TEST REPORT

Lucideon Reference:	194419 (QT-57353/1/AS)/Ref. 1
Project Title:	Testing of Godfrey Ellis Associates Balustrade MOD 46 System in Accordance with BS 6180:2011
Client:	Godfrey Ellis Associates Ltd 26 Silver Birch Close Lostock Bolton Lancashire BL6 4GF
For the Attention of:	Mr David Godfrey
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1 INTRODUCTION

Lucideon Limited were commissioned by the client, Godfrey Ellis Associates 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:

Godfrey Ellis Associates Balustrades MOD 46.

Drawings detailing the system can be found in the Appendix of this report.

3 TEST PROGRAMME

3.1 Line Load

A horizontal line load was applied to the following systems incorporating Toughened Laminated glazed sections of the following type:

- MOD 46 1000 mm span with a glazed 12 mm clear toughened panel 1100 mm x 1000 mm x 12 mm (h x l x w).
- MOD 46 1000 mm span with a glazed 15 mm clear toughened panel 1100 mm x 1000 mm x 15 mm (h x l x w).
- MOD 46 1000 mm span with a glazed 17.5 mm PVB laminated panel 1270 mm x 1330 mm x 17.5 mm (h x l x w).

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 Godfrey Ellis Associates personnel.

4 TEST PREPARATION

The channel was bolted to the top of a concrete block, which was fixed to the floor of the test facility.

The 1000 mm length of channel was bolted to the block using 12 mm counter sunk rawl bolts referenced as Fischer FH II 12/25 SK. The bolts were installed at 250 mm

centres with the first bolt installed 250 mm from the end. The glass panel was inserted into the channel and adjustable mechanical grips with plastic wedges were installed at 4 wedges per 1000 mm length of channel and spaced at 250 mm centres. The wedges were tightened to hold the glass panel in position. The exception to this was the 15 mm toughened glass where 5 wedges per meter were installed.

5 TEST METHOD

A horizontal imposed line load was applied to the system at a height of 1100 mm above the datum level of the floor and the deflection measured at the horizontal centre point of the panel directly behind the load application point. The load was applied via a hydraulic ram and the deflection continuously measured using a linear voltage displacement transducer. On reaching 25 mm deflection the load was released and the residual deflection noted.

In all tests the load was measured using a calibrated load cell and the data recorded using a calibrated Delphin data logger.

The general test configurations can be found in Plate 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 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 Godfrey Ellis Associates systems tested under horizontal imposed line load to the maximum deflection of 25 mm are given in Tables 1. All figures quoted in the Tables contain no safety factors and are direct loads as achieved by the system under test conditions.

Table 2 summarises the suitability of the tested systems in accordance with Table 2 of BS 6180:2011.

TABLES

Table 1 - Summary of Performance of Godfrey Ellis Associates Balustrade Systems Tested under Horizontal Imposed Line Load

Balustrade Type	Panel 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)	Residual Deflection
MOD 46	12 mm Toughened	1100	0.61	0.36	7.86	1.76
	15 mm Toughened (5 Grips)	1100	0.83	0.74	17.87	2.70
	17.5 mm PVB	1100	0.86	0.74	19.66	1.15

Table 2 - Summary of Suitability of Godfrey Ellis Associates Balustrade MOD 46 System under Line Load in Accordance with Table 2 of BS 6180:2011

Type of Occupancy for Part of the Building	Examples of Specific Use	Horizontal Distributed Line Load (kN/m)	12 mm Toughened Glass	15 mm Toughened Glass	17.5 mm PVB Glass
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	✓	✓

Type of Occupancy for Part of the Building	Examples of Specific Use	Horizontal Distributed Line Load (kN/m)	12 mm Toughened Glass	15 mm Toughened Glass	17.5 mm PVB Glass
Areas where people might congregate	(vi) areas having fixed seating within 530 mm of the barrier, balustrade or parapet	1.50	x	x	x
Areas with tables or fixed seating	(vii) restaurants and bars	1.50	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	✓	✓
Areas susceptible to overcrowding	(x) footways or pavements less than 3 m wide adjacent to sunken areas	1.50	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
	(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
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
	(xv) horizontal loads imposed by vehicles	(Note 2)	-	-	-

Note 1 – See requirements of the appropriate certifying authority
Note 2 – Clause 8.1.1 of BS 6180:2011 states that “glass should not be used for vehicle protection barriers”

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

END OF REPORT

PLATES

Plate 1 - General Test Configuration Line Load

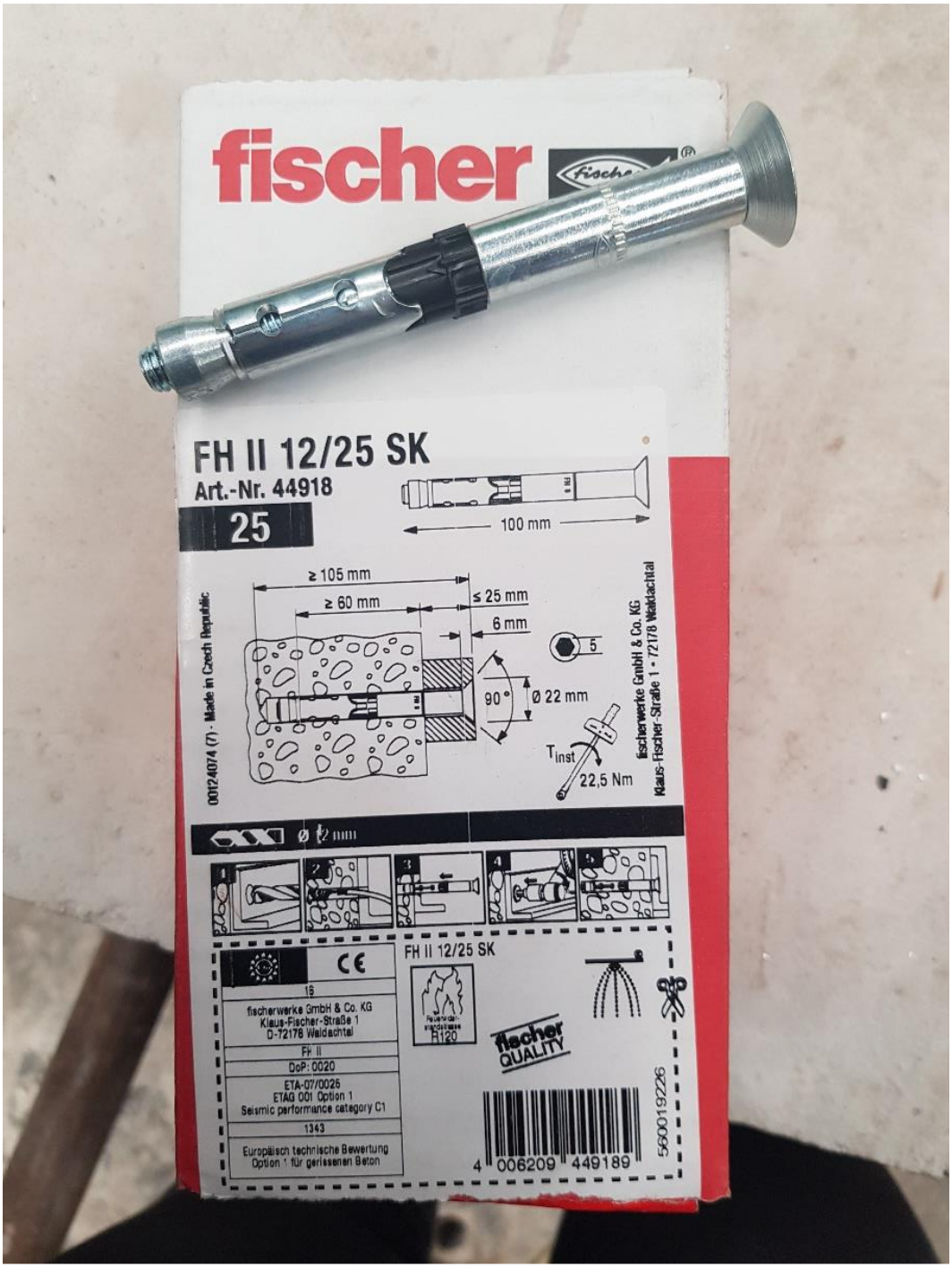

Plate 2 – Channel Fixings

Plate 3 – Mechanical Grips and Wedges

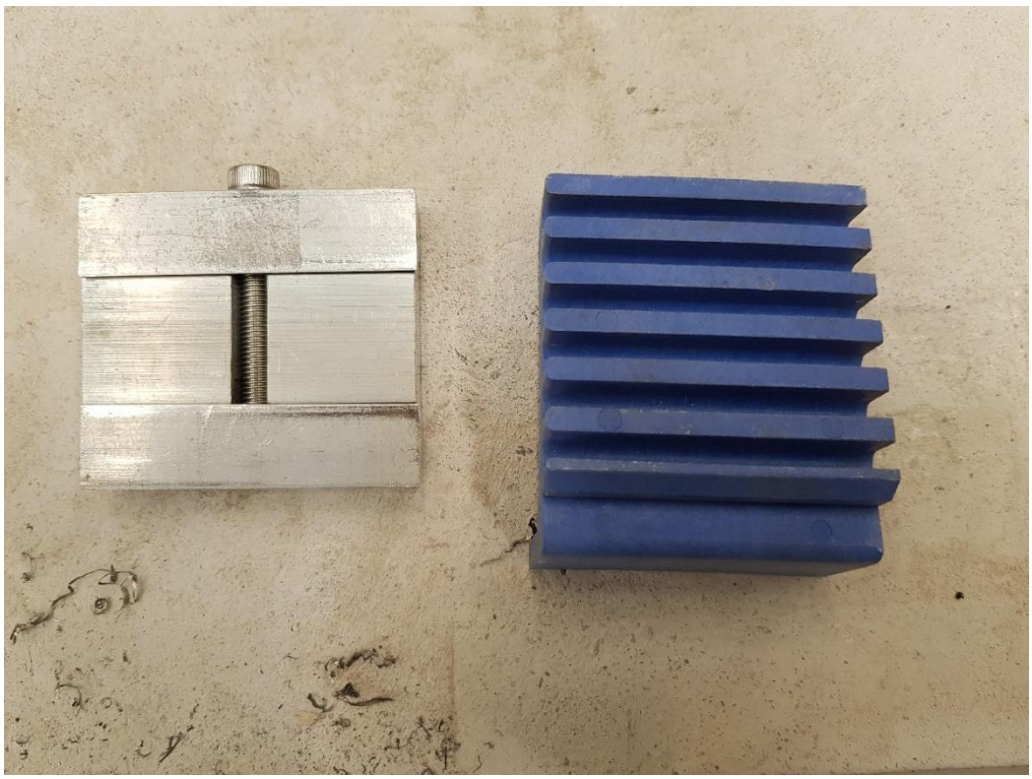

Plate 4 – Mechanical Grips and Wedges

Chart 1 - Load Deflection Curve for Godfrey Ellis Associates MOD 46 Channel - Line Load at 1100 mm

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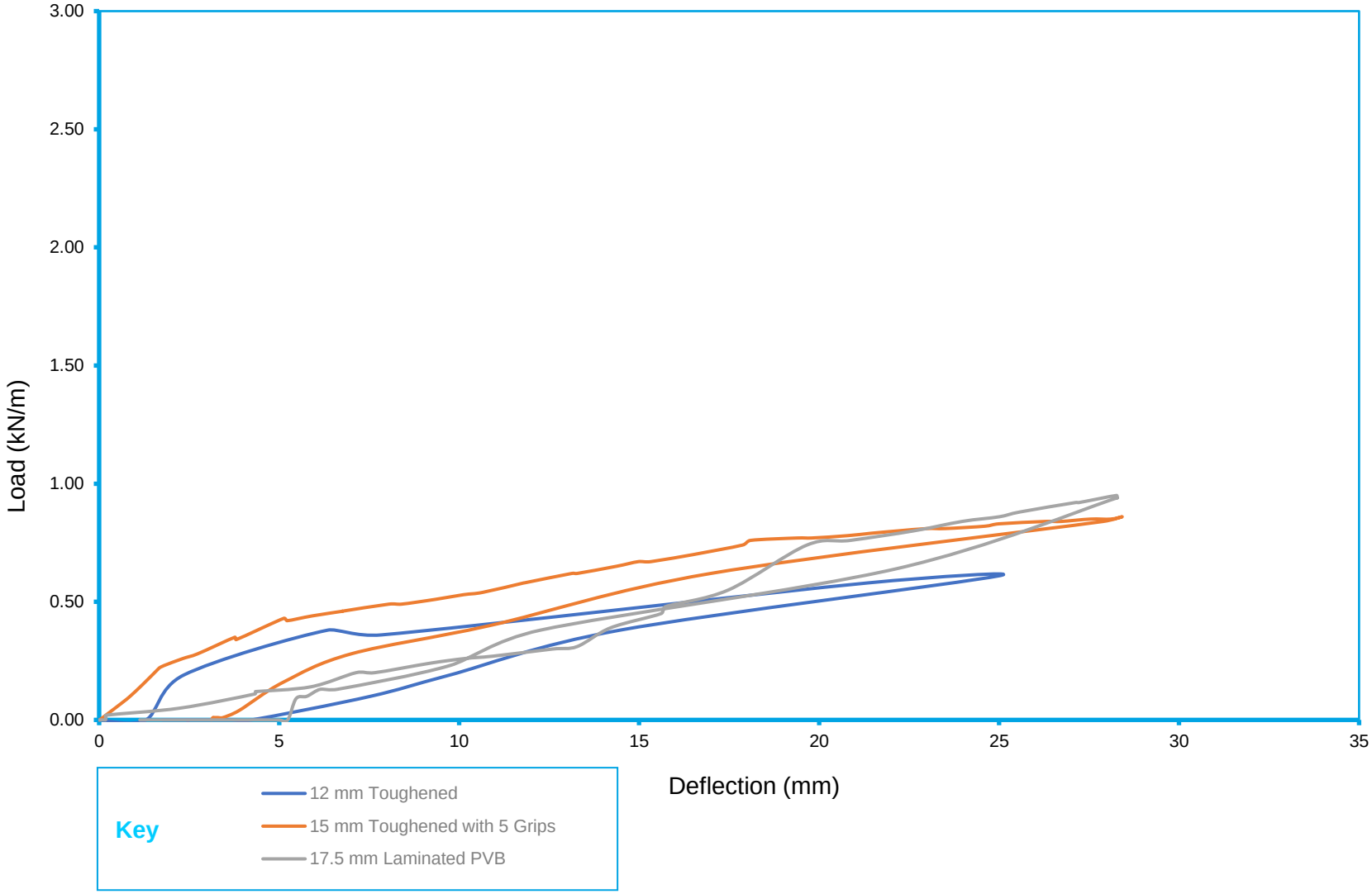
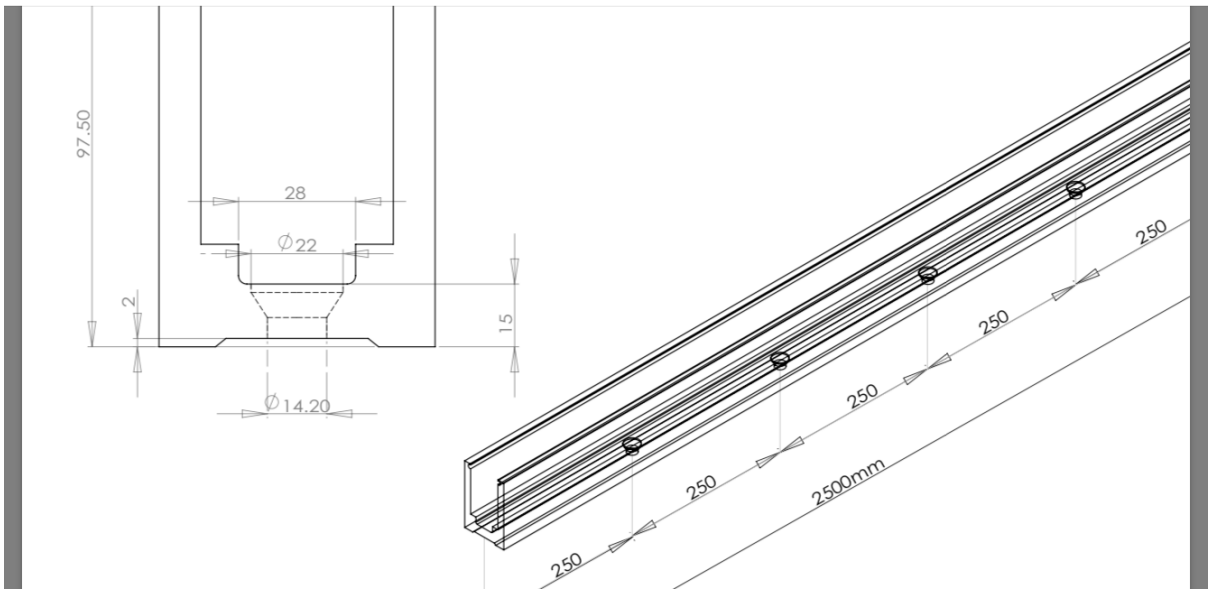


APPENDIX A - Clients Drawings



MOD 46 Channel