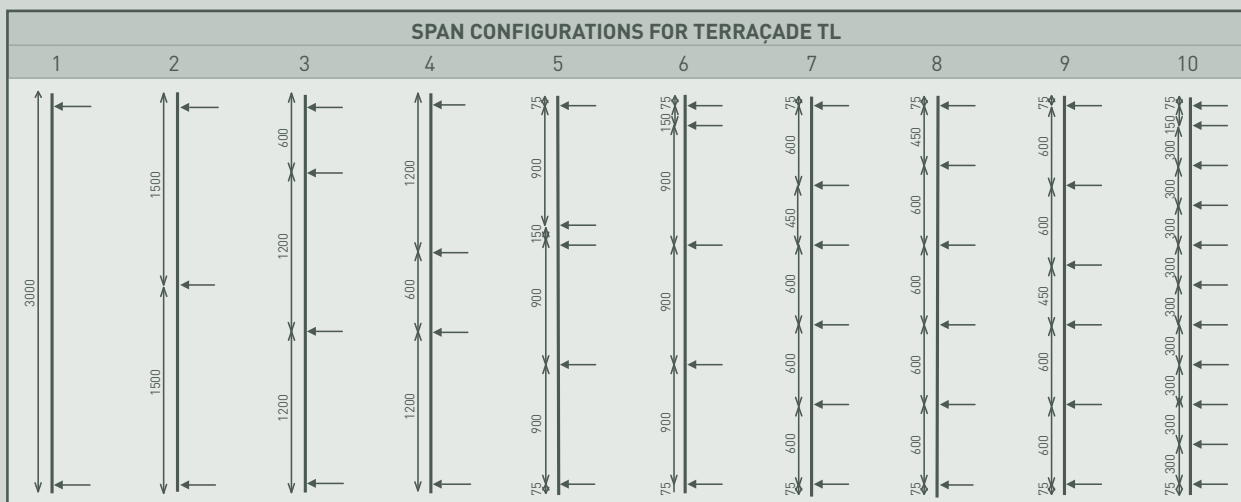
- In the B region.
- In an areas classified as Terrain Category 3.
- Installed at a height of 4 m.

If the standard version (galvanised rails) is required then using Table B3 and B4 the required span is Span 4 for general areas and Span 5 at the corners. It should be noted that these spans are based on two different configurations. It may be worthwhile for the project to specify the higher rated Span 5 for the entire project to simplify installation.

Note: It is important to remember that particular projects that require the coastal version (stainless steel rails) should use Tables B5 and B6.

Note: The span configurations determined should be specified along with the fastener requirements (refer to the Terraçade TL Design Manual) in all project documentation.

Note: Terraçade TL standard (galvanised) and coastal (stainless steel) rails that are cut to lengths of less than 1.8 m should always be installed at 600 mm centres.



* Note: The arrows in the allowable pressures tables indicate the fastener locations and the distance noted is the span (mm) between the fasteners.

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STANDARD VERSION:

TABLE B3: General Installation of Terraçade TL Suspension Rail

Wind Region	Limiting Height (m)	Terrain Category 1	Terrain Category 2	Terrain Category 3	Terrain Category 4
A	3	Span 4	Span 3	Span 3	Span 3
	5	Span 4	Span 3	Span 3	Span 3
	10	Span 5	Span 4	Span 3	Span 3
	15	Span 5	Span 4	Span 3	Span 3
	20	Span 5	Span 5	Span 4	Span 3
B	3	Span 5	Span 5	Span 4	Span 4
	5	Span 5	Span 5	Span 4	Span 4
	10	Span 7	Span 5	Span 4	Span 4
	15	Span 7	Span 5	Span 5	Span 4
	20	Span 7	Span 6	Span 5	Span 4
C	3	Span 6	Span 6	Span 5	Span 5
	5	Span 7	Span 7	Span 5	Span 5
	10	Span 7	Span 7	Span 6	Span 6
	15	Span 7	Span 7	Span 7	Span 7
	20	Span 7	Span 7	Span 7	Span 7
D	3	N/A	N/A	Span 7	Span 7
	5	N/A	N/A	Span 7	Span 7
	10	N/A	N/A	Span 7	Span 7
	15	N/A	N/A	N/A	N/A
	20	N/A	N/A	N/A	N/A

TABLE B4: Corner Installation of Terraçade TL Standard Suspension Rails

Wind Region	Limiting Height (m)	Terrain Category 1	Terrain Category 2	Terrain Category 3	Terrain Category 4
A	3	Span 5	Span 4	Span 4	Span 3
	5	Span 5	Span 4	Span 4	Span 3
	10	Span 5	Span 5	Span 4	Span 3
	15	Span 5	Span 5	Span 4	Span 3
	20	Span 6	Span 5	Span 5	Span 3
B	3	Span 7	Span 5	Span 5	Span 5
	5	Span 7	Span 5	Span 5	Span 5
	10	Span 7	Span 7	Span 5	Span 5
	15	Span 7	Span 7	Span 5	Span 5
	20	Span 7	Span 7	Span 6	Span 5
C	3	Span 7	Span 7	Span 7	Span 7
	5	Span 7	Span 7	Span 7	Span 7
	10	Span 7	Span 7	Span 7	Span 7
	15	Span 7	N/A	Span 7	Span 7
	20	Span 7	N/A	N/A	N/A
D	3	N/A	N/A	N/A	N/A
	5	N/A	N/A	N/A	N/A
	10	N/A	N/A	N/A	N/A
	15	N/A	N/A	N/A	N/A
	20	N/A	N/A	N/A	N/A

*N/A equals Not Available

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COASTAL VERSION:

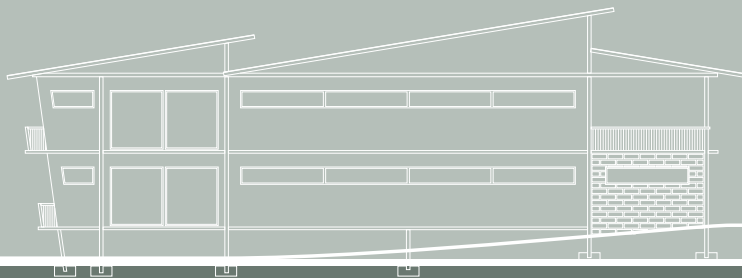
TABLE B5: General Installation of Terraçade TL Coastal Version

Wind Region	Limiting Height (m)	Terrain Category 1	Terrain Category 2	Terrain Category 3	Terrain Category 4
A	3	Span 5	Span 5	Span 5	Span 4
	5	Span 6	Span 5	Span 5	Span 4
	10	Span 7	Span 5	Span 5	Span 4
	15	Span 7	Span 6	Span 5	Span 4
	20	Span 7	Span 7	Span 5	Span 4
B	3	Span 7	Span 7	Span 6	Span 5
	5	Span 7	Span 7	Span 6	Span 5
	10	Span 7	Span 7	Span 6	Span 5
	15	N/A	Span 7	Span 7	Span 5
	20	N/A	Span 7	Span 7	Span 5
C	3	Span 7	Span 7	Span 7	Span 7
	5	N/A	N/A	Span 7	Span 7
	10	N/A	N/A	Span 7	Span 7
	15	N/A	N/A	N/A	N/A
	20	N/A	N/A	N/A	N/A
D	3	N/A	N/A	N/A	N/A
	5	N/A	N/A	N/A	N/A
	10	N/A	N/A	N/A	N/A
	15	N/A	N/A	N/A	N/A
	20	N/A	N/A	N/A	N/A

TABLE B6: Corner Installation of Terraçade TL Coastal Version

Wind Region	Limiting Height (m)	Terrain Category 1	Terrain Category 2	Terrain Category 3	Terrain Category 4
A	3	Span 7	Span 5	Span 5	Span 5
	5	Span 7	Span 5	Span 5	Span 5
	10	Span 7	Span 7	Span 5	Span 5
	15	Span 7	Span 7	Span 5	Span 5
	20	Span 7	Span 7	Span 6	Span 5
B	3	Span 7	Span 7	Span 7	Span 7
	5	N/A	Span 7	Span 7	Span 7
	10	N/A	N/A	Span 7	Span 7
	15	N/A	N/A	Span 7	Span 7
	20	N/A	N/A	Span 7	Span 7
C	3	N/A	N/A	Span 7	Span 7
	5	N/A	N/A	Span 7	Span 7
	10	N/A	N/A	N/A	N/A
	15	N/A	N/A	N/A	N/A
	20	N/A	N/A	N/A	N/A
D	3	N/A	N/A	Span 7	N/A
	5	N/A	N/A	Span 7	N/A
	10	N/A	N/A	N/A	N/A
	15	N/A	N/A	N/A	N/A
	20	N/A	N/A	N/A	N/A

*N/A equals Not Available



QUALITY GUARANTEE:

Austral Bricks' continued commitment to quality and innovation ensures that Terraçade TL will remain the benchmark for excellence for many years to come.

Our tradition, experience and financial strength have made Austral Bricks the first choice for many architects, builders and designers.

Terraçade TL has a warranty of 10 years on the system and a lifetime warranty on colourfastness and durability, as per Austral Bricks' Warranty for Terraçade.

Contact Austral Bricks to have an architectural consultant visit you with samples and technical information, or to discuss your next project.

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