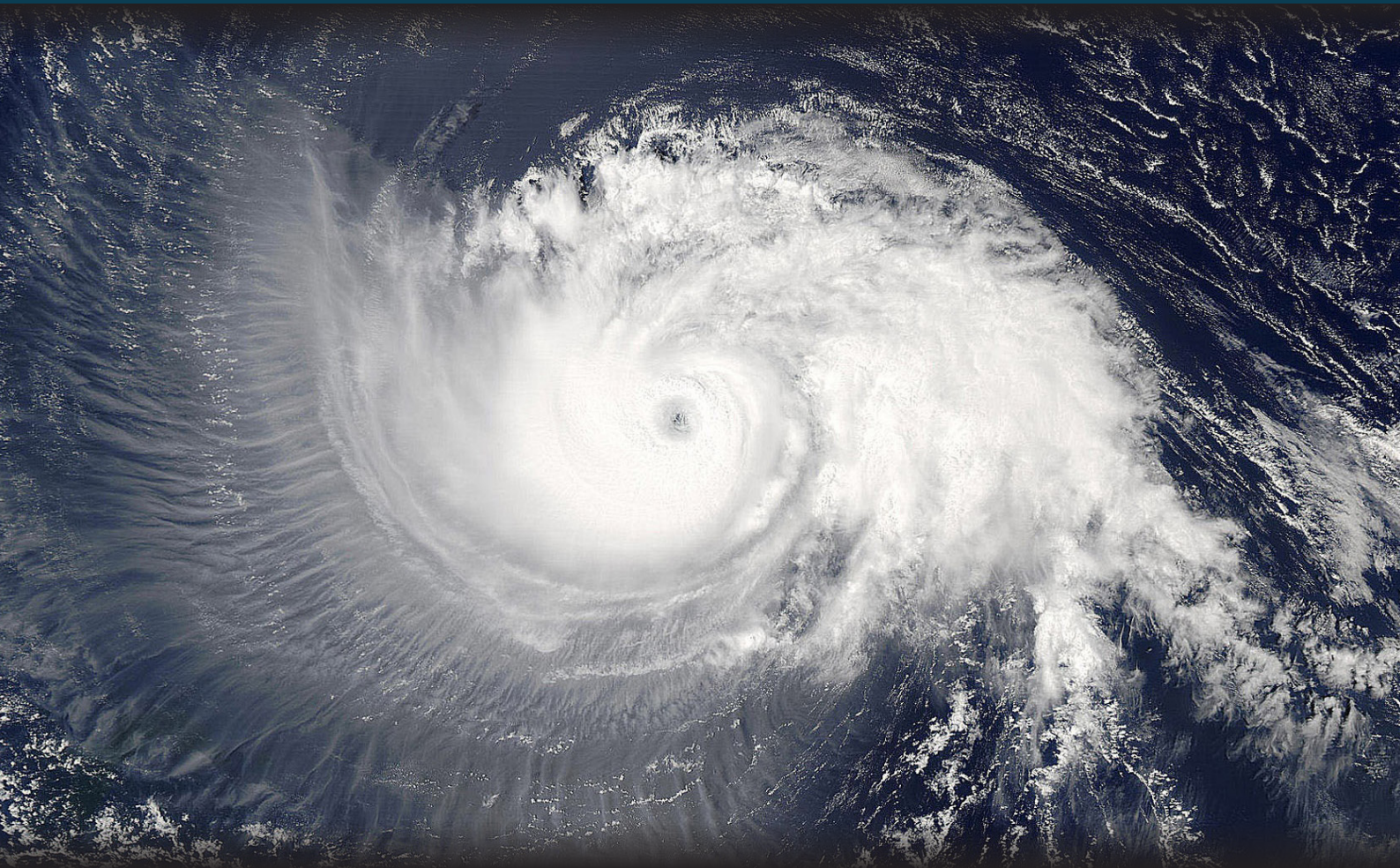




CYCLONE RESISTANT WINDOW SOLUTIONS



glasshape.com

A photograph of a modern, two-story building with a balcony. The balcony has a white railing and a large wooden panel above it. The building features large glass windows and doors. In the foreground, there is a green lawn and some outdoor furniture. A palm frond is visible in the top right corner.

CYCLONE RESISTANT WINDOW SOLUTIONS



StormShield®

CYCLONE RESISTANT GLASS - BY GLASSHAPE



Overview

Protecting your family, staff and property during cyclones, hurricanes and severe storm conditions means resisting excessive wind speeds and penetration from flying debris. In the event the glass is damaged by flying storm debris windows need to remain weather tight without a breach or the buildings structural integrity could be compromised.

StormShield® uses specially formulated ultra-high grade laminate in the manufacturing process. Engineered so the glass can expand and contract up to five times its normal rate before breaking, providing protection from wind-borne debris.

E-zone® Glass is a thermal resistant cyclone rated glass, boasting the same ultra-high grade laminate with additional thermal advantages and flood resistance.

Fully certified for use in Regions C and D in Australia and the Pacific Islands, StormShield® has been extensively tested at our IPENZ certified in-house testing facility as well as other NATA accredited testing facilities including the James Cook University cyclone testing station.

Flag Ship Storm Glass Projects:

Australia:

- ICON Apartments: Port Hedland, WA
- Baynton Apartments: Karratha, WA
- Townsville Apartments: Townsville, QLD
- Darwin Medical Centre: Darwin, NT
- Lizard Island Resort: QLD
- Palmerston Hospital: NT
- Cairns Aquarium: Cairns, QLD
- Palmerston Police Station: NT
- Tambray Village Shopping Centre: Karratha, WA
- Hungry Jacks: Karratha, WA
- Liberty Fuel Station: Karratha, WA
- Bunnings Warehouse: Darwin, NT
- Bunnings Warehouse: Yeppoon, QLD
- Whitsunday Council Proserpine Administration Innovation Hub and Disaster Centre: QLD

Fiji Islands:

- MHCC Shopping Mall: Suva
- ANZ Tower: Suva
- Shreedah Motors Building: Suva
- Westpac Bank: Suva
- Continental Hotel: Denarau
- Momi Bay Resort
- Pearl Resort
- Sun Insurance Tower: Suva
- Nadi International Airport: Nadi

Cyclone Debris Impact Resistance & Wind Loading

Wind-borne debris is a major threat in extreme cyclone conditions. These missiles can be anything from branches to parts of other damaged buildings. If these penetrate the building envelope, including the windows, the risk of injury to occupants or damage to contents is extremely high.

In the event of a breach of the buildings envelope during a storm, the likelihood of complete destruction is greatly increased. When subjected to high wind loads, buildings which are adequately sealed develop a negative internal pressure which helps to counteract the wind pressures acting on the roof and walls of the building. If the building envelope is penetrated in these conditions, the sudden change to a positive internal pressure can result in the failure of the roof or, in the worst case, the whole building structure.



Negative Internal Pressure
 Windows intact, building remains structurally safe.



Positive Internal Pressure
 Windows breached, structural integrity compromised.

Debris Impact Testing

StormShield® has been designed to resist the impact of flying debris without any penetration or perforation of the laminated interlayer protecting buildings and the occupants from the risk of injury or damage. This means the window isn't compromised which keeps the structural integrity of the building intact.

StormShield® has been tested by a fully accredited third party cyclone testing station and has exceeded the test described in AS/NZS1170.2:2011, clause 5.3.2. This test involved a 4kg piece of timber (100 x 50mm cross section) projected at up to 45m/sec (162km/h).

Storm Shutters

Traditional structures have required secondary protection such as storm shutters or storm screens to meet the required impact standards. These additions obscure vision and compromise the design aesthetics.

StormShield® when installed in a certified framing system provides a complete solution which meets the demands of AS/NZS1170.2:2011 without the need of any additional protective measures.

Wind Speed, Wind Loading and Standards

Although the impact resistances of the glass used in windows and doors is critical to ensuring a building is safe during a storm, the thickness of the glass is also of equal importance. If the glass is not glazed to the correct thickness required under the AS1288 standard, the risk is the entire glass panel will deflect under wind loads to a point that it pulls completely out of the window frame. Glasshape® have online calculators that architects and engineers are able to simply input window dimensions and ULS wind loads to calculate the required minimum thickness glass to comply with the codes.

StormShield® Wind Loading Testing

The thinnest panel in the StormShield® range (7.88mm thick) has been cyclic tested in accordance with AS4040.3 and has a rating of 5.75kPa! This equates to a wind speed of approx. 350km/hr. The 10mm StormShield® panel has a strength limit state design wind capacity of 6.74kPa (approx 380km/hr wind speeds), which is a huge result for relatively thin cyclone rated glass. While Glasshape® technicians are willing to advise on the appropriate glass specification for your projects, we recommend using specialist structural engineers with experience in cyclonic wind loadings to help with specific design for buildings in cyclone areas.

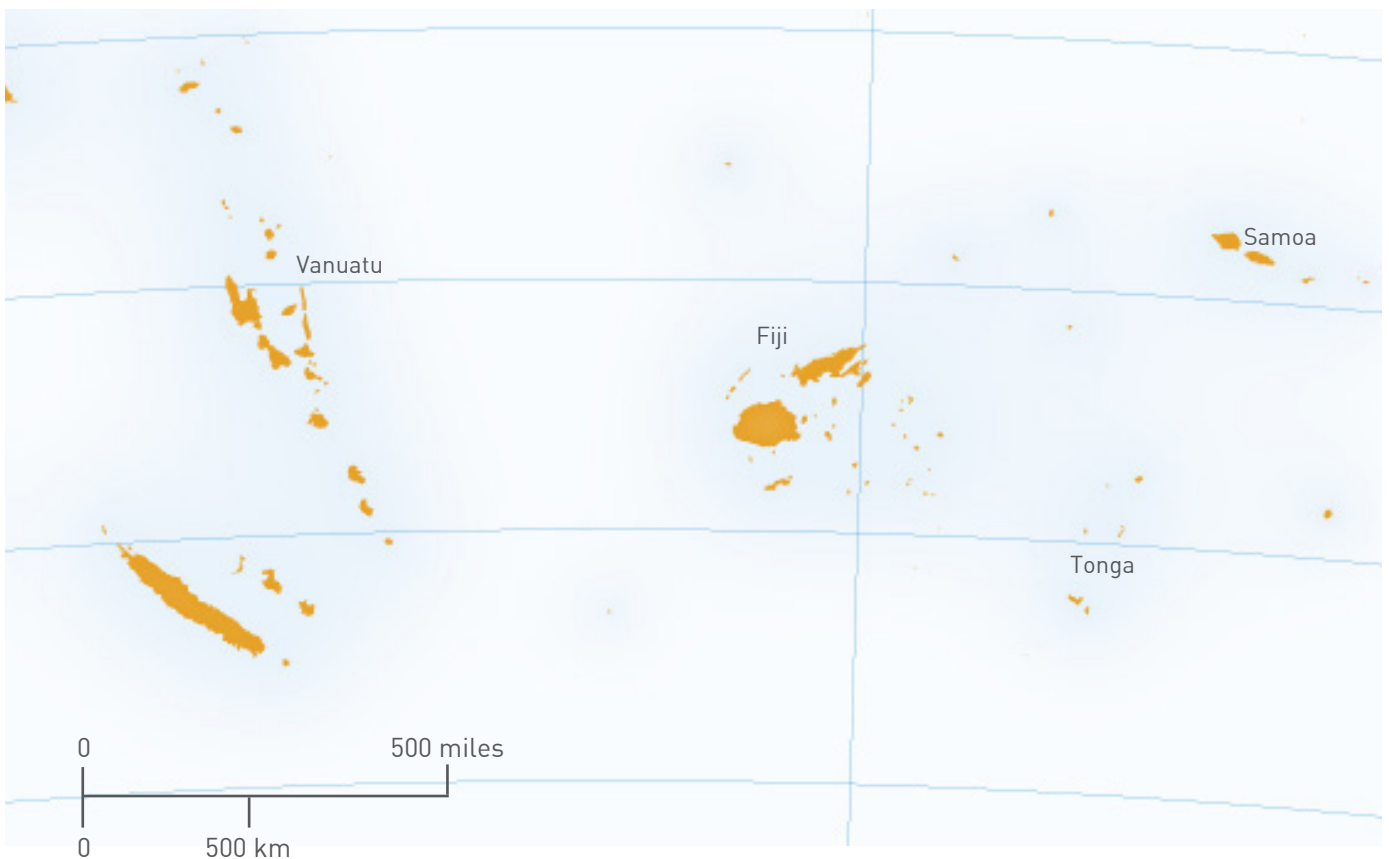
Pacific Islands Wind Speed Region

The Pacific Islands align themselves with Australian Standards and fall under Region C with wind born debris impact ratings of up to 32m/s



Region C


Cyclonic Area - The building envelope requires cyclone debris impact resistance between 28m/s and 32m/s.




Australian Wind Speed Regions

Building wind loadings and debris impact loadings are determined by the regional wind speeds specified in the AS/NZS1170.2:2011 standard. The standard has four wind regions in Australia of which regions C and D are classified as cyclonic regions where protection from wind born debris is required.


The building must be engineered to also withstand full negative internal pressure regardless of the glazing system used.

- 
Region D


 Cyclonic Area - The building envelope requires cyclone debris impact resistance between 34m/s and 44m/s.

- 
Region C

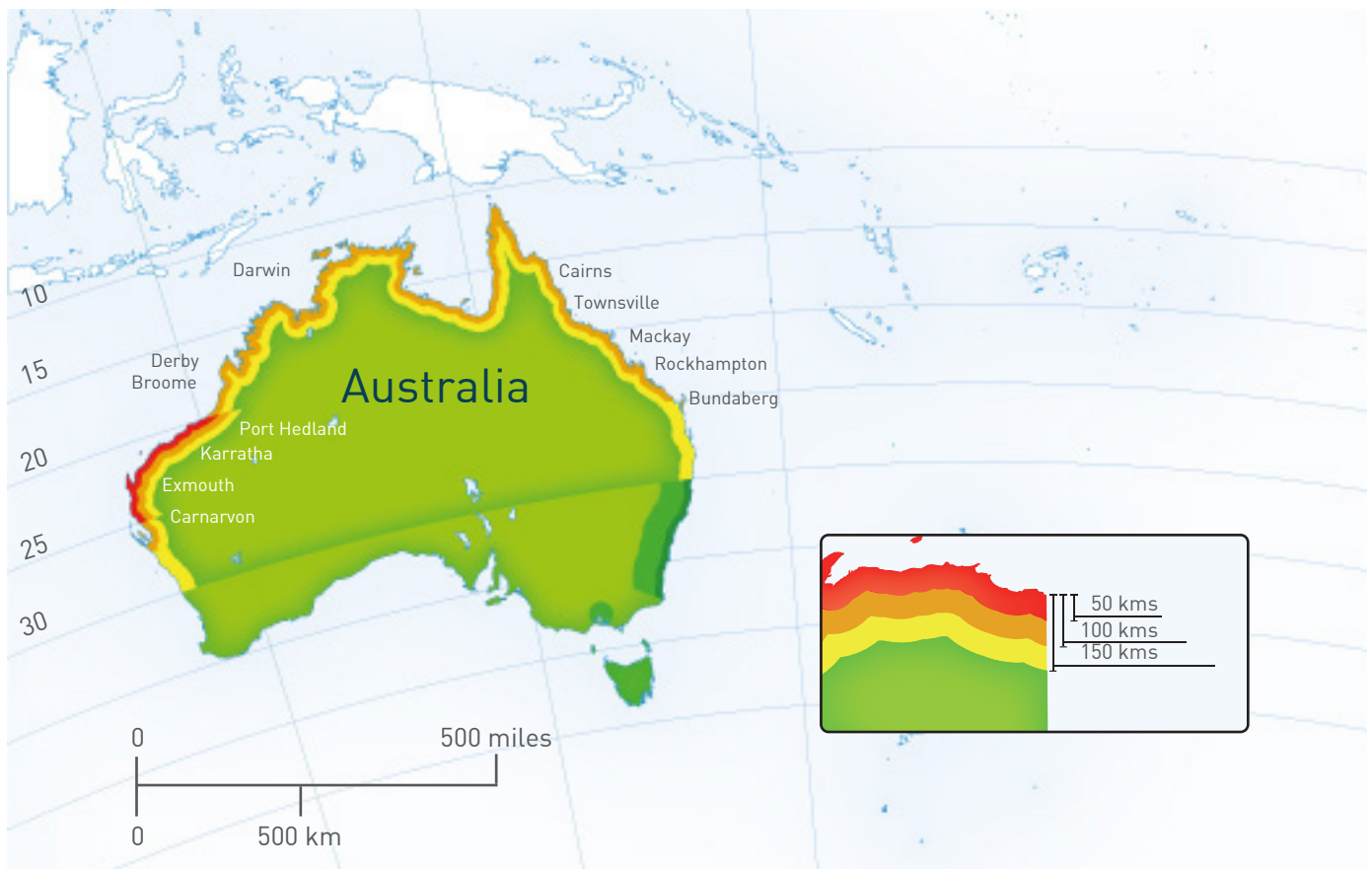
 Cyclonic Area - The building envelope requires cyclone debris impact resistance between 28m/s and 32m/s.

- 
Region B

 Non-Cyclonic Area - Doesn't require specific Cyclonic rated glass.

- 
Region A

 Non-Cyclonic Area - Doesn't require specific Cyclonic rated glass.



Certified Cyclone Resistant Glass Solutions

Specifically developed to resist excessive wind speeds and penetration from flying debris, StormShield® is a certified debris impact resistant glass ideal for protecting your family, staff and property during cyclones.

The secret is the specially formulated ultra-high grade laminate used in the manufacturing process, which absorbs the impact of the debris without tearing or breaching the window envelope. This means even in the event the glass is damaged by flying storm debris, StormShield® remains weather-tight to protect the structural integrity of the building and ensure the safety of the occupants.

Benefits

- Protects your family, staff and property from cyclone and hurricane winds and debris penetration
- Proven to withstand extreme test pressures of more than 12kPa, which equates to wind gusts in excess of 500km/h (10mm StormShield®)
- No need for secondary protection such as storm shutters or screens, allowing excellent clear vision
- No perforation: resists impact from 4kg piece of timber 100 x 50mm at over 45m/sec (162km/h) travelling lengthways with no perforation
- Fully certified for use in Regions C & D in Australia and the Pacific Islands
- Excellent noise reduction
- Increased security - impact resistant interlayer provides increased resistance to intruders

Features

- Grade A Safety Glass conforming to all human impact safety requirements
- Available in many types of high performance Low-E glass and tints to enhance thermal and solar performance characteristics
- Available cut to size or in stock sheets
- Range of thicknesses available, enabling full compliance with wind loadings and deflection standards as in AS1288 glass selection and installation, regardless of window size
- Evaluated at the world-class James Cook University cyclone testing station with excellent results



Whitsunday Council - Proserpine Administration Innovation Hub and Disaster Center - QLD

StormShield® Range

StormShield® is available in a range of thicknesses to satisfy wind loading and deflection requirements. The Australian standard AS1288 normally determines the minimum thickness of glass allowed in cyclonic areas.

Glasshape® has recently improved its product range and we are now offering combined product solutions for both Region C&D, StormShield® *Ultra* and StormShield® *Extreme*. These two new product variants provide multifaceted enhancements to combat the conditions experienced in both regions, StormShield® *Ultra* for impact resistance up to 39m/s & StormShield® *Extreme* for impacts up to 44m/s. StormShield® products are the only available annealed laminated product solution for Cyclone Resistance that can be cut and processed from stock sheets and available from our local stockists.

StormShield® can be manufactured to incorporate tinted glass and high performance Low E coated glass such as Solar E and Planibel to boost thermal and solar performance characteristics. Specialty make-ups of StormShield® tints are recommended to have a Thermal Safety Assessment for the specific application.

Heat Strengthened Options

For dark tints and Low E products where an increased risk of thermal stress is present we recommend heat strengthened StormShield®.

Heat Strengthened StormShield® can also be used to reduce the glass thickness particularly in applications where extreme wind loads and large windows demand thicker glass, which can become an issue when glazing.

StormShield® Thickness Calculator

Glasshape® have an E-calculator available for your convenience, it has an AS1288 formulae embedded for a very quick assessment of the thickness required.



The Pearl Resort - Fiji

Thermal Efficient Cyclone Rated Glass Solutions

Specifically developed for thermal performance, energy efficiency and durability, E-zone® Glass is engineered to perform in the most challenging storm conditions.

In the event the glass is damaged by flying storm debris, E-zone® Glass remains weather-tight without tearing or breaching the window envelope.

The pyrolytic process used in the manufacture of E-zone® Glass embeds invisible heat-reflective materials to the glass. This allows light to enter, but reflects much of the inbound heat, increasing comfort. Conversely in cool climates we can configure E-zone® Glass to maximize heat retention.

Additionally E-zone® Glass has been subjected to a series of hydrostatic pressure tests - taking cyclone resistant glass to a completely new level, setting yet another benchmark as an industry leader. E-zone® Glass is not only serious protection from wind and storm damage but is also flood resistant.

Benefits

- Decreased solar heat gain providing a cooler environment for improved working conditions and comfort levels
- Retains high levels of visual light transmission
- Can reduce HVAC requirements with positive impact on systems size requirements for cooling and heating
- No need for secondary protection such as storm shutters or screens, allowing excellent clear vision
- Protects your family, staff and property from cyclone and hurricane winds and debris penetration
- Customised solution with certified glass tailored for your individual project

Features

- Grade A Safety Glass conforming to all Human Impact Safety requirements
- Available in a range of high performance Low E glass and tints to enhance thermal and solar performance characteristics
- Available cut to size or in stock sheets
- Range of thicknesses available enabling full compliance with wind loadings and deflection standards as in AS1288 glass selection and installation, regardless of window size





Flood Resistance

Taking cyclone resistant glass to a completely new level, E-zone® Glass has been tested for performance in flood conditions. E-zone® Glass has been hydrostatically tested and certified for resistance against rising flood waters which are prevalent in cyclonic weather. Wind is only one factor that causes extensive damage to buildings and property throughout fierce storms. Rising flood waters up against windows (especially in a shop front) can cause extensive water damage if the window fails. E-zone® Glass is designed to handle water pressures well beyond what is normal for its thickness due to the ultra-robust laminate interlayer between the glass sheets.



Window Systems

The glazing frame that StormShield® is glazed into is just as important as the glass itself. A weak frame will dramatically affect the performance of the glass.

StormShield® has been tested and certified in a large range of framing suites available in Australia and the Pacific Islands. A list of fully certified window suites is available on request.

Glasshape® recommends full window suites be live-tested to prove their compliance to the AS/NZS1170.2:2011 impact requirements, as performance varies depending on the window system, the sealant, edge cover of glass into the frame, and the beading system being used. Fixing details of the frame to the building are equally important, and are clearly noted on StormShield® test reports.

Glasshape® offers full testing and certification to customers using StormShield® in their own aluminium window systems. Fully documented test reports are provided with high speed video files for further R&D requirements if needed.



Window System Failure



Window System Performance

Certified Cyclone Resistant Glass Solutions

Specifically developed to resist excessive wind speeds and penetration from flying debris, StormShield® is a certified debris impact resistant glass ideal for protecting your family, staff and property during cyclones.

The secret is the specially formulated ultra-high grade laminate used in the manufacturing process, which absorbs the impact of the debris without tearing or breaching the window envelope. This means even in the event the glass is damaged by flying storm debris, StormShield® remains weather-tight to protect the structural integrity of the building and ensure the safety of the occupants.

Testing & Certification

Major insurance companies and Local Shire Councils have approved StormShield® for use in North Western Australia, Queensland, Fiji and other Pacific regions.

Certified to AS/NZS1170.2:2011 (Cyclone Impact Resistance), AS4040.2:1992, AS4040.3:1992 (Static & Cyclic Wind loading) and AS/NZS2208:1996 (Safety glazing materials in buildings), StormShield® ticks all the boxes for compliance and certification.



Testing Cannon



Glazing and Installation

StormShield® must be glazed correctly and in accordance with how it was tested to guarantee performance in cyclonic conditions.

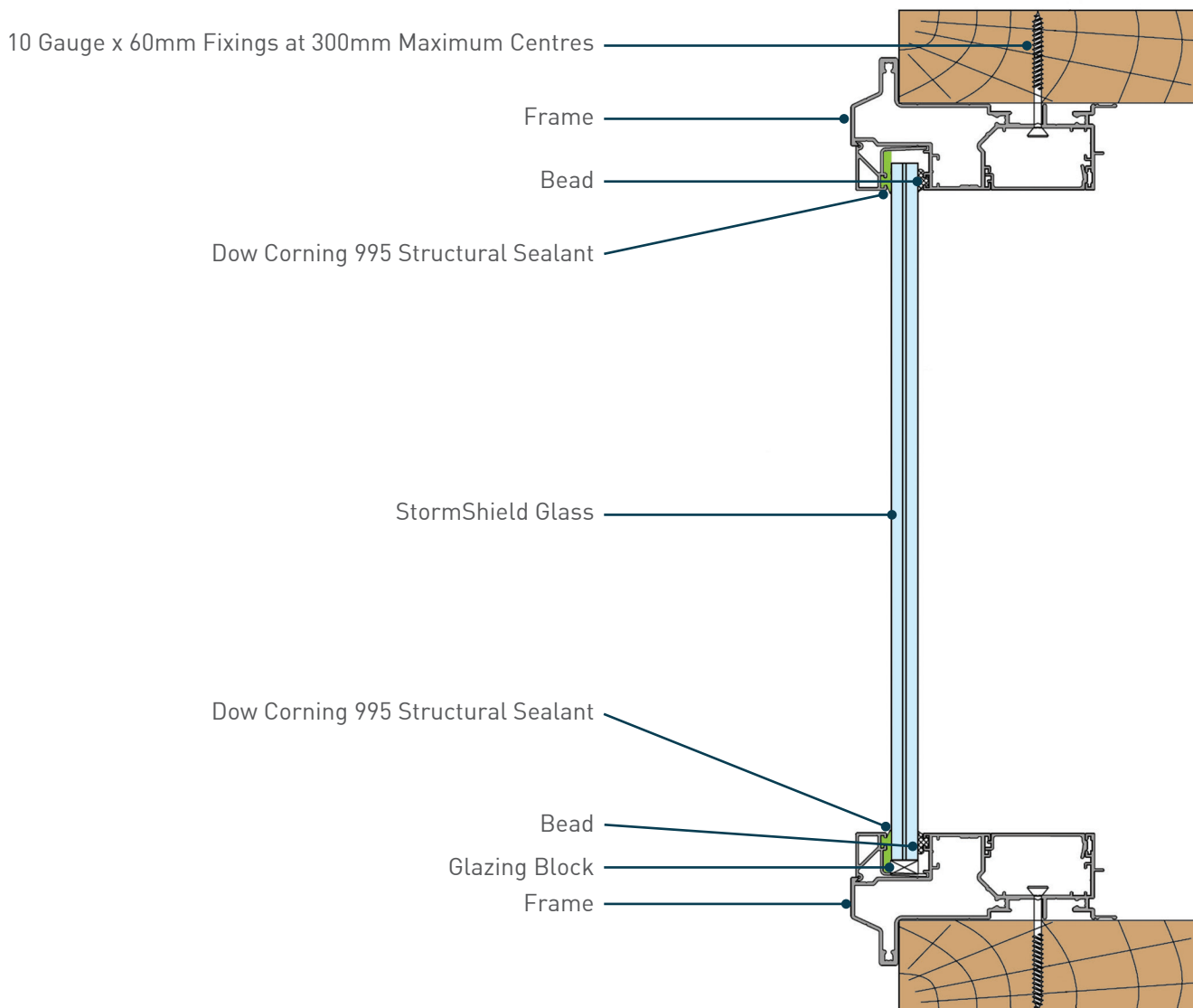
StormShield® must be fully glazed on all four sides. Glazing adhesives are not essential but if used, they must be non-acidic cure, non-solvent based sealants, approved by Glasshape® such as Dow Corning 995 or 795 as a structural sealant. A list of compatible sealants are available on request.

For more extreme applications, Aluminium clad steel frames or Aluminium frames with strong steel inserts are recommended with a minimum edge cover equal to the thickness of the glass.

For full height shop-fronts or façades where minimal framing is desired glass fins may be used in lieu of centre mullions. Specific tested and certified designs are available upon request.

As shown below, edge engagement and correct glazing methods are extremely important to ensure the window does not breach upon impact. The StormShield® panel does not perforate, however on the left hand side image, the entire side of the glass has dislodged from the frame, causing a serious breach in the system, due to insufficient edge engagement.

Typical Glazing for StormShield®



StormShield® 15m/s Impact Resistance (AS/NZS1170.2.2002 Cyclone Impact Resistance)														
Product Type	Tint	Product Code	Region	Visible Light Trans. %	Visible Light Reflect (out). %	Visible Light Reflect (in). %	Solar Trans. %	Solar Reflect. %	SHGC	SC	U Value (W/m2K) Summer	U Value (W/m2K) Winter	R Value	STC (dB)
				LIGHT			SOLAR		THERMAL				NOISE	
8mm StormShield®	Clear	SSCL08	-	88	8	8	72	7	0.78	0.90	5.01	5.52	0.18	34
10mm StormShield®	Clear	SSCL10	-	87	8	8	71	7	0.77	0.89	4.98	5.48	0.18	35
12mm StormShield®	Clear	SSCL12	-	87	8	8	68	7	0.76	0.87	4.93	5.42	0.18	36
14mm StormShield®	Clear	SSCL14	-	86	8	8	66	7	0.74	0.85	4.89	5.36	0.19	37
16mm StormShield®	Clear	SSCL16	-	84	8	8	61	6	0.71	0.82	4.80	5.25	0.19	39
8mm StormShield®	Grey	SSGR08	-	42	5	5	46	5	0.61	0.71	5.01	5.52	0.18	34
10mm StormShield®	Grey	SSGR10	-	41	5	5	45	5	0.61	0.70	4.98	5.48	0.18	35
12mm StormShield®	Grey	SSGR12	-	41	5	5	43	5	0.59	0.69	4.93	5.42	0.18	36
14mm StormShield®	Grey	SSGR14	-	41	5	5	41	5	0.58	0.67	4.89	5.36	0.19	37
8mm StormShield®	Arctic Obscure	SSOB08	-	67	6	6	55	6	0.67	0.77	5.00	5.52	0.18	34
10mm StormShield®	Arctic Obscure	SSOB10	-	67	6	6	53	6	0.66	0.76	4.95	5.46	0.18	35
12mm StormShield®	Arctic Obscure	SSOB12	-	66	6	6	51	5	0.65	0.75	4.90	5.40	0.19	36
14mm StormShield®	Arctic Obscure	SSOB14	-	65	6	6	49	5	0.64	0.73	4.85	5.34	0.19	37

Custom options available on all products for tints or additional features or specifications.

E-zone Glass® 15m/s Impact Resistance (AS/NZS1170.2.2002 Cyclone Impact Resistance)														
Product Type	Tint	Product Code	Region	Visible Light Trans. %	Visible Light Reflect (out). %	Visible Light Reflect (in). %	Solar Trans. %	Solar Reflect. %	SHGC	SC	U Value (W/m2K) Summer	U Value (W/m2K) Winter	R Value	STC (dB)
				LIGHT			SOLAR		THERMAL				NOISE	
8mm E-zone® CP	Clear Low E	EZCLCP08	-	82	11	12	65	9	0.69	0.80	2.74	3.54	0.28	34
10mm E-zone® CP	Clear Low E	EZCLCP10	-	81	11	11	63	9	0.68	0.79	2.73	3.51	0.28	35
12mm E-zone® CP	Clear Low E	EZCLCP12	-	80	10	11	57	8	0.64	0.74	2.72	3.49	0.29	36
14mm E-zone® CP	Clear Low E	EZCLCP14	-	79	10	11	55	8	0.62	0.72	2.70	3.46	0.29	37
8mm E-zone® CP	Neutral Low E	EZNCP08	-	60	8	10	43	7	0.53	0.62	2.75	3.54	0.28	34
10mm E-zone® CP	Neutral Low E	EZNCP10	-	59	8	10	42	7	0.53	0.62	2.74	3.52	0.28	35
12mm E-zone® CP	Neutral Low E	EZNCP12	-	58	8	9	39	6	0.50	0.59	2.72	3.49	0.29	36
14mm E-zone® CP	Neutral Low E	EZNCP14	-	58	8	9	37	6	0.49	0.58	2.71	3.46	0.29	37
8mm E-zone® CP	Grey Low E	EZGRCP08	-	28	5	8	26	5	0.40	0.48	2.75	3.54	0.28	34
10mm E-zone® CP	Grey Low E	EZGRCP10	-	28	5	8	26	5	0.40	0.47	2.74	3.52	0.28	35
12mm E-zone® CP	Grey Low E	EZGRCP12	-	28	5	8	23	5	0.38	0.45	2.72	3.49	0.29	36
14mm E-zone® CP	Grey Low E	EZGRCP14	-	27	5	8	22	5	0.38	0.45	2.71	3.46	0.29	37

Custom options available on all products for tints or additional features or specifications.

StormShield [®] Ultra "Region C & D" - 39m/s Impact Resistance (AS/NZS1170.2.2011 Cyclone Impact Resistance)														
Product Type	Tint	Product Code	Region	Visible Light Trans. %	Visible Light Reflect (out) %	Visible Light Reflect (in) %	Solar Trans. %	Solar Reflect. %	SHGC	SC	U Value (W/m ² K) Summer	U Value (W/m ² K) Winter	R Value	STC (dB)
				LIGHT			SOLAR		THERMAL				NOISE	
12.4mm StormShield [®] Ultra	Clear	SSCL124D	Region C & D	86	8	8	67	7	0.74	0.86	4.68	5.13	0.19	35
14.4mm StormShield [®] Ultra	Clear	SSCL144D	Region C & D	85	8	8	64	7	0.73	0.84	4.64	5.08	0.20	36
16.4mm StormShield [®] Ultra	Clear	SSCL164D	Region C & D	84	8	8	62	6	0.71	0.82	4.60	5.02	0.20	37
18.4mm StormShield [®] Ultra	Clear	SSCL184D	Region C & D	84	8	8	60	6	0.70	0.81	4.56	4.98	0.20	38
12.4mm StormShield [®] Ultra	Grey	S5GR124D	Region C & D	41	5	5	42	5	0.60	0.69	4.68	5.13	0.19	35
14.4mm StormShield [®] Ultra	Grey	S5GR144D	Region C & D	40	5	5	40	5	0.59	0.68	4.64	5.08	0.20	36
16.4mm StormShield [®] Ultra	Grey	S5GR124D	Region C & D	40	5	5	38	5	0.58	0.67	4.60	5.02	0.20	37
18.4mm StormShield [®] Ultra	Grey	S5GR124D	Region C & D	40	5	5	37	5	0.57	0.65	4.56	4.98	0.20	38
12.4mm StormShield [®] Ultra	Arctic Obscure	SSOB124D	Region C & D	66	6	6	50	5	0.65	0.75	4.64	5.10	0.20	35
14.4mm StormShield [®] Ultra	Arctic Obscure	SSOB144D	Region C & D	65	6	6	48	5	0.64	0.73	4.60	5.05	0.20	36
16.4mm StormShield [®] Ultra	Arctic Obscure	SSOB164D	Region C & D	65	6	6	46	5	0.63	0.72	4.56	5.00	0.20	37
18.4mm StormShield [®] Ultra	Arctic Obscure	SSOB184D	Region C & D	64	6	6	44	5	0.61	0.71	4.51	4.95	0.20	38

Custom options available on all products for tints or additional features or specifications.

E-zone Glass [®] Ultra "Region C & D" - 39m/s Impact Resistance (AS/NZS1170.2.2011 Cyclone Impact Resistance)														
Product Type	Tint	Product Code	Region	Visible Light Trans. %	Visible Light Reflect (out) %	Visible Light Reflect (in) %	Solar Trans. %	Solar Reflect. %	SHGC	SC	U Value (W/m ² K) Summer	U Value (W/m ² K) Winter	R Value	STC (dB)
				LIGHT			SOLAR		THERMAL				NOISE	
12.4mm E-zone [®] Ultra CP	Clear Low E	EZCLCP124D	Region C & D	80	10	11	60	8	0.66	0.77	2.63	3.35	0.30	35
14.4mm E-zone [®] Ultra CP	Clear Low E	EZCLCP144D	Region C & D	78	10	11	55	8	0.62	0.72	2.62	3.33	0.30	36
16.4mm E-zone [®] Ultra CP	Clear Low E	EZCLCP164D	Region C & D	77	10	11	53	7	0.61	0.70	2.60	3.30	0.30	37
18.4mm E-zone [®] Ultra CP	Clear Low E	EZCLCP184D	Region C & D	77	10	11	51	7	0.59	0.69	2.59	3.28	0.30	38
12.4mm E-zone [®] Ultra CP	Neutral Low E	EZNCP124D	Region C & D	58	8	10	41	6	0.53	0.62	2.64	3.36	0.30	35
14.4mm E-zone [®] Ultra CP	Neutral Low E	EZNCP144D	Region C & D	57	8	9	37	6	0.50	0.59	2.62	3.33	0.30	36
16.4mm E-zone [®] Ultra CP	Neutral Low E	EZNCP164D	Region C & D	57	7	9	36	6	0.49	0.58	2.61	3.31	0.30	37
18.4mm E-zone [®] Ultra CP	Neutral Low E	EZNCP184D	Region C & D	56	7	9	35	6	0.48	0.57	2.59	3.28	0.30	38
12.4mm E-zone [®] Ultra CP	Grey Low E	EZGRCP124D	Region C & D	29	5	8	23	5	0.39	0.45	2.63	3.35	0.30	35
14.4mm E-zone [®] Ultra CP	Grey Low E	EZGRCP144D	Region C & D	29	5	8	22	5	0.39	0.44	2.61	3.33	0.30	36
16.4mm E-zone [®] Ultra CP	Grey Low E	EZGRCP164D	Region C & D	29	5	8	22	5	0.38	0.44	2.60	3.30	0.30	37
18.4mm E-zone [®] Ultra CP	Grey Low E	EZGRCP184D	Region C & D	29	5	8	21	5	0.38	0.43	2.58	3.28	0.30	38

Custom options available on all products for tints or additional features or specifications.

NB: Conditions and calculation of the optical and solar performance data are based on ASHRAE Standard. Performance data is based on representative value from software tabulation and information available at the time of preparation of this document which is subject to changes without notice. Actual value may vary slightly due to variations in the production process. Other glass manufacturers and coaters may use different instruments and measurement techniques. Therefore, reported performance values may vary on identical products by others. STC Ratings are estimated from test results of similar like product build ups.

StormShield [®] Extreme "Region C & D" - 44m/s Impact Resistance (AS/NZS1170.2.2011 Cyclone Impact Resistance)														
Product Type	Tint	Product Code	Region	Visible Light Trans. %	Visible Light Reflect (out) %	Visible Light Reflect (in) %	Solar Trans. %	Solar Reflect. %	SHGC	SC	U Value (W/m ² K) Summer	U Value (W/m ² K) Winter	R Value	STC (dB)
				LIGHT			SOLAR		THERMAL					NOISE
14.1mm StormShield [®] Extreme	Clear	SSCL141D	Region C & D	85	8	8	65	7	0.73	0.85	4.53	4.95	0.20	35
16.1mm StormShield [®] Extreme	Clear	SSCL161D	Region C & D	84	8	8	63	7	0.72	0.83	4.49	4.90	0.20	36
18.1mm StormShield [®] Extreme	Clear	SSCL181D	Region C & D	83	8	8	60	6	0.70	0.81	4.45	4.85	0.21	37
20.1mm StormShield [®] Extreme	Clear	SSCL201D	Region C & D	83	8	8	58	6	0.69	0.80	4.41	4.81	0.21	38
14.1mm StormShield [®] Extreme	Grey	SSGR141D	Region C & D	40	5	5	40	5	0.59	0.69	4.53	5.13	0.20	35
16.1mm StormShield [®] Extreme	Grey	SSGR161D	Region C & D	40	5	5	39	5	0.58	0.67	4.49	4.90	0.20	36
18.1mm StormShield [®] Extreme	Grey	SSGR181D	Region C & D	39	5	5	37	5	0.57	0.66	4.45	4.85	0.21	37
20.1mm StormShield [®] Extreme	Grey	SSGR201D	Region C & D	39	5	5	36	5	0.56	0.65	4.41	4.81	0.21	38
14.1mm StormShield [®] Extreme	Arctic Obscure	SSOB141D	Region C & D	66	6	6	49	5	0.65	0.74	4.48	4.92	0.20	35
16.1mm StormShield [®] Extreme	Arctic Obscure	SSOB161D	Region C & D	65	6	6	47	5	0.63	0.73	4.44	4.87	0.20	36
18.1mm StormShield [®] Extreme	Arctic Obscure	SSOB181D	Region C & D	64	6	6	45	5	0.62	0.72	4.40	4.82	0.21	37
20.1mm StormShield [®] Extreme	Arctic Obscure	SSOB201D	Region C & D	64	6	6	43	5	0.61	0.70	4.36	4.78	0.21	38

Custom options available on all products for tints or additional features or specifications.

E-zone Glass [®] Extreme "Region C & D" - 44m/s Impact Resistance (AS/NZS1170.2.2011 Cyclone Impact Resistance)														
Product Type	Tint	Product Code	Region	Visible Light Trans. %	Visible Light Reflect (out) %	Visible Light Reflect (in) %	Solar Trans. %	Solar Reflect. %	SHGC	SC	U Value (W/m ² K) Summer	U Value (W/m ² K) Winter	R Value	STC (dB)
				LIGHT			SOLAR		THERMAL					NOISE
14.1mm E-zone [®] Extreme CP	Clear Low E	EZCLCP141D	Region C & D	79	10	11	59	8	0.65	0.76	2.58	3.27	0.31	35
16.1mm E-zone [®] Extreme CP	Clear Low E	EZCLCP161D	Region C & D	77	10	11	54	8	0.62	0.72	2.57	3.24	0.31	36
18.1mm E-zone [®] Extreme CP	Clear Low E	EZCLCP181D	Region C & D	76	10	11	52	7	0.60	0.70	2.55	3.22	0.31	37
20.1mm E-zone [®] Extreme CP	Clear Low E	EZCLCP201D	Region C & D	76	10	11	50	7	0.59	0.68	2.54	3.20	0.31	38
14.1mm E-zone [®] Extreme CP	Neutral Low E	EZNCP141D	Region C & D	58	8	9	40	6	0.52	0.61	2.58	3.27	0.31	35
16.1mm E-zone [®] Extreme CP	Neutral Low E	EZNCP161D	Region C & D	57	7	9	37	6	0.50	0.59	2.57	3.25	0.31	36
18.1mm E-zone [®] Extreme CP	Neutral Low E	EZNCP181D	Region C & D	56	7	9	35	6	0.49	0.58	2.56	3.22	0.31	37
20.1mm E-zone [®] Extreme CP	Neutral Low E	EZNCP201D	Region C & D	56	7	9	34	6	0.48	0.57	2.54	3.20	0.31	38
14.1mm E-zone [®] Extreme CP	Grey Low E	EZGRCP141D	Region C & D	27	5	8	24	5	0.41	0.49	2.58	3.27	0.31	35
16.1mm E-zone [®] Extreme CP	Grey Low E	EZGRCP161D	Region C & D	27	5	8	22	5	0.40	0.47	2.57	3.25	0.31	36
18.1mm E-zone [®] Extreme CP	Grey Low E	EZGRCP181D	Region C & D	27	5	8	21	5	0.39	0.46	2.56	3.22	0.31	37
20.1mm E-zone [®] Extreme CP	Grey Low E	EZGRCP201D	Region C & D	26	5	8	20	5	0.39	0.46	2.54	3.20	0.31	38

Custom options available on all products for tints or additional features or specifications.

When requesting pricing or technical information please ensure the following details are available:

- Confirm Cyclonic region of your project (C or D)
- Confirm Building Importance Level (1,2,3,4)
- ULS (Ultimate Limit State) and or SLS (Serviceability Limit State) Wind Pressures
- Provide size details of glass or windows
- Reference these tables to confirm specifications for the correct StormShield[®] or E-zone[®] product for your project.
- Specify using the correct product code.
- Call Glasshape Customer Service Team for further assistance if unsure. Have the peace of mind that your project will perform in the demanding conditions of cyclonic activity.

About Us

Complete Cyclone Glass Solutions

When it comes to glass, Glasshape® understand that quality, performance, durability and safety standards are paramount, especially in Cyclone Risk Areas.

Combining decades of industry knowledge and technical expertise Glasshape® have developed unique proprietary manufacturing processes addressing the specific needs of cyclonic regions with certified impact resistant glass solutions.

At Glasshape®, we take a customised approach. We work with clients to confirm their needs and establish the appropriate glass solutions. Our complete service includes consultation, digital measurement, CAD design, certification, and manufacturing. With the Glasshape® tailored approach, clients are assured their glass solutions are effortlessly fulfilled.

About Us

Established in 1986, we are a leading innovator, designer and manufacturer of bent, toughened, laminated and digital ceramic print specialty glass. Family owned, based in Auckland, New Zealand, with offices in Australia and the US, Glasshapes philosophy of growth through innovation, ingenuity and customer service sees it deliver best-in-class glazing solutions in a variety of categories, with notable success in marine, architectural (residential and commercial), high security and heavy machinery projects.

We're driven to exceed our client's design and performance requirements using our extensive industry knowledge and technical expertise to provide the perfect solution. Glasshape® provides customised turnkey solutions from initial consult through to installation, with proven global success backed by comprehensive warranties and validated by international accreditation.

The family spirit underpins the delivery of excellence at Glasshape®. Mark Forrest and his four sons combine more than 100 years of combined experience in bent and specialist glass technology. It's always the people behind the message who deliver on the promises.



The Pearl Resort
Pacific Harbour, Fiji





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