



## Report No 263/7202341

Pure Vista  
Pendeway  
Stoney Lane  
Bodmin  
Cornwall  
PL31 2QX

Authority & date Quotation acceptance reference BSI 129695 dated 17 April 2008

Items tested Balustrade system

Specification BS 6180: 1999 clauses 6.3.1, 6.4.1 and 8.5 only  
Direct commission testing

Results Refer to Report text

Prepared by G Wackett (Senior Engineer)

Authorized by F Merrison (Laboratory Manager)

Issue Date

## Conditions of issue

This Test Report is issued subject to the conditions stated in current issue of PS082 'General conditions relating to acceptance of testing'. The results contained herein apply only to the particular sample/s tested and to the specific tests carried out, as detailed in this Test Report. The issuing of this Test Report does not indicate any measure of Approval, Certification, Supervision, Control or Surveillance by BSI of any product. No extract, abridgement or abstraction from a Test Report may be published or used to advertise a product without the written consent of the Managing Director, BSI Product Services, who reserves the absolute right to agree or reject all or any of the details of any items or publicity for which consent may be sought. BSI Product Services Maylands Avenue Hemel Hempstead Hertfordshire HP2 4SQ Telephone: (08450) 765600

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## TESTING, EXAMINATION AND ASSESSMENT OF BALUSTRADE SYSTEMS SUBMITTED AS DIRECT COMMISSION TEST SAMPLES

At the request of Pure Vista the balustrade systems submitted on behalf of Pure Vista, were tested and assessed against specific requirements of BS 6180: 1999 clauses 6.3.1, 6.4.1 and 8.5 only, as indicated on the following pages of this Report. This request was made on Quotation Acceptance reference BSI 129695 dated 17 April 2008 and identified under Equipment Record No 10096778.

The results detailed in this Report apply only to the particular samples tested and to the specific tests carried out. This Report does not indicate, provide or imply any measure of Approval, Certification, Supervision or Control of Surveillance by BSI to this or any related product.

It is emphasized that assessments have not been made against the other clauses of the Specification.

This testing was witnessed by BSI Product Services at the clients' premises on 30 April to 2 May 2008.

### TEST ITEMS

#### Laminated Glass - Resin Interlayer

17.8mm Safeguard laminated structural safety glass.

2 x 8mm clear toughened 2mm clear acrylic resin interlayer polished edges all round.

21.8mm safeguard laminated structural safety glass.

2 x 10mm clear toughened 2mm clear acrylic resin interlayer polished edges all round.

25.8mm safeguard laminated structural safety glass.

2 x 12mm clear toughened 2mm clear acrylic resin interlayer polished edges all round.

#### Laminated Glass - EVA Interlayer

17.5 EVA Laminated

Polished, 2 x 8mm clear toughened and heat soaked

21.5 EVA Laminated

Polished, 2 x 10mm clear toughened and heat soaked

25.5 mm EVA Laminated

Polished, 2 x 12mm clear toughened and heat soaked

#### Toughened Glass

15 mm

Polished, toughened and heat soaked

19 mm

Polished, toughened and heat soaked

25mm

Polished, toughened and heat soaked

**TESTING, EXAMINATION AND ASSESSMENT OF BALUSTRADE SYSTEMS  
SUBMITTED AS DIRECT COMMISSION TEST SAMPLES**

Aluminium Shoe 16mm thick 'U' channel 6082 T6 aluminium extrusion 1000mm in length

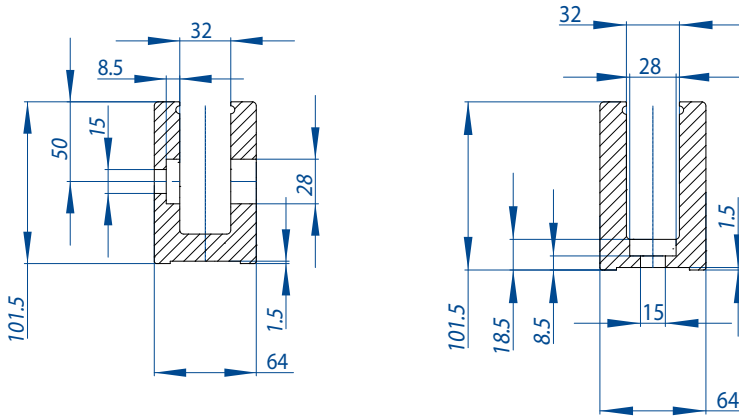
**Fixings used in test**

- M12 (10.9) hex head bolts
- M10 (10.9) hex head bolts
- Fischer F11 12/10S fixings
- Fischer FHB 11 A L M12x120/10 bolts held with resin FESH345S
- Wedges (Aluminium / Acetal)

Base: Concrete Slab 300mm x 250mm x 1000mm  
RMXENC C16/20 20mm Agg CEM II/A-LL WRA61

C Channel Steel 300mm x 150mm x 10mm x 1000mm

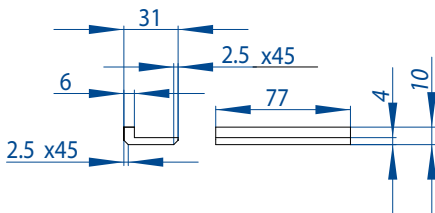
Detail of Aluminium shoe



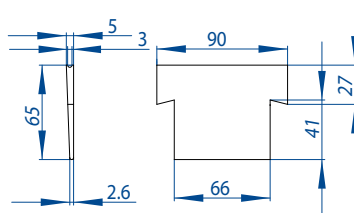
Side fixing detail

Base fixing detail

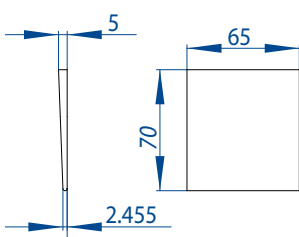
Bottom Isolator



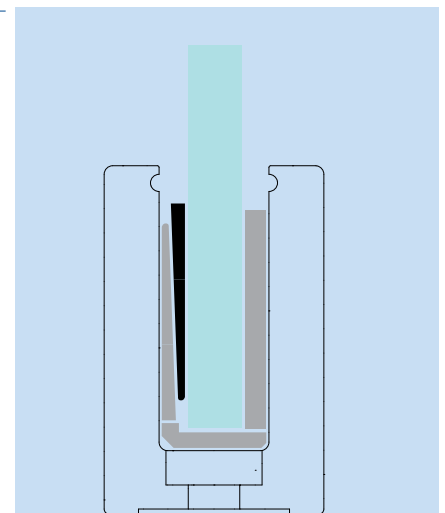
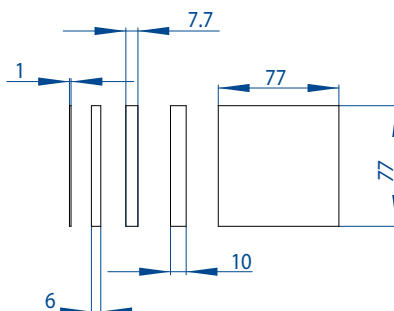
Aluminium Wedge



Acetal Wedge



Side Isolator



On completion of fitting the aluminium shoe, place the bottom isolators into the shoe at 250mm centers with the nib on the side the wedges are required. Place the glass into the desired position and then place the 1-10mm thick side isolators in line above the bottom isolators, now slide the isolator wedges (thin point up) in between the glass and alloy shoe in line above the bottom isolator nib, place the aluminium wedge between the isolator wedge and the alloy shoe with the wings protruding each side of the isolator wedge, when the required amount of wedges have been set up you can now hammer in the alloy wedge with a lump hammer and bolster.

### TEST SET UP METHOD

For the test set up, Pure Vista installed the balustrade systems. All balustrade system parts were supplied by Pure Vista

Each balustrade module consisted of an aluminium base section extruded aluminium 6082T6 anchored to the side of, or down on to, either solely concrete or solely steel sections or steel sections anchored to concrete.

Material: Acetal C

The anchoring methods and fixings are described throughout this Report. The horizontal uniformly distributed line loads were applied to the balustrade handrail using a hydraulic cylinder via a 16mm aluminium extruded 'U' channel. The load was measured using a BSI Product Services calibrated load cell and digital display unit.

The deflection measurements were made using a BSI Product Services calibrated dial test indicator.

## Health and Safety

Synonyms: 1,1-diethoxyethane, diethylacetal, ethylidene diethyl ether

Molecular formula: C<sub>6</sub>H<sub>14</sub>O<sub>2</sub> ( Structural: CH<sub>3</sub>CH(OC<sub>2</sub>H<sub>5</sub>)<sub>2</sub> )

CAS No: 105-57-7

EC No: 203-310-6

Annex I Index No: 605-015-00-1

Physical data

Molecular Weight: 118

Vapor pressure at 20 C: 4.08 mm Hg

Melting point: -100 C

Boiling point: 102.7 C

Flash point: 36 C

Lower explosive limit: 1.7 %

Upper explosive limit: 10.4 %

Solubility in water at 20 C: 5%

Stability

Stable. Highly flammable. May form peroxides in storage. Test for peroxides before use. Vapors may form an explosive mixture with air, and may travel to source of ignition and flash back. Vapors may spread along ground and collect in low or confined areas (sewers, basements, tanks).

Toxicology

Inhalation or skin contact may irritate or burn skin and eyes. Vapors may cause dizziness or suffocation.

Toxicity data

(The meaning of any toxicological abbreviations which appear in this section is given here.)

ORL-RAT LD<sub>50</sub> 4600 mg kg<sup>-1</sup>

IPR-RAT LD<sub>50</sub> 900 mg kg<sup>-1</sup>

ORL-MUS LD<sub>50</sub> 3500 mg kg<sup>-1</sup>

Risk phrases

(The meaning of any risk phrases which appear in this section is given here.)

R11 R36 R38.

Transport information

(The meaning of any UN hazard codes which appear in this section is given here.)

UN No 1088. Hazard class 3. Packing group II.

Personal protection

Safety glasses. Good ventilation.

Safety phrases

(The meaning of any safety phrases which appear in this section is given here.)

S9 S16 S33.

## **BS 6180: 1999**

### **EXAMINATION AND TEST**

#### **CLAUSE**

#### **6 Design Criteria**

##### **6.3 Loading**

###### **6.3.1 General**

The minimum horizontal imposed loads appropriate to the design of parapets, barriers, balustrades and other elements of structure intended to retain, stop or guide people, should be determined in accordance with BS 6399: Part 1: 1996, clause 10.

All the loads are determined according to the type of occupancy which reflects the possible in-service conditions.

The design level (the level at which the horizontal uniformly distributed line load should be considered to act) is 1100mm for 'other positions' as defined in clause 6, table 1

##### **6.4 Deflection**

###### **6.4.1 Barriers for the protection of people**

Where a glass component of a barrier is subjected to imposed loads given in BS 6399-1 the displacement of any point of the glass component, relative to its fixings, should not exceed  $L/65$  or 25mm, whichever is the smaller where L is given in 8.5

#### **8.5 Design of free-standing glass protective barriers**

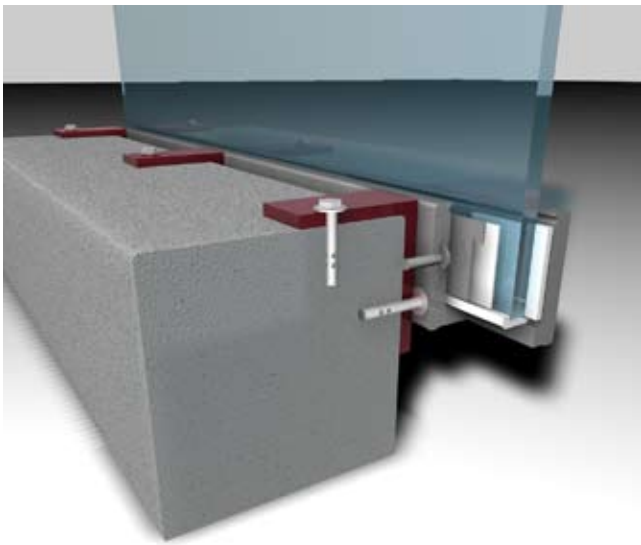
##### **8.5.1 Design Criteria**

The deflection of the glass should be as recommended in 6.4.1, taking L as 1300mm

**CLAUSE****8.5 Design of free-standing glass protective barriers (continued)****8.5.1 Design Criteria (continued)  
Anchoring System 2 (Side Fixing)**

150x150x75mm wide x 10mm thick angle irons bolted into side of concrete at 200mm centres with 5 x Fischer FH11 12/10S fixings to top and side with the aluminium shoe bolted to side of steel angle with M10 (10.9) hex head bolts. Wedges spaced at approximately 200mm centres, slotted hand rail  $\varnothing$  48.3mm.

Horizontally uniformly distributed load (U.D.L.)



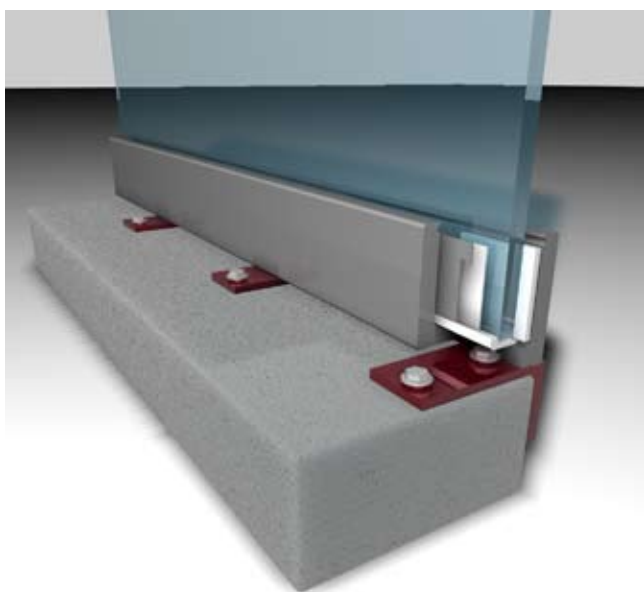
Max Glass deflection = 20mm  
Wedges = 4

Glass Type	UDL (kN/m)	Glass length (mm)	Height of glass above datum (mm)	Actual Deflection
15mm Toughened	0.74	1000	1100	18.88
17.8mm Resin Interlayer	0.36	1000	1100	13.76
17.5mm EVA Interlayer	0.74	1000	1100	11.0
19mm Toughened	0.8	1000	1100	12.31
17.8mm Resin Interlayer	0.8	1000	1110	16.55
17.5mm Resin Interlayer	0.74	1000	1110	14.1
17.5mm EVA Interlayer	0.74	1000	1110	13.78
17.5mm EVA Interlayer	0.74	1000	1110	15.09
25mm Toughened	1.5	1000	1110	13.84

**CLAUSE****8.5 Design of free-standing glass protective barriers (continued)****8.5.1 Design Criteria (continued)****Anchoring System 1 (Top Fixing)**

150x150x75mm wide x 10mm thick angle irons bolted down into concrete at 200mm centres with 5 x Fischer FH11 12/10S fixings to top and 5 to the side with the aluminium shoe bolted to top of steel angle with M12 (10.9) hex head bolts. Wedges spaced at approximately 200mm centres, slotted hand rail  $\varnothing$  48.3mm.

Horizontally uniformly distributed load (U.D.L.)



Max Glass deflection = 20mm

Wedges = 4

Glass Type	UDL (kN/m)	Glass length (mm)	Height of glass above datum (mm)	Actual Deflection
15mm Toughened	0.74	1000	1100	13.17
15mm Toughened	0.8	1000	1100	14.28
17.8mm Resin Interlayer	0.36	1000	1100	10.95
17.5mm EVA Interlayer	0.74	1000	1100	15.75
17.5mm EVA Interlayer	0.8	1000	1100	17.3
19mm Toughened	1.5	1000	1100	14.97
21.8mm Resin Interlayer	0.74	1000	1110	14.2
21.8mm Resin Interlayer	0.8	1000	1110	15.58
21.5mm EVA Interlayer	0.74	1000	1100	10.1
21.5mm EVA Interlayer	0.8	1000	1100	11.07
<b>25mm Toughened*</b>	<b>3.0</b>	<b>1000</b>	<b>1100</b>	<b>19.15</b>
25.8mm Resin Interlayer	1.5	1000	1100	18.65
25.5mm EVA Interlayer	1.5	1000	1100	16.42

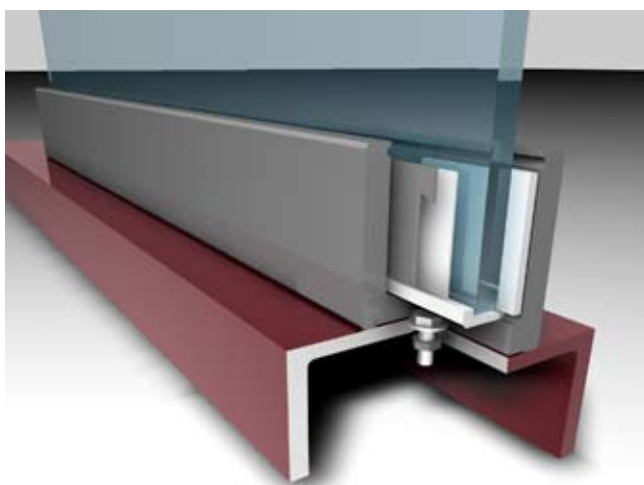
\* 5 Wedges used



**CLAUSE****8.5 Design of free-standing glass protective barriers (continued)****8.5.1 Design Criteria (continued)****Anchoring System 4 (Top Fixing)**

Aluminium shoe base bolted down onto steel at 200mm centres with 5 x M12 (10.9) hex head bolts.  
Wedges at 200 - 250mm centres, slotted hand rail  $\varnothing$ 48.3mm

Horizontally uniformly distributed load (U.D.L.)



Max Glass deflection = 20mm

Wedges = 4 (unless otherwise stated)

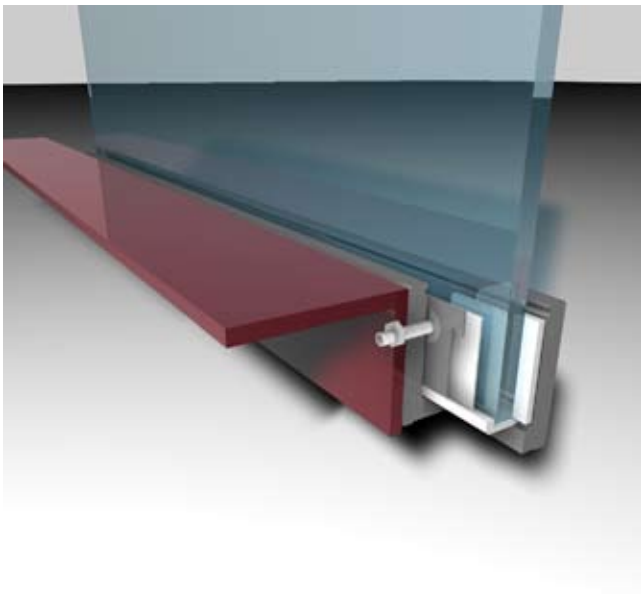
Glass Type	UDL (kN/m)	Glass length (mm)	Height of glass above datum (mm)	Actual Deflection
15mm Toughened	0.74	1000	1100	13.61
15mm Toughened	0.8	1000	1100	14.51
17.8mm Resin Interlayer	0.36	1000	1100	13.88
17.5mm EVA Interlayer	0.74	1000	1100	8.9
17.5mm EVA Interlayer	0.36	1000	1100	19.62
19mm Toughened	1.5	1000	1100	15.38
21.8mm Resin Interlayer	0.36	1000	1100	8.27
21.8mm Resin Interlayer	0.74	1000	1100	18.62
21.5mm EVA Interlayer	0.74	1000	1100	11.76
21.5mm EVA Interlayer	0.8	1000	1100	13.05
25mm Toughened *	1.5	1000	1100	10.9
25mm Toughened *	3.0	1000	1100	19.89
25.5mm EVA Interlayer	1.5	1000	1100	18.2

\* 5 Wedges used

**CLAUSE****8.5 Design of free-standing glass protective barriers (continued)****8.5.1 Design Criteria (continued)****Anchoring System 5 (Side Fixing)**

Aluminium shoe side bolted to steel at 250mm centres with 4 x M12 (10.9) hex head bolts.  
Wedges at 250mm centres, slotted hand rail

Horizontally uniformly distributed load (U.D.L.)



Max Glass deflection = 20mm

Wedges = 4 (unless otherwise stated)

Glass Type	UDL (kN/m)	Glass length (mm)	Height of glass above datum (mm)	Actual Deflection
15mm Toughened	0.74	1000	1100	18.6
15mm Toughened	0.8	1000	1100	19.58
17.8mm Resin Interlayer	0.36	1000	1100	19.87
17.5mm EVA Interlayer	0.36	1000	1100	11.31
19mm Toughened	0.74	1000	1100	10.49
19mm Toughened	0.8	1000	1100	11.7
21.5mm EVA Interlayer	0.74	1000	1100	14.11
21.5mm EVA Interlayer	0.8	1000	1100	15.43
25mm Toughened	0.74	1000	1100	5.99
25mm Toughened	0.8	1000	1100	7.07
25mm Toughened	1.5	1000	1100	12.8
25.8mm Resin Interlayer	0.74	1000	1100	14.76
25.8mm Resin Interlayer	0.8	1000	1100	16.5
25.5mm EVA Interlayer	0.74	1000	1100	9.83
25.5mm EVA Interlayer	0.8	1000	1100	10.63

\* 5 Wedges used

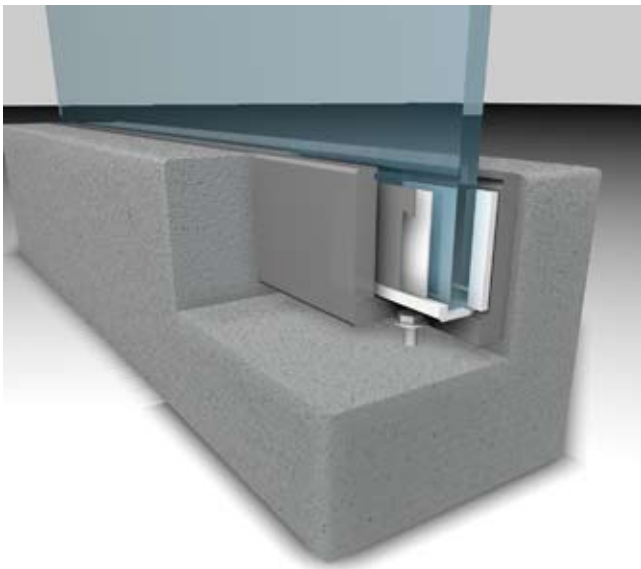
**CLAUSE****8.5 Design of free-standing glass protective barriers (continued)****8.5.1 Design Criteria (continued)****Anchoring System 6 (Cast into Concrete)**

Anchoring System 6 (Cast into Concrete)

Aluminium shoe cast into concrete.

Wedges at 200 - 250mm centres, slotted hand rail

Horizontally uniformly distributed load (U.D.L.)



Max Glass deflection = 20mm

Wedges = 4 (unless otherwise stated)

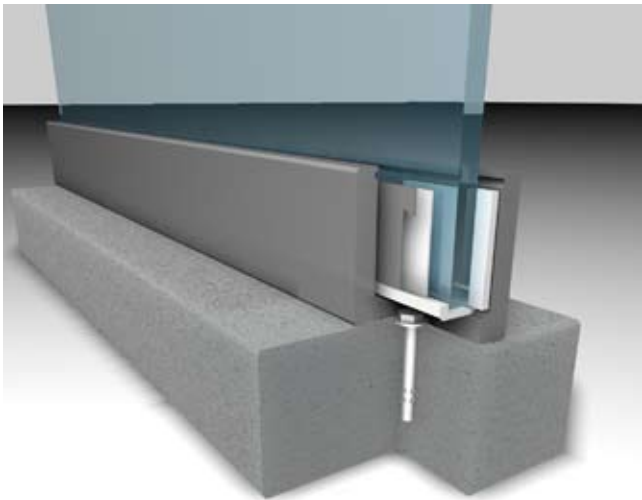
Glass Type	UDL (kN/m)	Glass length (mm)	Height of glass above datum (mm)	Actual Deflection
15mm Toughened	0.74	1000	1100	17.14
15mm Toughened	0.8	1000	1100	18.56
17.8mm Resin Interlayer	0.36	1000	1100	18.1
17.5mm EVA Interlayer	0.36	1000	1100	12.37
19mm Toughened	1.5	1000	1100	19.92
21.8mm Resin Interlayer	0.74	1000	1100	18.7
21.5mm EVA Interlayer	0.74	1000	1100	14.85
21.5mm EVA Interlayer	0.8	1000	1100	16.23
<b>25mm Toughened</b>	<b>3.0</b>	<b>1000</b>	<b>1100</b>	<b>19.47</b>

\* 5 Wedges used

**CLAUSE****8.5 Design of free-standing glass protective barriers (continued)****8.5.1 Design Criteria (continued)****Anchoring System 7 (Top Fixing)**

Aluminium shoe base bolted down onto concrete at 250mm centres with 4 x Fischer FH11 12/10S fixings.  
Wedges at 250mm centres, slotted hand rail  $\varnothing 48.3$

Horizontally uniformly distributed load (U.D.L.)



Max Glass deflection = 20mm

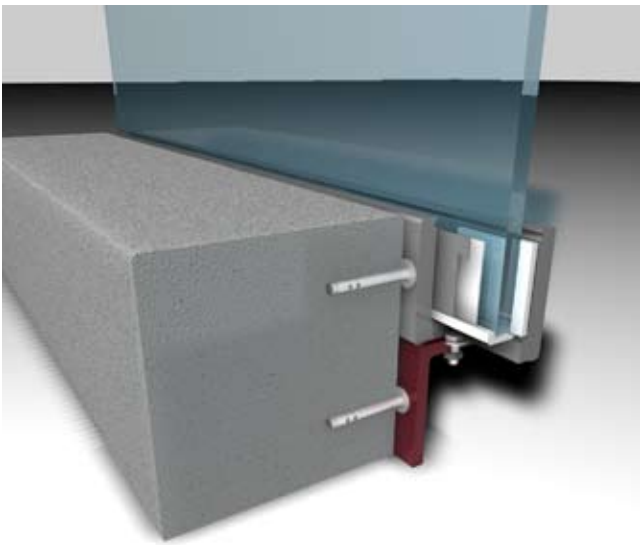
Wedges = 4 (unless otherwise stated)

Glass Type	UDL (kN/m)	Glass length (mm)	Height of glass above datum (mm)	Actual Deflection
15mm Toughened	0.74	1000	1100	14.21
15mm Toughened	0.8	1000	1100	15.5
17.8mm Resin Interlayer	0.36	1000	1100	14.93
17.5mm EVA Interlayer	0.36	1000	1100	9.57
17.5mm EVA Interlayer	0.74	1000	1100	19.46
19mm Toughened	1.5	1000	1100	17.05
21.8mm Resin Interlayer	0.74	1000	1100	19.1
21.5mm EVA Interlayer	0.74	1000	1100	12.81
21.5mm EVA Interlayer	0.8	1000	1100	14.17
25.8mm Resin Interlayer	0.8	1000	1100	10.65
25.5mm EVA Interlayer	0.8	1000	1100	8.54
25.5mm EVA Interlayer	1.5	1000	1100	17.94

**CLAUSE****8.5 Design of free-standing glass protective barriers (continued)****8.5.1 Design Criteria (continued)****Anchoring System 8 (Side Fixing)**

Aluminium shoe base side bolted to concrete at 200mm centres with 4 x Fischer FHB 11 A L M12x120/10 fixings supported by 1000mm wide 75x75x6mm thick angle iron fixed to concrete with M10 studding and bolted to aluminium shoe with 5 x M10 (10.9) hex head bolts. Wedges at 250mm centres, slotted hand rail.

Horizontally uniformly distributed load (U.D.L.)



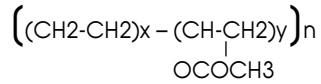
Max Glass deflection = 20mm

Wedges = 4 (unless otherwise stated)

Glass Type	UDL (kN/m)	Glass length (mm)	Height of glass above datum (mm)	Actual Deflection
15mm Toughened	0.74	1000	1100	19.88
19mm Toughened	0.8	1000	1100	13.96
19mm Toughened	0.74	1000	1100	12.42

## 1. What is EN film?

1) EN is made from Ethylene-Acetate copolymer (EVA), which has the following structure.



2) EVA is a crystallized polymer, and its crystallization is depending on the vinyl acetate contents. Crystallization is formed at the 10oC higher than its melting point.

3) Controlling this crystallization affects on the transparency of the film.

## 2. Characteristics of EN film

1) EN has excellent adhesion strength not only to inorganic materials like glass or metals, but also to organic materials such as polycarbonate (PC) and PET. Furthermore this adhesion can be obtained around at 100oC while lamination process.

2) Because of its hydrophobic nature, EN doesn't absorb water. Therefore EN film can be used for open edge method or the place under high temperature and humidity such as bathrooms.

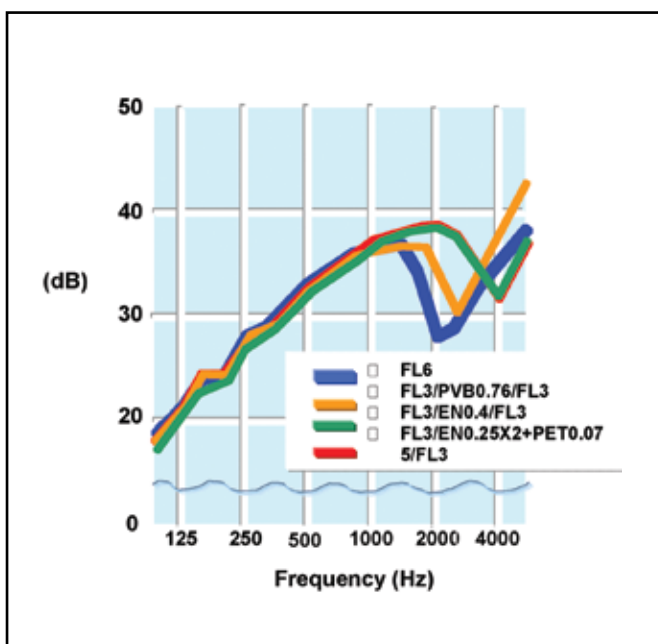
3) Laminating process is quite simple, EN just needs heating under vacuum condition.

4) As EN can be laminated at low temperature, the functions of the materials to be laminated can be fully exercised.

5) EN has good long term stability such as light stability and humidity resistance.

6) EN has better acoustic performance than PVB.

7) As EN doesn't need air-conditioning for storage, and can be assembled at normal temperature, EN is very easy to handle



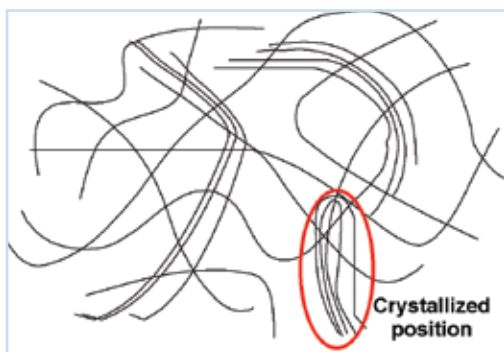
### 3. Have level of EN Film

1) As mentioned before, crystallization makes transparency of EN FILM worse. In order to maintain its transparency, we add a resin-clarifying agent which prevents crystallization.

2) For the resin-clarifying agent's higher effect, we recommend reheating glass up to 85°C.

3) Theoretically the resin-clarifying agent's dispersion effect is reinforced by re-melting as follows.

#### Crystallization Model of EN FILM



**At room temperature**

There are crystallized parts and Noncrystallized parts.

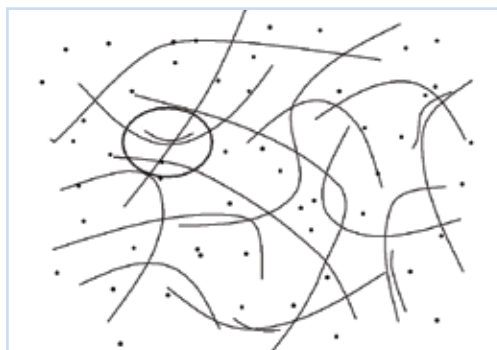


**At high temperature**



**After cooling process**

The resin-clarifying agent prevents re-crystallization, but crystallization occurs at the parts



**After re-heating process**

The resin-clarifying agent's dispersion becomes better after re-heating, resulting in improvement of haze level.

4. Technical Data  
 4-1 Comparative Data

Physical Properties		EN Sekisui	COMPETITORS			PVB Sekisui
Condition		A	B	C		
Condition	Laminating temperature (°C)	100	140	100	100	140
	Flow starting temperature (°C)	80.5	80.5	82.7	82.8	90.4
	Flow gradient x104(cm/s-°C)	1.2	4.0	8.4	4.1	
Optical quality	Transmission (%)	87.7	87.1	87.6	86.5	88.1
	Haze (%)	0.6	0.6	0.6	1.3	0.4
	UV cutting rate (%)	98.7	---	---	---	99.6
Adhesion Strength (180° peel)	to glass (kg/cm)	3.2	2.7	0.8	1.2	3.2
	to PET (kg/cm)	0.93	0.45	0.05	0.01	0.06
Water absorption rate	23 °C, 24hr (%)	0.1	0.1	1.0	1.0	3.6
Tensile characteristics	Strength at break (kg/cm <sup>2</sup> )	290	60.4	190	248	339
	Elongation at break (%)	2340	545	1180	1100	455
Weathering Prop	Super UV 200hr ΔYI	2.0	7.0	19.2	23.3	15.0
	JIS-UV 3,000hr	Passed	Delamination	Small bubbles	-	Passed
	Sunshine Weatherometer (Pyrex glass) 1,000hr	Passed	Delamination	Smallbubbles		Passed
	2,000hr	Passed	-	-		Passed
Heat resistance	100°C, 3 months	Passed	-	Sagging	-	Passed
Humidity resistance	50°C, 95%RH, 2 weeks	Passed	Passed	Fine bubbles	-	Passed

## 4-2 Physical Properties of S-LEC EN FILM

Items	Unit	EN	PVB	Remarks
1 Density	g/cm <sup>3</sup>	0.971	1.07	JIS K 7112
2 Rupture point	%	2340	455	JIS K 7113
3 Strength at rupture point	kg/cm <sup>2</sup>	290	339	
4 Durometer A hardness		75	---	JIS K 7215
5 Specific heat	cal/goC	1.35	---	JIS K 7123
6 Thermal conductivity	kcal/mhoC	0.14	0.14	JIS A 1412
7 Volume restivity	Ω cm	1.7 x 10 <sup>13</sup>	---	JIS K 6911
8 Dielectric constant	----	3.43	6.2	
9 Dielectirc loss	----	0.0013	---	
10 Linear expansion coefficient	----	2.54 x 10 <sup>-4</sup>	---	JIS K 7197
11 Refractive index	----	1.485	1.52	JIS K 7105
12 Water absorption rate	%	0.1	3.6	
13 Flow starting temperature	oC	80.5	90.4	JIS K 7199



4-3 Key Physical Properties

(1) Film self-adhesion

Method : After loading with 300g/cm<sup>2</sup> on the films for specific period, then 180o peel strength was measured.

Results : EN Film has no self adhesion even after storage at room temperature.

(2) Humidity resistance test

Method : After keeping a laminated glass under the condition of 50oC and 95%RH, then the appearance of laminated glass was observed.

	2 Weeks
EN	No remarks
Competitor A	No remarks
Competitor B	Bubbles at the edge

(3) Heat resistance test

Method : After keeping a laminated glass at 100oC, then the appearance of laminated glass was observed.

	1 month	3 months
EN	No remarks	No remarks
Competitor B	Sagging	-

(4) Weather resistance test

Method : Sunshine weatherometer test

	EN	Competitor A	Competitor B
1000hr	No remarks	Delamination	Small bubbles
2000hr	No remarks	Delamination	Small bubbles

(5)JIS-UV test

a) With Float glass

Time	EN			Competitor A			Competitor B			PVB		
	ΔE	ΔYI	Haze	ΔE	ΔYI	Haze	ΔE	ΔYI	Haze	ΔE	ΔYI	Haze
500hr	0.5	0.7	0.4	2.5	2.2	0.7	1.5	1.5	0.7	1.5	0.4	0.2
1000hr	0.7	1.0	0.5	-	-	-	1.7	2.4	0.6	1.6	0.5	0.2
1500hr	0.7	1.1	0.4	2.4	2.0	1.0	2.3	3.8	0.4	1.6	0.5	0.2
2000hr	0.7	1.2	0.4	1.9	1.3	0.9	2.6	4.7	0.6	1.6	0.5	0.2
3000hr	0.7	1.4	0.5	2.2	1.5	0.6	4.3	7.2	0.5	2.0	1.4	0.2

b) With Pylex glass (Its UV transmission is 2-3 times more than that of Float glass)

Time	EN			Competitor A			Competitor B			PVB		
	ΔE	ΔYI	Haze	ΔE	ΔYI	Haze	ΔE	ΔYI	Haze	ΔE	ΔYI	Haze
500hr	0.6	0.6	0.3	1.5	2.1	0.6	4.0	6.8	0.5	1.0	1.4	0.2
1000hr	0.9	1.6	0.5	-	-	-	6.2	10.5	0.8	5.1	8.6	0.2
1500hr	1.2	2.3	0.4	3.0	5.1	0.8	7.7	13.2	0.4	6.9	11.6	0.3
2000hr	1.4	2.7	0.4	3.7	6.4	0.6	9.1	15.1	0.6	7.7	13.0	0.2
3000hr	1.6	3.0	0.5	5.4	10.7	0.7	10.0	17.5	0.6	8.8	15.1	0.3

b) With Pylex glass (Its UV transmission is 2-3 times more than that of Float glass)

(6) Ball drop test (JIS R 3212)

Steel ball : 2.26kg, which diameter is 82mm

Test specimen : 300mm x 300mm

Test temperature : 23oC

Results - Glass thickness : 2.5mm, PET thickness : 75m

Combination	EN		Competitor A	
	G/0.25mm/G	G/0.25/PET/0.25/G	G/0.4mm/G	G/0.4mm/G
50% MBH (m)	0.7	3.5	1.9	0.9

Reference : PVB HI DX-12 0.38mm MBH=2.75m

0.76mm MBH=5.75m

ST 0.38mm MBH=0.80m

\* Higher MBH than that of PVB 0.38mm can be obtained with the combination of EN 0.25mm and PET 75micron

(7) Shot bag test (JIS R 3212)

Weight : 45kg

Test specimen : 1930mm x 864mm

Test temperature : 23oC

Test conducted by General Building Research Corporation of Japan (Osaka, Japan)

Combination	EN		
	G/0.25mm/G	G/0.4mm/G	G/0.25mm/PET/0.25mm/G
Dropping height (cm)	48	61	120
Classification	III	III	II-1

Glass thickness : 2.5mm, PET thickness : 75m

\* Classification II-1 can be obtained with the combination of EN 0.25mm and PET 75micron.

5. EN Film Product Specification

Color	Thickness	Length	Width
Clear transparent	0.25mm	150 m	Max 220 cm
Clear transparent	0.40mm	100 m	