


Second Edition
September 2009



**GLASS
VICE™**



Glass Vice

At Glass Vice Products we pride ourselves on great aesthetic design and incomparable Technical Integrity. Our systems are specified to rigorous engineering standards and are tested by Independent organisations to ensure that the highest standards are met, surpassed and maintained, and to that end we include these Testing results in this Information pack.

As Originators of this specific method of Frameless Glass Fixing, Glass Vice Products knows and understands the requirements and the challenges better than anyone and we have answered each and everyone of these challenges whilst maintaining our proprietary Design Integrity and Product Performance.

We invite you to review our systems and our products range confident in the fact that Glass Vice Products patented “Glass Vice” is at the very core of this contemporary and innovative frameless glass design revolution.

New Zealand Patent 556329.

**New Zealand Registered Design 409675
Australian Registered Design 200811185
Australian Registered Design 200813833**

**Tested to NZ Standard
AS/NZS 1170.0
AS/NZS 1170.1
AS/NZS 1170.2**

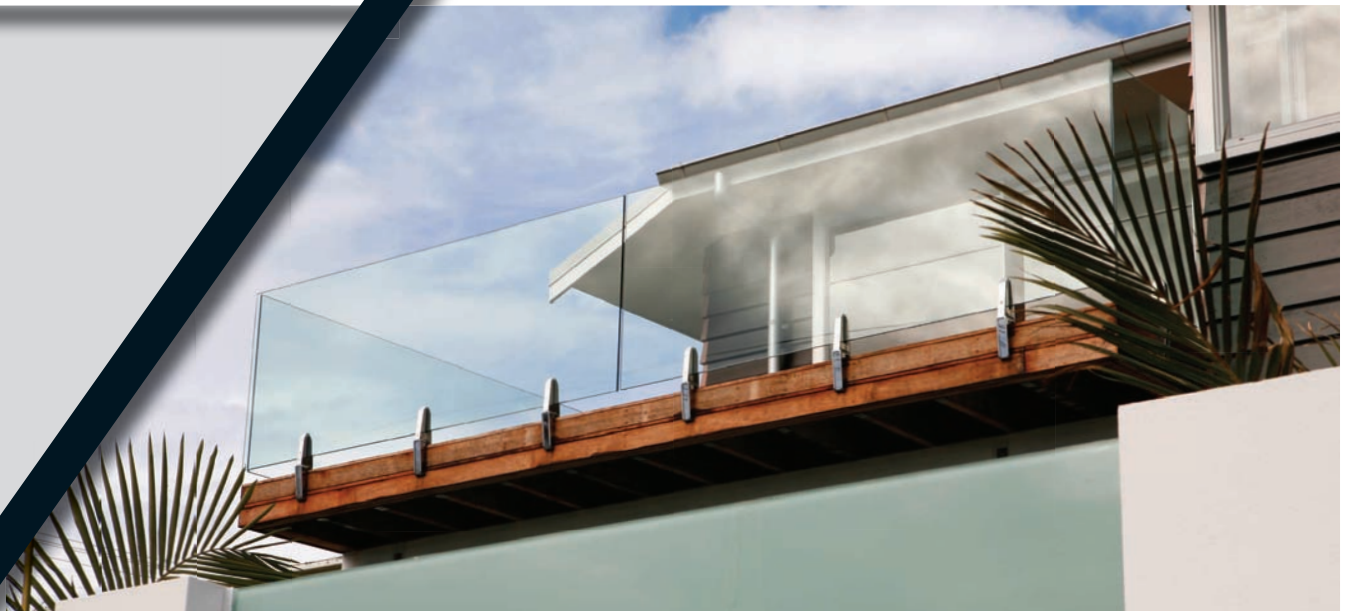
Frameless Pool Fencing



Landscape
Design



Balustrades



Frameless Pool Fencing

With a view like this the choice is obvious...



Glass Vice
"Glass Clamp"
Patented Product

Tested to NZ Standards

AS/NZS 1170.0

AS/NZS 1170.1

AS/NZS 1170.2



Balustrades

Clean...Contemporary...Incomparable



Glass Vice
"Architectural Bracket"
Patented Product

Tested to NZ Standards

AS/NZS 1170.0

AS/NZS 1170.1

AS/NZS 1170.2





Balustrades

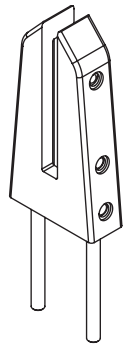


Landscape Design

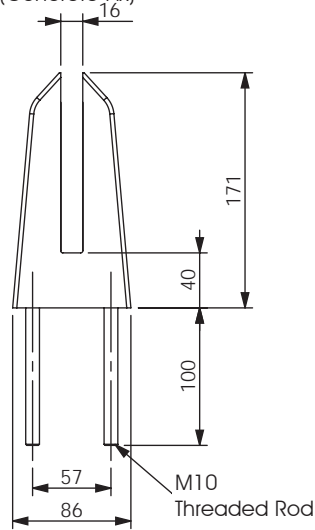
Glass Vice...Simply a great option for any location



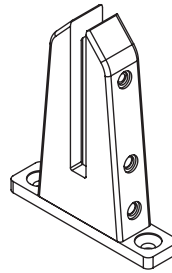
Option 1.



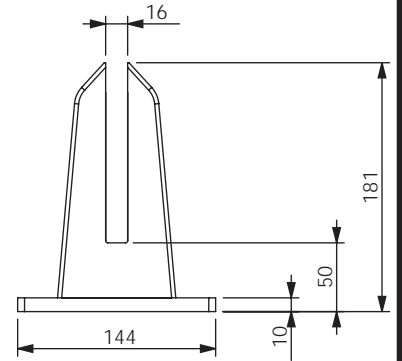
Direct Fix Glass Vice with Threaded Rods (Concrete Fix)



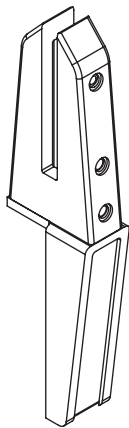
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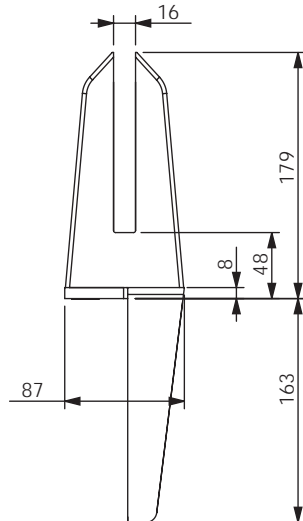
Flat Bracket Glass Vice with Flat Bracket



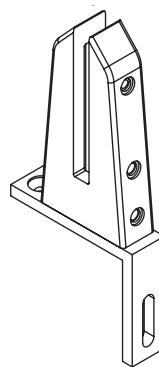
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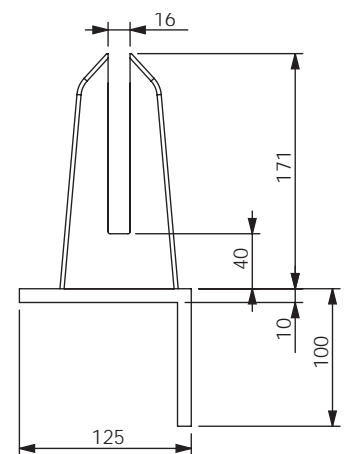
Architectural Bracket Glass Vice with Side Fixing bracket



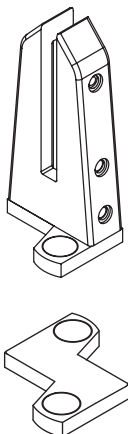
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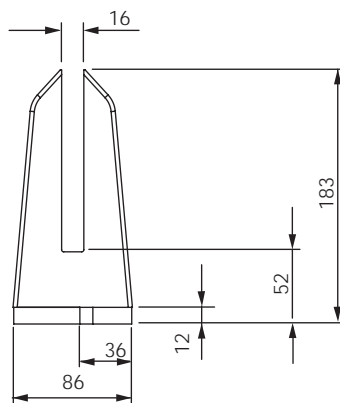
L Bracket Glass Vice with Top and Side Fixing Bracket



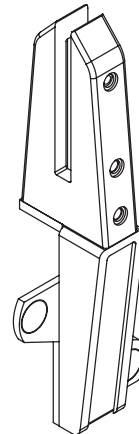
Option 5.



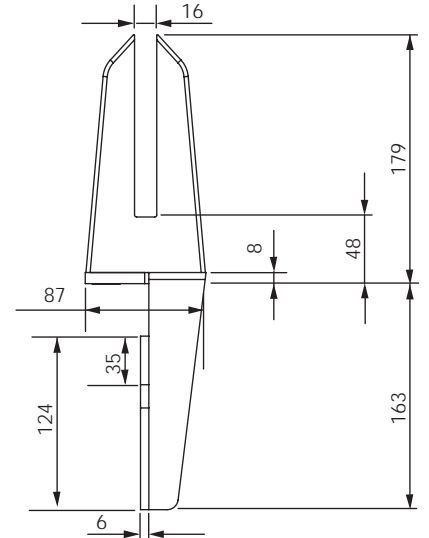
S Bracket Glass Vice with S Bracket



Option 6.

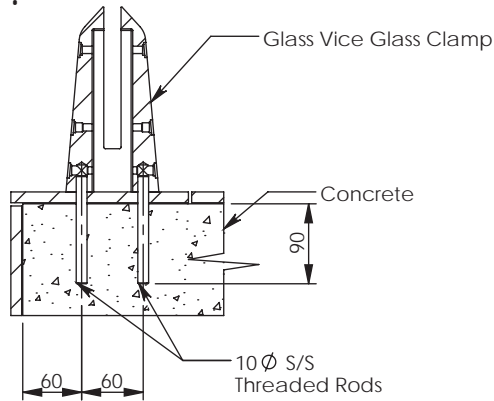


Z Bracket Glass Vice with Architectural Bracket and Z Bracket

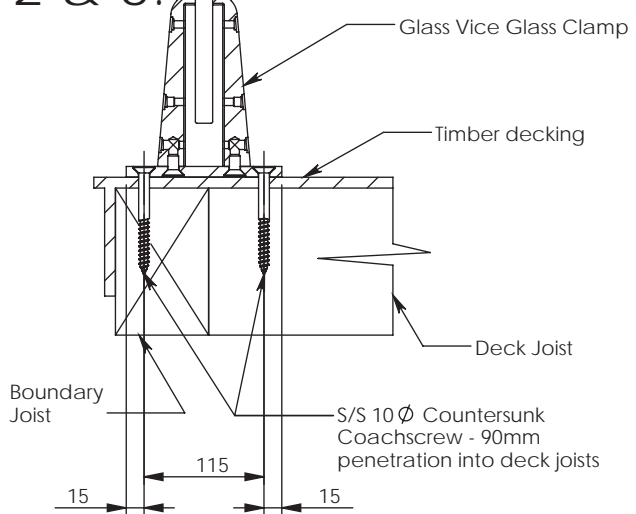


Glass Vice Products Ltd.

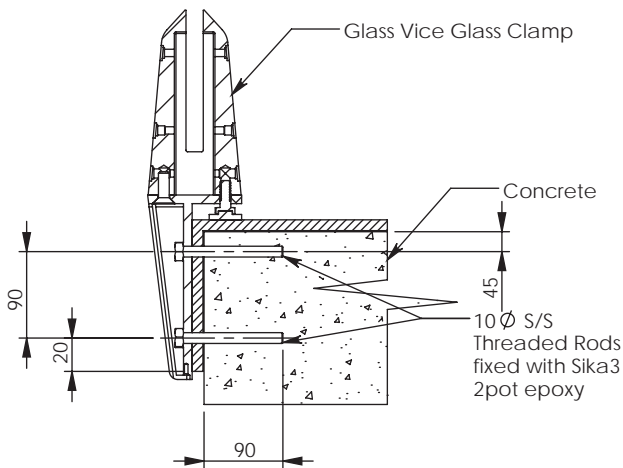
Option 1. Direct Fix Detail for Concrete



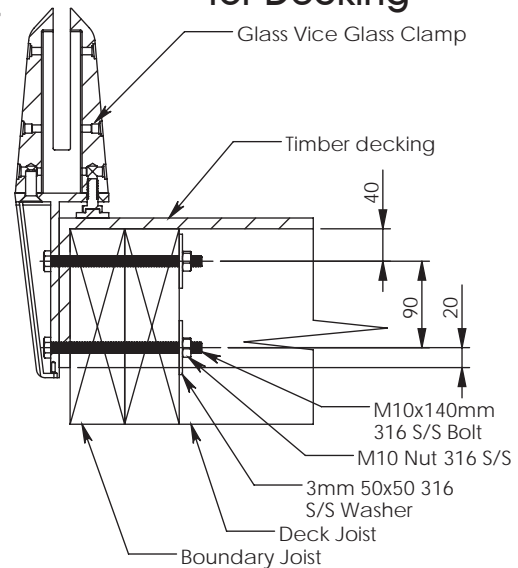
Options 2 & 5. Flat Bracket & Z Bracket Detail for Decking



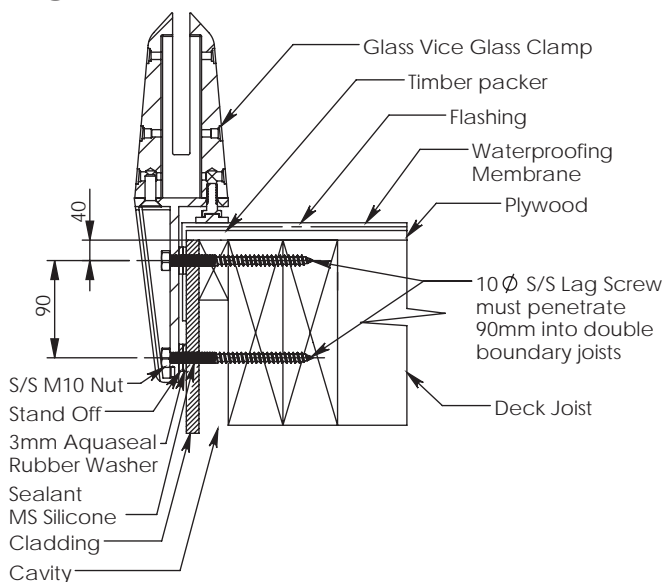
Option 3. Architectural Bracket Detail for Concrete



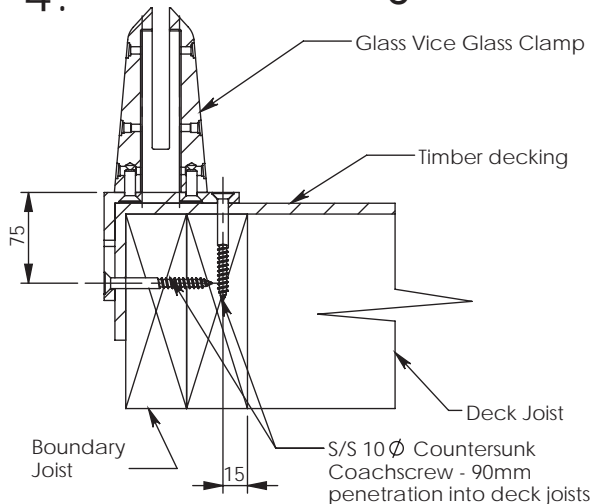
Option 3. Architectural Bracket Detail for Decking



Option 3. Architectural Bracket Detail for Cavity



Option 4. L Bracket Detail for Decking



Glassvice
Glass Clamp™

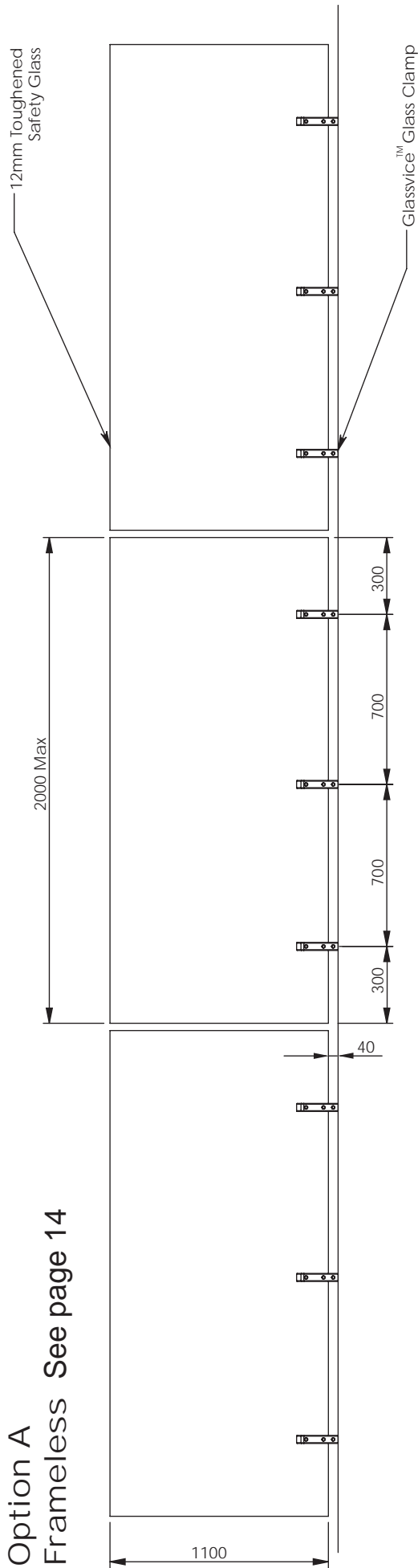
The Fixing Details

Glass Vice Glass Clamps...The System

Glass Vice Products Ltd.

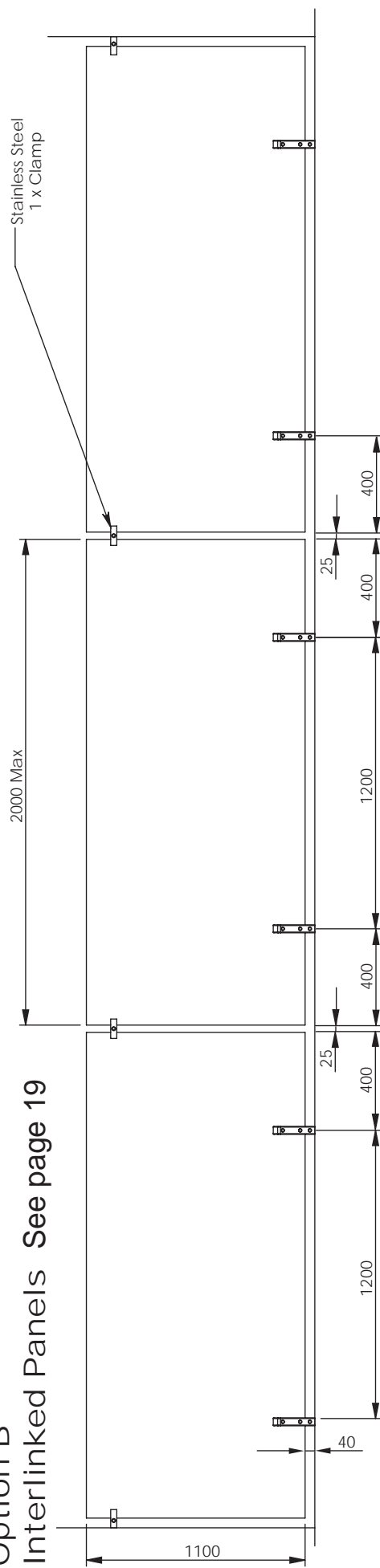
Option A

Frameless See page 14



Option B

Interlinked Panels See page 19

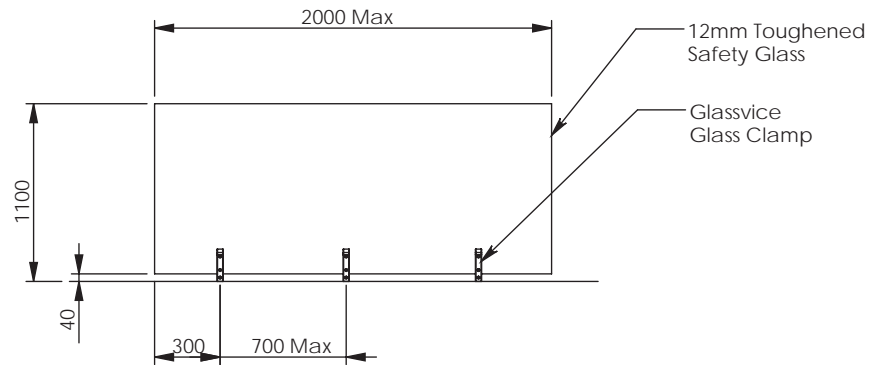


Balustrade System - Tested Configurations

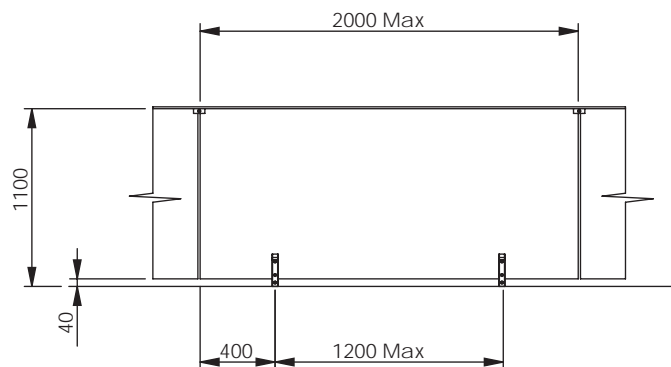
**Glassvice™
Glass Clamp**

Glass Vice Products Ltd.

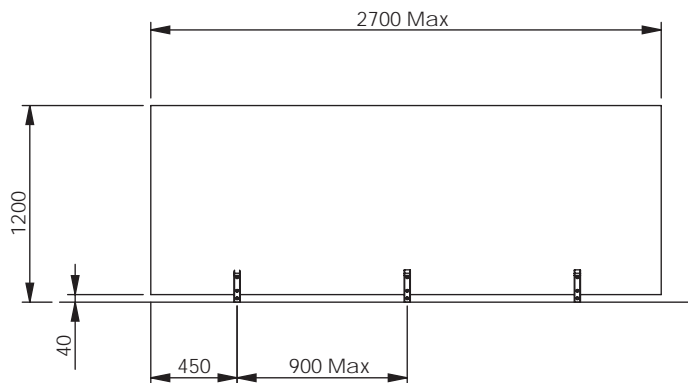
Balustrade System



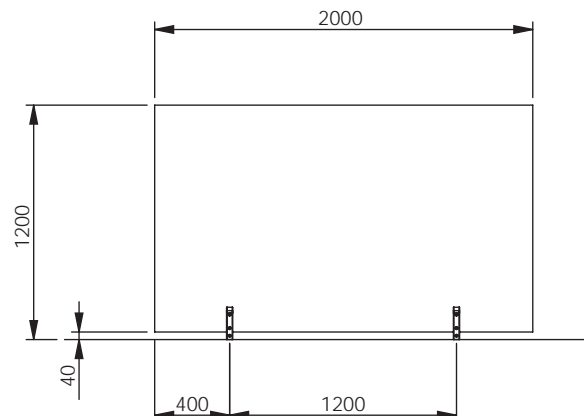
Handrail Balustrade System



Pool Fence System - 3 Clamp Option



Pool Fence System - 2 Clamp Option for concrete fix only



Using The System

GlassviceTM
Glass Clamp

Glass Testing Report			
Client:	Glass Vice Products Ltd.	Order Number:	TBA
Location:	Extreme Team Workshop, 26 Manga Road, Silverdale		
Job Description:	Testing of glass/vice balustrade: 1. As a barrier system in accordance with the codes below 2. To resist wind load as per the code below		
Identification:	Glass barrier with vices as installed by client		
Test in Accordance With:	<ul style="list-style-type: none"> AS/NZS 1170.0 2002 <i>Structural Design Actions Part 0: General Principles</i> AS/NZS 1170.1 2002 <i>Structural Design Actions Part1: Permanent, Imposed and Other Actions</i> Section 3.6 AS/NZS 1170.2 2002 <i>Structural Design Actions Part 2: Wind Actions</i> 		
Acceptance Criteria:	As below		
Inspector:	Tian Qiu	Date of Inspection:	24/09/2008 to 07/10/2008

Balustrade Description:

List of Components:

- Toughened glass (specification not verified)
- Stainless steel vices (as shown in *Figure A4*)
- Anchoring bolts (specification not verified)
- Polyethylene strips

Installation/ Setup:

The balustrade system was setup as shown in *Figure A1*. The glass panel was clamped by three vices which were then bolted onto the concrete floor. To prevent stressing of the glass, a strip of high impact polyethylene was positioned between the mating surfaces of the glass and the stainless steel vice. Dimensions of the system are as below.

Dimensions:

- Glass Height: 1160 mm
- Glass Width: 2000 mm
- Glass Thickness: 12 mm
- Elevation: 50 mm
- Number of Vices: 3
- Vice Spacing: 700 mm
- Overhang: 300 mm
- Polyethylene Strip: 141mm x 33mm x 3mm

Technician:	T. Qiu	Report printed on 29/10/2008	Reviewed by:	L. Kong
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Barrier Test:

Test Setup:

The setup of the test is shown in *Figure A2*.

Steel beam was used to distribute the load in top edge testing. The contact area size of the point loading was 40mm x 40mm.

Test Condition:

0.75kN/m x 1.5 = 1.125kN/m as per AS/NZS 1170.1 2002 Section 3.6 and AS/NZS 1170.0 2002 Section 4.2

Test Results:

Loading Type		Load Required	Load Tested	Duration	Findings	Results
Top Edge	Horizontal	229.36 kg	230 kg	16 min	No fracture	Complies
	Vertical	229.36 kg	230 kg	16 min	No fracture	Complies
Point Load	Top corner	91.74 kg	92 kg	16 min	No fracture	Complies

Range of Approval:

As per AS/NZS 1170.1 2002 Table 3.3, the balustrade system tested is qualified for the following occupancy types:

Type A,
Type B,
Type E and
Type C3

Wind Loading Test:

Test Setup:

The test setup is shown in *Figure A3*. The load applied was uniformly distributed over the glass panel using timber frames and hydraulic ram.

Test Condition:

- **Load Applied :** 300 kg
- **Load Duration:** 16 min
- **Glass Area:** 2.32 m²
- **Pressure:** 1268.5 Pa

Findings:

No deformation or fracture

Results:

The balustrade system was capable to withstand a uniformly distributed load of 300kg.

Range of Approval:

Range of approval for site conditions is subject to evaluation by competent authority. (see Appendix C for typical evaluation example)

Option A - The Facts

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Appendix A - Setups

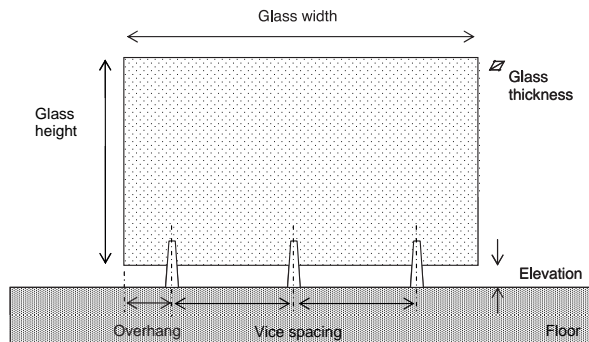


Figure A1. Setup of the balustrade system

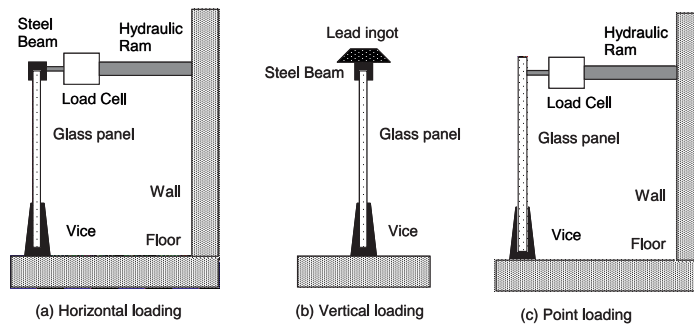


Figure A2. Testing setup for system as a barrier

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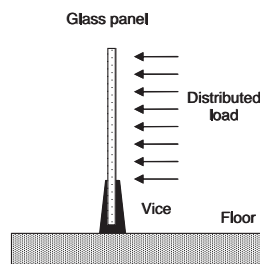


Figure A3. Testing setup of wind loading

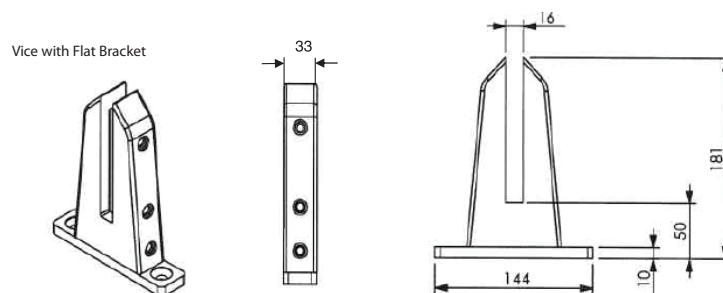


Figure A4. Stainless steel vice (all dimensions are in mm)

Appendix C – Wind action calculations

According to AS/NZS 1170.2 2002 section 2.4.1, the design criteria of a balustrade is governed by the following equations,

$$p = (0.5\rho_{air})[V_{des,\theta}]^2 C_{fig} C_{dyn} \quad \text{eq. (1) (AS/NZS 1170.2 2002 section 2.4.1)}$$

$$V_{des,\theta} = V_{sit,\beta} \quad \text{eq. (2) (AS/NZS 1170.2 2002 section 2.3)}$$

$$V_{sit,\beta} = V_R M_d (M_{z,cat} M_s M_t) \quad \text{eq. (3) (AS/NZS 1170.2 2002 section 2.2)}$$

Where,

P = design wind pressure acting normal to a surface, in pascals

ρ_{Air} = density of air, which shall be taken as 1.2kg/m^3

$V_{des,\theta}$ = building orthogonal design wind speed (usually, $\theta = 0^\circ, 90^\circ, 180^\circ$ and 270°)
(AS/NZS 1170.2 2002 Section 2.3)

V_R = regional 3 s gust wind speed, in meters per second, for annual probability of exceedance of 1/R
(AS/NZS 1170.2 2002 Section 3.2)

M_d = wind directional multipliers for 8 cardinal directions (β) (AS/NZS 1170.2 2002 Section 3.3)

$M_{z,cat}$ = terrain/height multiplier (AS/NZS 1170.2 2002 Section 4.2)

M_s = shielding multiplier (AS/NZS 1170.2 2002 Section 4.3)

M_t = topographic multiplier (AS/NZS 1170.2 2002 Section 4.4)

C_{fig} = Aerodynamic shape factor (AS/NZS 1170.2 2002 Section 5)

C_{dyn} = Dynamic response factor (AS/NZS 1170.2 2002 Section 6)

Example for a typical Wellington suburb house,

The glass balustrade system was to be installed in the following site conditions:

- House is located in Wellington (NZ) district
- To be installed on second floor balcony with average local ground level of 5m
- House is on a hill with upwind slope gradient of 0.1
- No applicable shielding building is around
- House is 50m above sea level
- Possible wind directions: all wind directions
- Designed life span of the installed balustrade is 25 years

Assumptions used for calculation:

- Aerodynamic shape factor $C_{fig} = 1$ (covers most types of pressure coefficients)
- Dynamic response factor $C_{dyn} = 1$ for natural first mode fundamental frequency greater than 1
- Density of air $\rho_{Air} = 1.2 \text{ kg/m}^3$

By substituting equation 1;

$$p = (0.5 \times 1.2) [V_{des,\theta}]^2 \times 1 \times 1$$

$$p = 0.6[V_{des,\theta}]^2$$

And from equation 2;

$$V_{des,\theta} = V_{sit,\beta} = V_R M_d (M_{z,cat} M_s M_t)$$

Where in this example,

V_R	= 45m/s with 2% annual probability of exceedance (AS/NZS 1170.2 2002 Table 3.1)
M_d	= 1 for all wind directions in all wind regions (AS/NZS 1170.2 2002 Table 3.2)
$M_{z,cat}$	= 0.83 for a structure in suburban housing area less than 10m above average local ground level (AS/NZS 1170.2 2002 Section 4.2.1 and Table 4.1(A))
M_s	= 1 where no shielding building is provided (AS/NZS 1170.2 2002 Section 4.3.1)
M_t	= 1.16 where the structure is less than 500m above sea level, and the upwind slope of the hill is 0.1 (AS/NZS 1170.2 2002 Table 4.4)

Therefore;

$$V_{des,\theta} = V_{sit,\beta} = 45 \times 1 \times 0.83 \times 1 \times 1.16 = 43.326 \text{ m/s}$$

$$\text{And } p = 0.6[43.326]^2 = 1126.3 \text{ Pascal}$$

The glass panel area, A is 2.32m^2 (1.16m x 2m) , therefore the minimum load required is,

$$\begin{aligned} F &= p \times A \\ &= 1126.3 \times 2.32 \\ &= 2613 \text{ N} \\ &= 266 \text{ kg} < 300 \text{ kg tested} \end{aligned}$$

Therefore, the balustrade system can be installed based on the conditions in the example.

Glass Testing Report

Client:	Glass Vice Products Ltd.	Order Number:	TBA
Location:	Extreme Team Workshop, 26 Manga Road, Silverdale		
Job Description:	Testing of glass/vice balustrade: 1. As a barrier system in accordance with code below 2. To resist wind load as per code below		
Identification:	Glass barrier with vices		
Test in Accordance With:	AS/NZS 1170.0 2002 <i>Structural Design Actions Part 0: General Principles</i> AS/NZS 1170.1 2002 <i>Structural Design Actions Part1: Permanent, Imposed and Other Actions</i> Section 3.6, & AS/NZS 1170.2 2002 <i>Structural Design Actions Part 2: Wind Actions</i>		
Acceptance Criteria:	As below		
Inspector:	Tian Qiu	Date of Inspection:	24/09/2008 to 07/10/2008

Balustrade Description:

List of Components:

- Toughened glass (specification not verified)
- Stainless steel vices (see *Figure A4*)
- Anchoring bolts (specification not verified)
- Stainless H-clamp (see *Figure A5*)
- Polyethylene strips

Installation/ Setup:

The balustrade system was setup as shown in *Figure A1*. The glass panel was clamped by two vices which were then bolted onto the concrete floor. Two H-clamps were used to attach the glass panel to adjacent balustrades. To prevent stressing of the glass, a strip of high impact polyethylene was positioned between the mating surfaces of the glass and the stainless steel vice or H-clamp. Dimensions of the system are as below.

Dimensions:

- Glass Height: 1160 mm
- Glass Thickness: 12 mm
- Glass spacing: 25mm
- Glass Width: 2000 mm
- Elevation: 50 mm
- Number of Vices:
- Vice Spacing: 1200 mm
- Overhang: 400 mm
- Polyethylene Strip: 141mm x 33mm x 3m
- H-Clamp location: 100 mm from top

Technician:	T. Qiu	Report printed on 29/10/2008	Reviewed by:	L. Kong
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Barrier Test:

Test Setup:

The setup of the test is shown in *Figure A2*.

Steel beam was used to distribute the load in top edge testing. The contact area size in top corner point loading was 40mm x 40mm.

Test Condition:

Up to 0.75kN/m x 1.5 as per AS/NZS 1170.1 2002 Section 3.6 and AS/NZS 1170.0 2002 Section 4.2

Test Results:

Loading Type		Load Required	Load Tested	Duration	Findings	Results
Top Edge	Horizontal	229.36 kg	230 kg	16 min	No fracture	Complies
	Vertical	229.36 kg	232 kg	16 min	No fracture	Complies
Point Load	Top corner	91.74 kg	92 kg	16 min	No fracture	Complies

Range of Approval:

As per AS/NZS 1170.1 2002 Table 3.3, the balustrade system tested is qualified for the following occupancy types:

- Type A,
- Type B,
- Type E and
- Type C3

Wind Loading Test:

Test Setup:

The test setup is as shown in *Figure A3*. The load applied was uniformly distributed over the glass panel.

Test Condition:

- **Load Applied :** 400 Kg
- **Load Duration:** 16 min
- **Glass Area:** 2.32 m²
- **Pressure:** 1691.4 Pa

Findings:

No deformation or fracture

Range of Approval:

Range of approval for site conditions is subject to evaluation by competent authority. (see Appendix C for typical evaluation example)

Option B - The Facts

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Appendix A - Setups

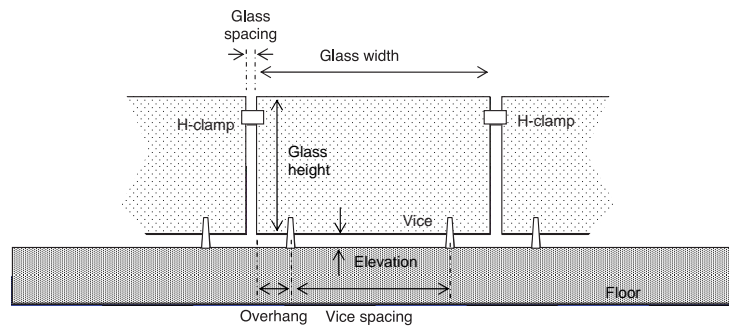


Figure A1. Setup of the balustrade system

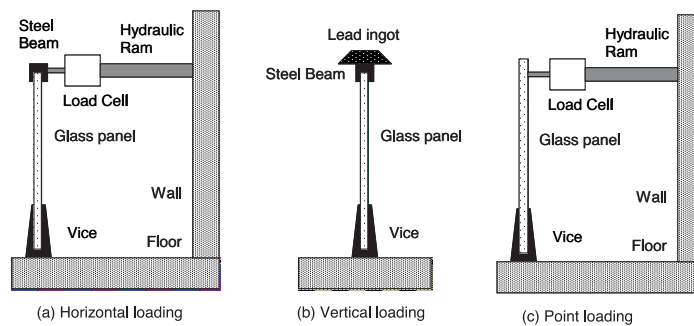


Figure A2. Testing setup for system as a barrier

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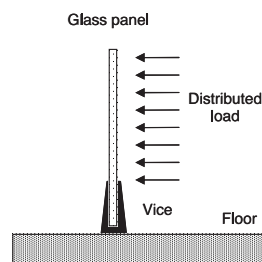


Figure A3. Testing setup of wind loading

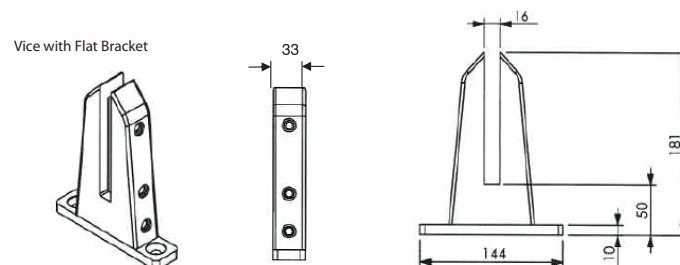


Figure A4. Stainless steel vice (all dimensions are in mm)

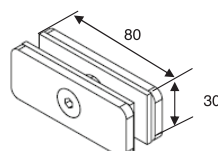


Figure A5. Stainless steel H-clamp (all dimensions are in mm)

Appendix C – Wind action calculations

According to AS/NZS 1170.2 2002 section 2.4.1, the design criteria of a balustrade is governed by the following equations,

$$p = (0.5\rho_{air})[V_{des,\theta}]^2 C_{fig} C_{dyn} \quad \text{eq. (1) (AS/NZS 1170.2 2002 section 2.4.1)}$$

$$V_{des,\theta} = V_{sit,\beta} \quad \text{eq. (2) (AS/NZS 1170.2 2002 section 2.3)}$$

$$V_{sit,\beta} = V_R M_d (M_{z,cat} M_s M_t) \quad \text{eq. (3) (AS/NZS 1170.2 2002 section 2.2)}$$

Where,

P	= design wind pressure acting normal to a surface, in pascals
ρ_{Air}	= density of air, which shall be taken as 1.2kg/m ³
$V_{des,\theta}$	= building orthogonal design wind speed (usually, $\theta = 0^\circ, 90^\circ, 180^\circ$ and 270°) (AS/NZS 1170.2 2002 Section 2.3)
V_R	= regional 3 s gust wind speed, in meters per second, for annual probability of exceedance of 1/R (AS/NZS 1170.2 2002 Section 3.2)
M_d	= wind directional multipliers for 8 cardinal directions (β) (AS/NZS 1170.2 2002 Section 3.3)
$M_{z,cat}$	= terrain/height multiplier (AS/NZS 1170.2 2002 Section 4.2)
M_s	= shielding multiplier (AS/NZS 1170.2 2002 Section 4.3)
M_t	= topographic multiplier (AS/NZS 1170.2 2002 Section 4.4)
C_{fig}	= Aerodynamic shape factor (AS/NZS 1170.2 2002 Section 5)
C_{dyn}	= Dynamic response factor (AS/NZS 1170.2 2002 Section 6)

Example for a typical Wellington suburb house,

The glass balustrade system was to be installed in the following site conditions:

- House is located in Wellington (NZ) district
- To be installed on second floor balcony with average local ground level of 5m
- House is on a hill with upwind slope gradient of 0.1
- No applicable shielding building is around
- House is 50m above sea level
- Possible wind directions: all wind directions
- Designed life span of the installed balustrade is 25 years

Assumptions used for calculation:

- Aerodynamic shape factor $C_{fig} = 1$ (covers most types of pressure coefficients)
- Dynamic response factor $C_{dyn} = 1$ for natural first mode fundamental frequency greater than 1
- Density of air $\rho_{Air} = 1.2 \text{ kg/m}^3$

By substituting equation 1;

$$p = (0.5 \times 1.2) [V_{des,\theta}]^2 \times 1 \times 1$$

$$p = 0.6 [V_{des,\theta}]^2$$

And from equation 2;

$$V_{des,\theta} = V_{sit,\beta} = V_R M_d (M_{z,cat} M_s M_t)$$

Where in this example,

V_R	= 45m/s with 2% annual probability of exceedance (AS/NZS 1170.2 2002 Table 3.1)
M_d	= 1 for all wind directions in all wind regions (AS/NZS 1170.2 2002 Table 3.2)
$M_{z,cat}$	= 0.83 for a structure in suburban housing area less than 10m above average local ground level (AS/NZS 1170.2 2002 Section 4.2.1 and Table 4.1(A))
M_s	= 1 where no shielding building is provided (AS/NZS 1170.2 2002 Section 4.3.1)
M_t	= 1.16 where the structure is less than 500m above sea level, and the upwind slope of the hill is 0.1 (AS/NZS 1170.2 2002 Table 4.4)

Therefore;

$$V_{des,\theta} = V_{sit,\beta} = 45 \times 1 \times 0.83 \times 1 \times 1.16 = 43.326 \text{ m/s}$$

$$\text{And } p = 0.6[43.326]^2 = 1126.3 \text{ Pascal}$$

The glass panel area, A is 2.32m^2 (1.16m x 2m) , therefore the minimum load required is,

$$\begin{aligned} F &= p \times A \\ &= 1126.3 \times 2.32 \\ &= 2613 \text{ N} \\ &= 266 \text{ kg} < 400 \text{ kg tested} \end{aligned}$$

Therefore, the balustrade system can be installed based on the conditions in the example.

Aesthetics, Innovation, Quality and Integrity



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