

## TEST REPORT

**Lucideon Reference:** 194078 (QT57040/1/JB)/Ref. 1/CR1

**Project Title:** Balustrade Testing of FH Brundle's Marano Bolt Down System in Accordance with BS 6180 & UNI 10806

**Client:** FH Brundle  
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**For the Attention of:** Mr Danny Hull

**Author(s):** Mr Justin Fryer

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**Purchase Order No.:** 613665

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**Work Location:** Lucideon UK

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This report supersedes the report issued on 21.11.19.



Miss Joanne Booth  
**Testing Team**  
**Reviewer**



Mr Justin Fryer  
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## 1 INTRODUCTION

FH Brundle design and manufacture Marano Bolt Down Post Balustrade Systems to be used as architectural features in new and existing buildings.

As part of their product development, they required a programme of testing to determine their products performance in accordance with British and European standards.

All tests were to be carried out to BS 6180:2011 Barriers in and about Buildings and UNI 10806 (Italian).

## 2 TEST ARRANGEMENT

1 No. concrete block of dimensions 2000 mm x 700 mm x 500 mm was fastened to the laboratory strong-floor.

The Marano Bolt Down Posts were attached to the top surface of said concrete block by way of fixings as highlighted in Appendix A per manufacturer's instructions and by a representative of FH Brundle, at 1200 mm centres.

2 No. glass thicknesses were tested, in turn, 10 mm toughened and 10.8 mm laminate.

## 3 TEST METHOD

A hardwood spreader beam was placed at a distance of 1100 mm from the finished floor height, to simulate a uniformly distributed line load.

A reaction frame consisting of 2 No. steel stanchions and a steel cross-member was fastened to the laboratory strong-floor, such that a ram could be clamped to the steel cross member, at the same height as the hardwood spreader.

A calibrated load cell was attached to the hydraulic ram by way of a steel cage, to measure the load during testing.

A calibrated Linear Voltage Displacement Transducer (LVDT) to measure the deflection, was attached to the opposite side of the glass panel as the load was applied in the centre width of the panel, at 1100 mm from the finished floor height.

For BS 6180 a load was steadily applied up to each loading increment or until a deflection of 25 mm was reached, as highlighted within BS 6180. The load at the last increment was then recorded.

For the UNI 10806 (Italy), the line load was increased to a load per metre, as denoted by a representative from FH Brundle. This was generally taken as  $2 \text{ kNm}^{-1}$ , unless otherwise stated due to the deflections found during testing.

Photographs can be seen in the Plates Section.

## 4 RESULTS

**Table 1 – BS 6180 Results**

Type of Occupancy for Part of the Building	Examples of Specific Use	Horizontal Uniformly Distributed Line Load (kN/m)	10 mm Toughened Glass	10.8 mm Laminated Glass
Domestic & residential activities	(i) All areas within or serving exclusively one single family dwelling, including stairs, landings, etc., but excluding external balconies & edges of roofs	0.36	✓	✓
	(ii) Other residential, i.e. houses of multiple occupancy & balconies, including Juliette balconies & edges of roofs in single family dwellings	0.74	✓	✓
Offices & work areas, not Included elsewhere, including storage areas	(iii) Light access stairs & gangways, not more than 600 mm wide	0.22	✓	✓
	(iv) Light pedestrian traffic routes in industrial & storage buildings, except designated escape routes	0.36	✓	✓
	(v) Areas not susceptible to overcrowding in office & institutional buildings, also industrial & storage buildings, except as given above	0.74	✓	✓
Areas where people might congregate	(vi) Areas having fixed seating within 530 mm of the barrier, balustrade or parapet	1.50	x	x
Areas with tables or fixed seating	(vii) Restaurants & bars	1.50	x	x
Areas without obstacles for moving people and not susceptible to overcrowding	(viii) Stairs, landings corridors ramps	0.74	✓	✓
	(ix) External balconies, including Juliette balconies & edges of roofs; footways & pavements within building cartilage adjacent to basement/sunken areas	0.74	✓	✓
Areas susceptible to overcrowding	(x) Footways or pavements less than 3 m wide adjacent to sunken areas	1.50	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
	(xii) Grandstands & stadia	(Note 1)		

Type of Occupancy for Part of the Building	Examples of Specific Use	Horizontal Uniformly Distributed Line Load (kN/m)	10 mm Toughened Glass	10.8 mm Laminated Glass
Retail areas	(xiii) All retail areas, including public areas of banks/building societies or betting shops	1.50	x	x
Vehicular	(xiv) Pedestrian areas in car parks, including stairs, landings, ramps, edges of internal floors, footways, edges of roofs	(Note 2)	x	x
	(xv) Horizontal loads imposed by vehicles	(Note 2)	x	x

**Table 2 - UNI 10806 (Italy) Results (3 Glass Clamps)**

Glass Thickness	Load (kNm <sup>-1</sup> )	Deflection (mm)
10.8 mm PVB	1.3	50.97

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

**END OF REPORT**

## PLATE

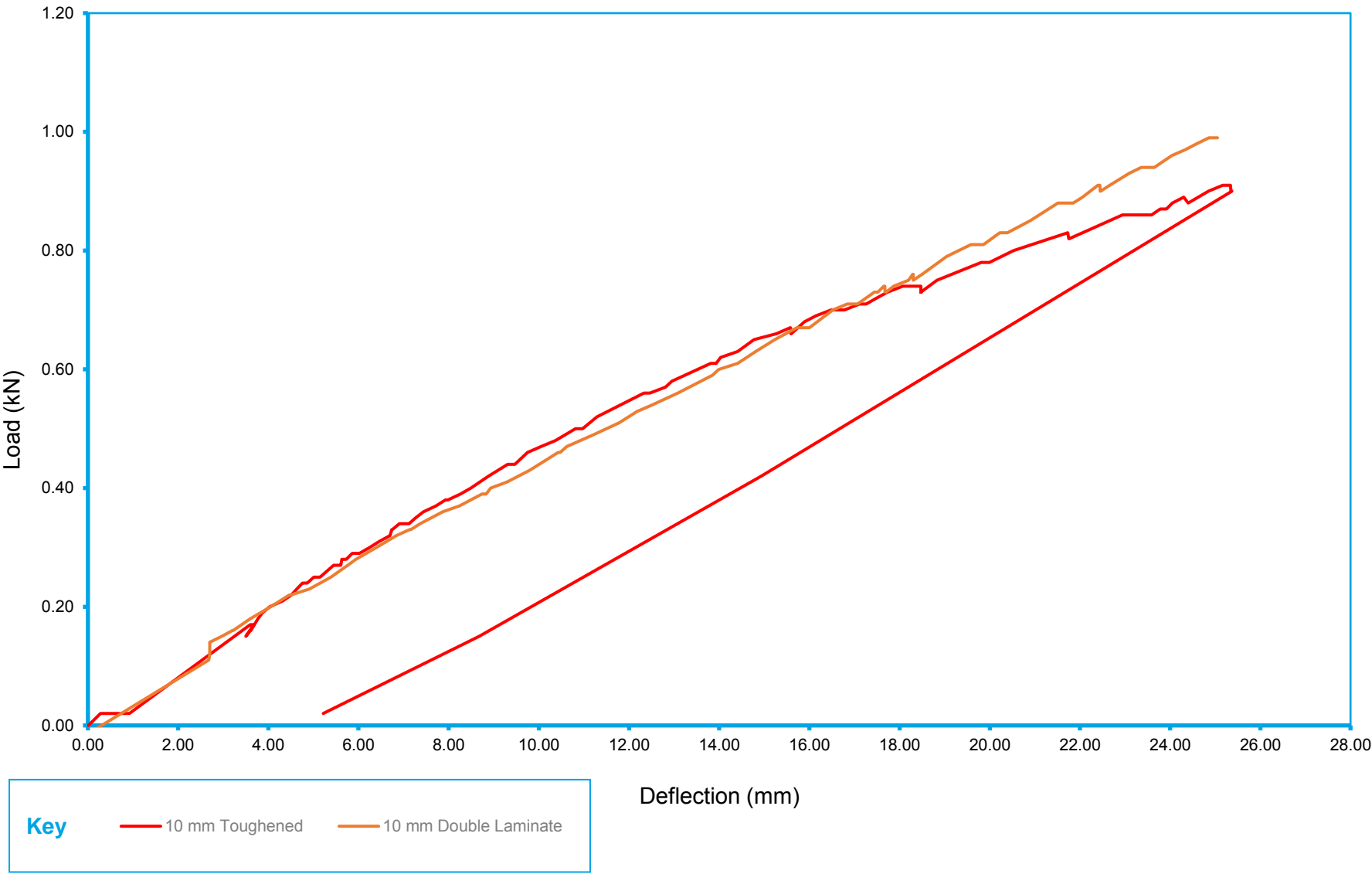


**Plate 1** - Typical Test Set-Up UDL

**Chart 1 - Load Deflection Curves for BS 6180 Balustrade Testing of FH Brundles Marano Round with Various Glass Types**



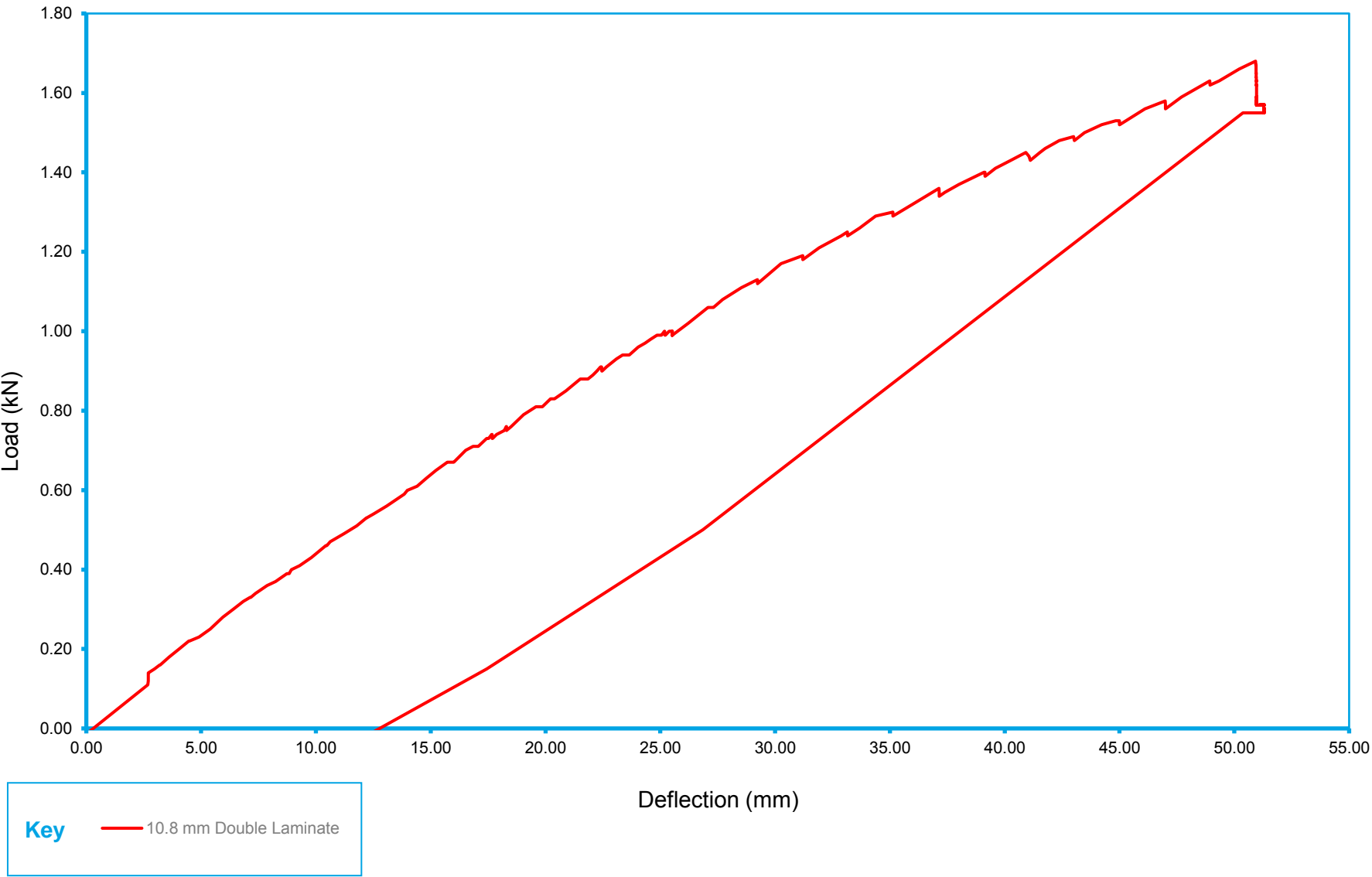
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**Chart 2 - Load Deflection Curve for UNI 10806 Load Testing of FH Brundles Marano Round with 10.8 mm Double Laminated Glass**



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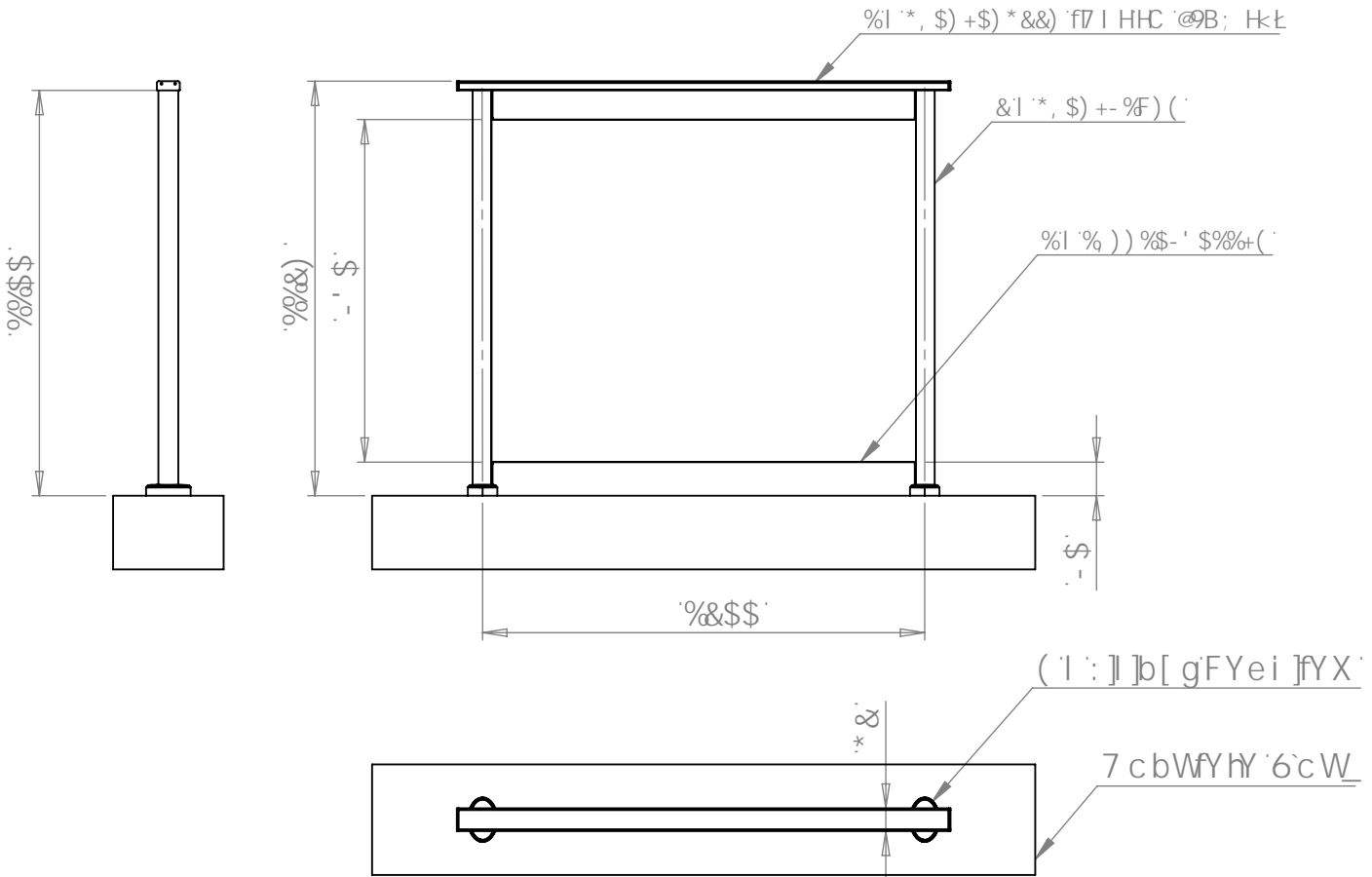
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