

TEST REPORT

Lucideon Reference: 174989 (QT-47953/1/GMB & QT-48520/1/GMB)/Ref. 4

Project Title: Testing of Origin-R Balustrade System Fixed into Steel in Accordance with BS 6180:2011 Barriers in and About Buildings

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1 INTRODUCTION

Lucideon Limited were commissioned by the client, Pure Vista Ltd, to carry out load testing in accordance with BS 6180:2011 Barriers in and about buildings, to allow their balustrade system to be classified for use in accordance with the Code of Practice included within the standard.

The testing was carried out at Lucideon's facilities at Queens Road, Penkhull, Stoke on Trent.

This report summarises the test results obtained during the test programme and does not provide interpretation of those results.

2 TEST SAMPLES

The system tested was designated as follows:

- Origin-R

The system had been designed and intended to be used as the base mount for free standing balustrades. The systems and glass were installed by Pure Vista personnel.

3 TEST PROGRAMME

A horizontal line load was applied to the systems using the following glazed sections:

- 12 mm Toughened Glass;
- 15 mm Toughened Glass;
- 17.5 mm Laminated PVB Glass;
- 19 mm Toughened Glass;
- 21.5 mm Laminated PVB Glass;
- 21.5 mm Sentry Glass.

4 TEST PREPARATION

4.1 Origin-R Steel Base Fix

The channel was bolted to the top of a piece of 10 mm thick steel C-section, which was welded to an anvil which in turn was bolted to the floor of the test facility. The 1.00 m length of Origin-R channel was bolted to the steel section at 200 mm centres using 12 mm bolts set in pre drilled counter sunk holes.

The appropriate thickness glass panel was fitted into the channel using wedges at 3 per metre and spaced 200 mm from the edge with 300 mm between the wedges. The exception to this being the 19 mm Toughened Glass and 21.5 mm Sentry Glass which was installed using 4 wedges per meter, spaced at 100 mm from the edge with 200 mm between the wedges.

4.2 Origin-R Steel Side Fix

The channel was bolted to the top of a piece of 10 mm thick steel C-section, which was welded to an anvil which in turn was bolted to the floor of the test facility. The 1.00 m length of Origin-R channel was bolted to the steel section at 200 mm centres using 12 mm bolts set in pre drilled counter sunk holes.

The appropriate thickness glass panel was fitted into the channel using wedges at 3 per metre and spaced 200 mm from the edge with 300 mm between the wedges. The exception to this being the 21.5 mm Sentry Glass which was installed using 4 wedges per meter spaced at 100 mm from the edge with 200 mm between the wedges.

5 TEST METHOD

A horizontal imposed line load was applied to the glass at a height of 1200 mm above the datum level of the floor and the deflection measured at the top central point of the panel. The exception to this being the base mounted 21.5 mm sentry glass where the load was applied at 1180 mm. The load was applied via a hydraulic ram and the deflection measured using a linear voltage displacement transducer (see Plates 1).

6 RESULTS

The tests were carried out in accordance with the guidance given in BS 6180 Barriers in and about buildings – Code of Practice. The standard states that the maximum allowable deflection for a free standing glass protective barrier panel is 25 mm.

Table 2 of BS 6180 Barriers in and about buildings – Code of Practice categorises parapets, barriers and balustrades for areas of use depending on the loads they have achieved under testing.

The loads achieved by the Pure Vista systems tested under horizontal imposed line load to the maximum deflection of 25 mm are given in Tables 1 - 2. All figures quoted in the Tables contain no safety factors and are direct loads as achieved by the system under test conditions.

Tables 3 to 4 summarise the suitability of the tested systems in accordance with Table 2 of BS 6180:2011.

NOTE: The results given in this report apply only to the samples that have been tested.

END OF REPORT



TABLES

Table 1 - Summary of Performance of Pure Vista Origin-R Balustrade System Base Mounted into Steel Tested under Horizontal Imposed Line Load

Glass Span (mm)	Glass Type	Test Height (mm)	Imposed Line Load at 25 mm Deflection (kN/m)	Working Line Load for System (kN/m)	Deflection at Working Line Load for System (mm)
1000	12 mm Toughened Glass	1200	0.61	0.36	16.00
1000	15 mm Toughened Glass	1200	0.81	0.74	21.83
1000	17.5 mm Laminated PVB	1200	0.80	0.74	22.10
1000	19 mm Toughened Glass	1200	1.34	0.74	14.21
1000	21.5 mm Laminated PVB	1200	1.15	0.74	13.81
1000	21.52 mm Laminated Sentry Glass	1180	1.6	1.5	23.42

Table 2 - Summary of Performance of Pure Vista Origin-R Balustrade System Side Mounted into Steel Tested under Horizontal Imposed Line Load

Glass Span (mm)	Glass Type	Test Height (mm)	Imposed Line Load at 25 mm Deflection (kN/m)	Working Line Load for System (kN/m)	Deflection at Working Line Load for System (mm)
1000	12 mm Toughened Glass	1200	0.57	0.36	16.58
1000	15 mm Toughened Glass	1200	0.96	0.74	19.01
1000	17.5 mm Laminated PVB	1200	1.05	0.74	16.24
1000	21.5 mm Laminated PVB	1200	1.35	0.74	10.89
1000	21.52 mm Laminated Sentry Glass	1200	1.51	1.5	24.99

Table 3 - Summary of Suitability of Pure Vista Origin-R System Base Mounted into Steel in Accordance with Table 2 of BS 6180:2011

Type of Occupancy for Part of the Building	Examples of Specific Use	Horizontal Uniformly Distributed Line Load (kN/m)	Origin-R Base Mounted					
			12 mm Toughened	15 mm Toughened	17.5 mm PVB	19 mm Toughened	21.5 mm PVB	21.5 mm Sentry
Domestic and residential activities	(i) all areas within or serving exclusively one single family dwelling including stairs, landings, etc. but excluding external balconies and edges of roofs	0.36	✓	✓	✓	✓	✓	✓
	(ii) other residential, i.e. houses of multiple occupancy and balconies, including Juliette balconies and edges of roofs in single family dwellings	0.74	X	✓	✓	✓	✓	✓
Offices and work areas not included elsewhere, including storage areas	(iii) light access stairs and gangways not more than 600 mm wide	0.22	✓	✓	✓	✓	✓	✓
	(iv) light pedestrian traffic routes in industrial and storage buildings except designated escape routes	0.36	✓	✓	✓	✓	✓	✓
	(v) areas not susceptible to overcrowding in office and institutional buildings, also industrial and storage buildings except as given above	0.74	X	✓	✓	✓	✓	✓
Areas where people might congregate	(vi) areas having fixed seating within 530 mm of the barrier, balustrade or parapet	1.50	X	X	X	X	X	✓
Areas with tables or fixed seating	(vii) restaurants and bars	1.50	X	X	X	X	X	✓
Areas without obstacles for moving people and not	(viii) stairs, landings corridors ramps	0.74	X	✓	✓	✓	✓	✓
	(ix) external balconies including Juliette balconies and edges of roofs; footways and pavements within building cartilage	0.74	X	✓	✓	✓	✓	✓



Type of Occupancy for Part of the Building	Examples of Specific Use	Horizontal Uniformly Distributed Line Load (kN/m)	Origin-R Base Mounted					
			12 mm Toughened	15 mm Toughened	17.5 mm PVB	19 mm Toughened	21.5 mm PVB	21.5 mm Sentry
susceptible to overcrowding	adjacent to basement/sunken areas							
Areas susceptible to overcrowding	(x) footways or pavements less than 3 m wide adjacent to sunken areas	1.50	X	X	X	X	X	✓
	(xi) theatres, cinemas, discotheques, bars, auditoria, shopping malls, assembly areas, studios; footways or pavements greater than 3 m wide adjacent to sunken areas	3.00	X	X	X	X	X	X
	(xii) grandstands and stadia	(Note 1)	-	-	-	-	-	-
Retail areas	(xiii) all retail areas including public areas of banks/building societies or betting shops	1.50	X	X	X	X	X	✓
Vehicular	(xiv) pedestrian areas in car parks, including stairs, landings, ramps, edges of internal floors, footways, edges of roofs	1.50 (Note 2)	X	X	X	X	X	✓
	(xv) horizontal loads imposed by vehicles	(Note 2)	-	-	-	-	-	-

Table 4 - Summary of Suitability of Pure Vista Origin-R System Side Mounted into Steel in Accordance with Table 2 of BS 6180:2011

Type of Occupancy for Part of the Building	Examples of Specific Use	Horizontal Uniformly Distributed Line Load (kN/m)	Origin-R Side Mounted				
			12 mm Toughened	15 mm Toughened	17.5 mm PVB	21.5 mm PVB	25 mm Sentry
Domestic and residential activities	(i) all areas within or serving exclusively one single family dwelling including stairs, landings, etc. but excluding external balconies and edges of roofs	0.36	✓	✓	✓	✓	✓
	(ii) other residential, i.e. houses of multiple occupancy and balconies, including Juliette balconies and edges of roofs in single family dwellings	0.74	X	✓	✓	✓	✓
Offices and work areas not included elsewhere, including storage areas	(iii) light access stairs and gangways not more than 600 mm wide	0.22	✓	✓	✓	✓	✓
	(iv) light pedestrian traffic routes in industrial and storage buildings except designated escape routes	0.36	✓	✓	✓	✓	✓
	(v) areas not susceptible to overcrowding in office and institutional buildings, also industrial and storage buildings except as given above	0.74	X	✓	✓	✓	✓
Areas where people might congregate	(vi) areas having fixed seating within 530 mm of the barrier, balustrade or parapet	1.50	X	X	X	X	✓
Areas with tables or fixed seating	(vii) restaurants and bars	1.50	X	X	X	X	✓
Areas without obstacles for moving people and not susceptible to overcrowding	(viii) stairs, landings corridors ramps	0.74	X	✓	✓	✓	✓
	(ix) external balconies including Juliette balconies and edges of roofs; footways and pavements within building cartilage adjacent to basement/sunken areas	0.74	X	✓	✓	✓	✓



Type of Occupancy for Part of the Building	Examples of Specific Use	Horizontal Uniformly Distributed Line Load (kN/m)	Origin-R Side Mounted				
			12 mm Toughened	15 mm Toughened	17.5 mm PVB	21.5 mm PVB	25 mm Sentry
Areas susceptible to overcrowding	(x) footways or pavements less than 3 m wide adjacent to sunken areas	1.50	X	X	X	X	✓
	(xi) theatres, cinemas, discotheques, bars, auditoria, shopping malls, assembly areas, studios; footways or pavements greater than 3 m wide adjacent to sunken areas	3.00	X	X	X	X	X
	(xii) grandstands and stadia	(Note 1)	-	-	-	-	-
Retail areas	(xiii) all retail areas including public areas of banks/building societies or betting shops	1.50	X	X	X	X	✓
Vehicular	(xiv) pedestrian areas in car parks, including stairs, landings, ramps, edges of internal floors, footways, edges of roofs	1.50 (Note 2)	X	X	X	X	✓
	(xv) horizontal loads imposed by vehicles	(Note 2)	-	-	-	-	-

PLATE



Plate 1 – Generic Test Configuration



Chart 1 - Load Deflection Curve for Uniformly Distributed Line Load of Pure Vista Origin-R Base Mounted into Steel

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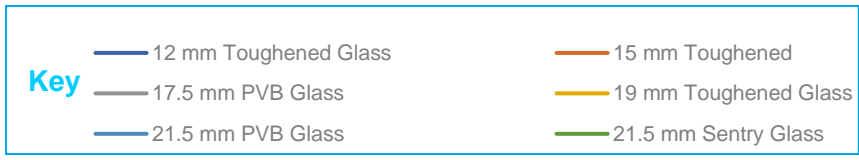
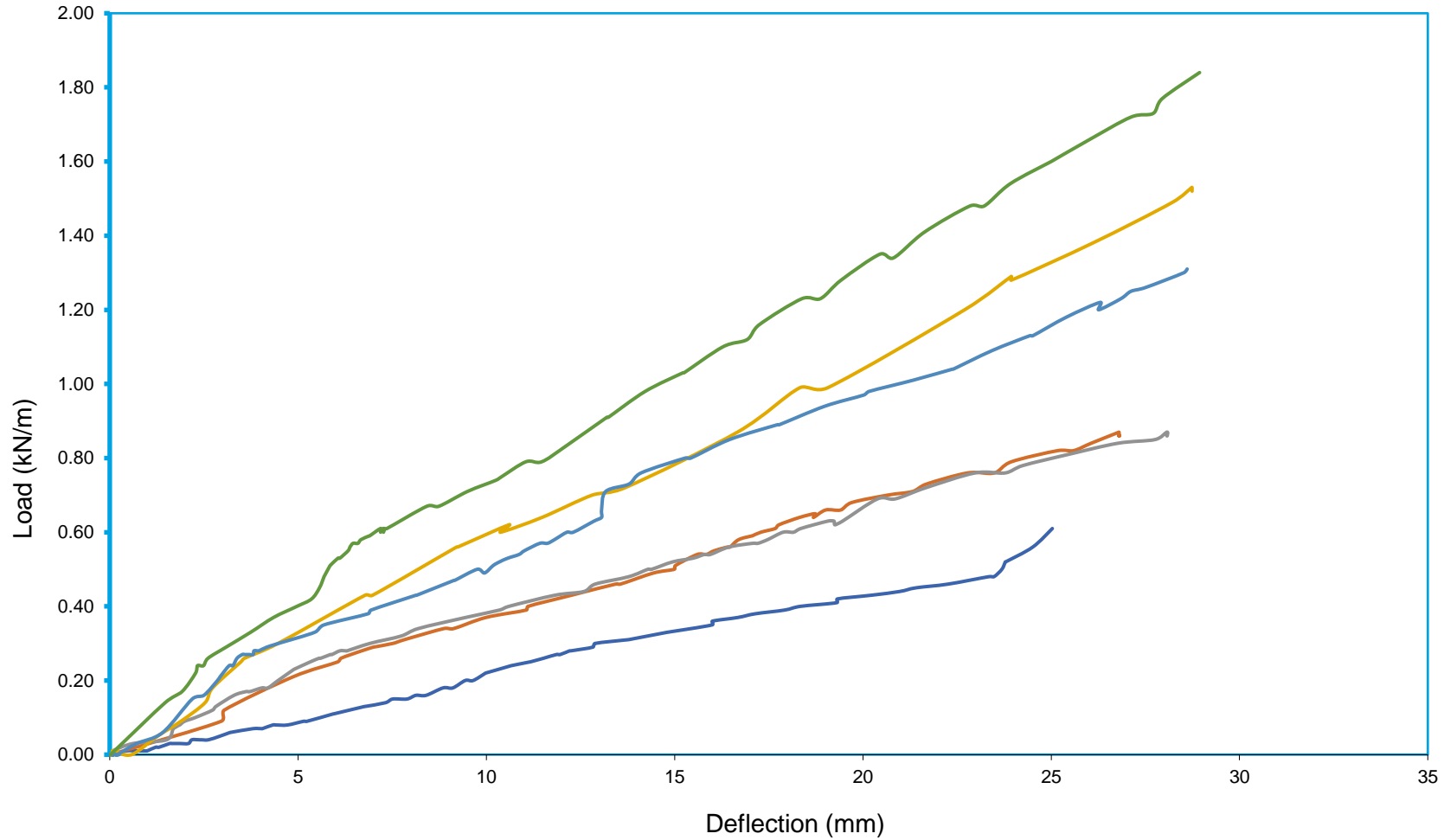




Chart 2 - Load Deflection Curve for Uniformly Distributed Line Load of Pure Vista Origin-R Side Mounted into Steel

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