

TEST REPORT

Lucideon Reference: 17716 (QT43782/1/SL(JPS))/Ref. 1/CR1

Project Title: Load Testing of Louvre Windows in Accordance with BS 6180:2011

Client: Fieger Lamellenfenster Gmbh
Auf der Ave 10
69488 Birkenau
Germany

For the Attention of: Mr Lindsay Eccles

Author(s): Miss Lisa Cobden

Report Date: 28 March, 2017

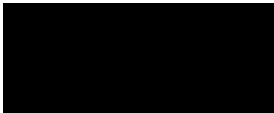
Purchase Order No.: None

Work Location: Lucideon UK

This report supersedes the report issued on 27.03.17.



Miss Joanne Booth
Consultancy Team
Reviewer



Miss Lisa Cobden
Consultancy Team
Project Manager



CONTENTS

	Page
1 INTRODUCTION	3
2 TEST SAMPLES	3
3 TEST PROGRAMME	3
4 TEST METHOD	3
5 RESULTS	4
TABLES	5-8
PLATES	9-11
CHARTS	12-14
APPENDIX A - Figures	

1 INTRODUCTION

Lucideon were commissioned by the client, Fieger Louvre Windows, to carry out load testing in accordance with BS 6180:2011 Barriers in and about buildings, to allow their Louvre Windows to be classified for use in accordance with Barriers in and about buildings – Code of Practice.

The testing was carried out at Lucideon's test 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 systems tested were designated as Fieger Louvre Windows FLM PG 12 Single Glaze, FLW32 Double Glazed and FLW40 Triple Glazed. The systems are shown in Figures 1-3.

3 TEST PROGRAMME

A horizontal line load, a uniformly distributed load and a point load were carried out on the Fieger Louvre Windows Systems with the following configurations:

1 No. FLM PG 12 Single Glazed unit (h x w) 1550 mm x 1200 mm.

1 No. FLW32_25 Double Glazed unit (h x w) 1600 mm x 1200 mm.

1 No. FLW40_25 Triple Glazed unit (h x w) 1750 mm x 1200 mm.

Dimensions for the individual systems can be found in Figures 1-3.

4 TEST METHOD

Two steel stanchions set at 1200mm centres were bolted to the floor of the test facility. The louvre windows were fixed back to the stations using 6No.clamps. A reaction frame incorporating a hydraulic ram and load cell were positioned to the front of the window.

A horizontal imposed line load was applied to the glass at a height of 1100 mm above the datum level of the floor. The deflection was measured at the top central point 1100 mm above the datum level of the floor. The load was applied via a hydraulic ram and the deflection measured using a digital electronic displacement transducer (see Plate 1).

A point load was applied to the centre point of the louvre 1100 mm above the datum level of the floor, the standard deems that the point load should be applied at the position likely to cause most deflection and the centre point of the louvre was deemed be the worst case scenario. The load was applied via a hydraulic ram and 50 mm by 50 mm spreader plate with deflection measured using a linear voltage displacement transducer.

A UDL was applied to the louvre window by means of a 1112 mm x 1100 mm panel. The load was applied via a hydraulic ram with deflection measured using a linear voltage displacement transducer.

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

5 RESULTS

The test was 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 Fieger Louvre Windows systems tested under horizontal imposed line load to the maximum deflection of 25 mm are given in Table 1.

The loads achieved by the Fieger Louvre Windows systems tested under uniformly distributed load to the maximum deflection of 25 mm are given in Table 2.

The loads achieved by the Fieger Louvre Windows systems tested under point load to the maximum deflection of 25 mm are given in Table 3.

All figures quoted in Tables 1-3 contain no safety factors and are direct loads as achieved by the system under test conditions.

Table 4-6 summarises 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

Table 1 - Summary of Performance of Fieger Louvre Window Systems
Tested under Horizontal Imposed Line Load

System	Unit Code	Glass	Height of Applied Load mm	Working Line Load for System (kN/m)	Deflection at Working Line Load for System (mm)
Fieger Louvre Windows	FLM PG 12	Single Glazed	1100	3.00	10.82
	FLW32_25	Double Glazed	1100	3.00	14.00
	FLW40_25	Triple Glazed	1100	3.00	7.80

Table 2 - Summary of Performance of Fieger Louvre Window Systems
Tested under Uniformly Distributed Load

System	Unit Code	Glass	Working UDL for System (kN/m ²)	Deflection at Working Line Load for System (mm)
Fieger Louvre Windows	FLM PG 12	Single Glazed	1.50	3.30
	FLW32_25	Double Glazed	1.50	0.47
	FLW40_25	Triple Glazed	1.50	0.74

Table 3 - Summary of Performance of Fieger Louvre Window Systems
Tested under Point Load

System	Unit Code	Glass	Imposed Point Load at 25 mm Deflection (kN)	Working Point Load for System (kN)	Deflection at Working Point Load for System (mm)
Fieger Louvre Windows	FLM PG 12	Single Glazed	2.56	1.50	16.37
	FLW32_25	Double Glazed	3.73	1.50	9.48
	FLW40_25	Triple Glazed	5.00*	1.50	4.40

*Test stopped at 5 kN with a deflection of 15.3 mm recorded

Table 4 - Summary of Suitability of Fieger Louvre Windows Systems fitted Horizontal Line Load in Accordance with Table 2 of BS 6180:2011

Type of Occupancy for Part of the Building	Examples of Specific Use	Horizontal Line Load (kN/m)	FLM PG 12	FLW32_25	FLW40_25
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	✓	✓	✓
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	✓	✓	✓
Areas where people might congregate	(vi) areas having fixed seating within 530 mm of the barrier, balustrade or parapet	1.50	✓	✓	✓
Areas with tables or fixed seating	(vii) restaurants and bars	1.50	✓	✓	✓
Areas without obstacles for moving people and not susceptible to overcrowding	(viii) stairs, landings corridors ramps	0.74	✓	✓	✓
	(ix) external balconies including Juliette balconies and edges of roofs; footways and 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	✓	✓	✓
	(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	✓	✓	✓
	(xii) grandstands and stadia	(Note 1)	-	-	-
Retail areas	(xiii) all retail areas including public areas of banks/building societies or betting shops	1.50	✓	✓	✓
Vehicular	(xiv) pedestrian areas in car parks, including stairs, landings, ramps, edges of internal floors, footways, edges of roofs	1.50 (Note 2)	✓	✓	✓
	(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”

Table 5 - Summary of Suitability of Fieger Louvre Windows Systems Uniformly Distributed Load in Accordance with Table 2 of BS 6180:2011

Type of Occupancy for Part of the Building	Examples of Specific Use	Horizontal UDL (kN/m ²)	FLM PG 12	FLW32_25	FLW40_25
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	0.50	✓	✓	✓
	(ii) other residential, i.e. houses of multiple occupancy and balconies, including Juliette balconies and edges of roofs in single family dwellings	1.00	✓	✓	✓
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	0.50	✓	✓	✓
	(v) areas not susceptible to overcrowding in office and institutional buildings, also industrial and storage buildings except as given above	1.00	✓	✓	✓
Areas where people might congregate	(vi) areas having fixed seating within 530 mm of the barrier, balustrade or parapet	1.50	✓	✓	✓
Areas with tables or fixed seating	(vii) restaurants and bars	1.50	✓	✓	✓
Areas without obstacles for moving people and not susceptible to overcrowding	(viii) stairs, landings corridors ramps	1.00	✓	✓	✓
	(ix) external balconies including Juliette balconies and edges of roofs; footways and pavements within building cartilage adjacent to basement/sunken areas	1.00	✓	✓	✓
Areas susceptible to overcrowding	(x) footways or pavements less than 3 m wide adjacent to sunken areas	1.50	✓	✓	✓
	(xi) theatres, cinemas, discotheques, bars, auditoria, shopping malls, assembly areas, studios; footways or pavements greater than 3 m wide adjacent to sunken areas	1.50	✓	✓	✓
	(xii) grandstands and stadia	(Note 1)	-	-	-
Retail areas	(xiii) all retail areas including public areas of banks/building societies or betting shops	1.50	✓	✓	✓
Vehicular	(xiv) pedestrian areas in car parks, including stairs, landings, ramps, edges of internal floors, footways, edges of roofs	1.50 (Note 2)	✓	✓	✓
	(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”

Table 6 - Summary of Suitability of Fieger Louvre Windows Systems Point Load in Accordance with Table 2 of BS 6180:2011

Type of Occupancy for Part of the Building	Examples of Specific Use	Point Load (kN)	FLM PG 12	FLW32_25	FLW40_25
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	0.25	✓	✓	✓
	(ii) other residential, i.e. houses of multiple occupancy and balconies, including Juliette balconies and edges of roofs in single family dwellings	0.50	✓	✓	✓
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	0.25	✓	✓	✓
	(v) areas not susceptible to overcrowding in office and institutional buildings, also industrial and storage buildings except as given above	0.50	✓	✓	✓
Areas where people might congregate	(vi) areas having fixed seating within 530 mm of the barrier, balustrade or parapet	1.50	✓	✓	✓
Areas with tables or fixed seating	(vii) restaurants and bars	1.50	✓	✓	✓
Areas without obstacles for moving people and not susceptible to overcrowding	(viii) stairs, landings corridors ramps	0.50	✓	✓	✓
	(ix) external balconies including Juliette balconies and edges of roofs; footways and pavements within building cartilage adjacent to basement/sunken areas	0.50	✓	✓	✓
Areas susceptible to overcrowding	(x) footways or pavements less than 3 m wide adjacent to sunken areas	1.50	✓	✓	✓
	(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	✓	✓
	(xii) grandstands and stadia	(Note 1)	-	-	-
Retail areas	(xiii) all retail areas including public areas of banks/building societies or betting shops	1.50	✓	✓	✓
Vehicular	(xiv) pedestrian areas in car parks, including stairs, landings, ramps, edges of internal floors, footways, edges of roofs	1.50	✓	✓	✓
	(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”

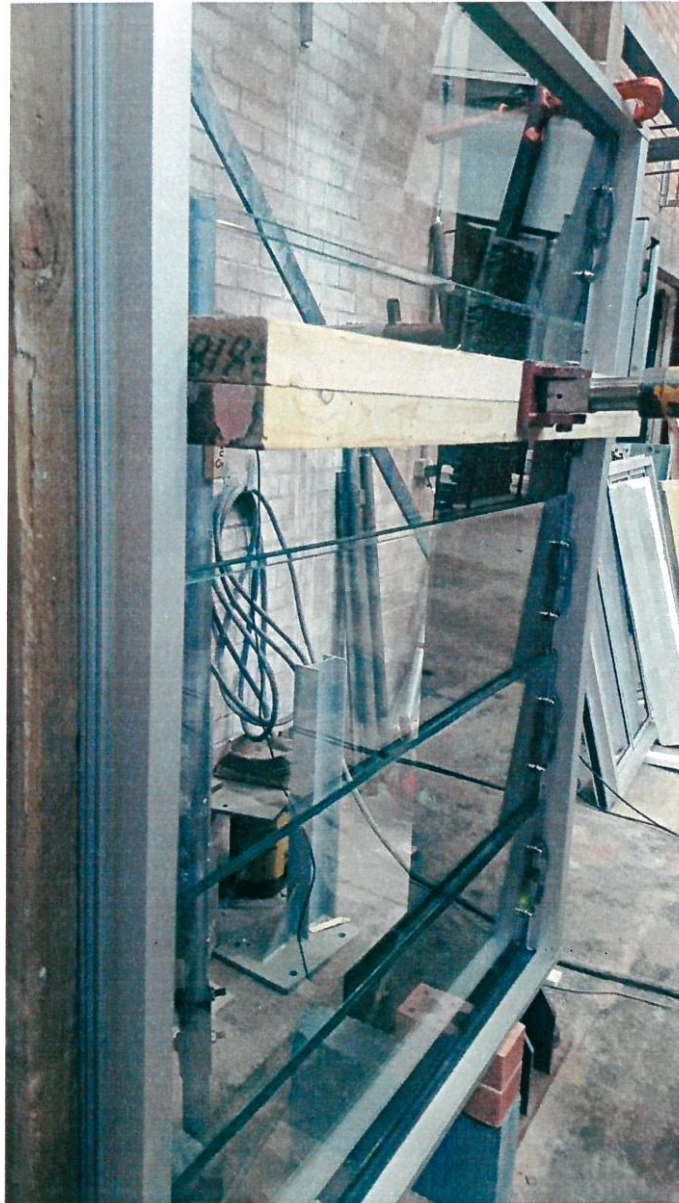


Plate 1 - Generic Test Arrangement Horizontal Line Load

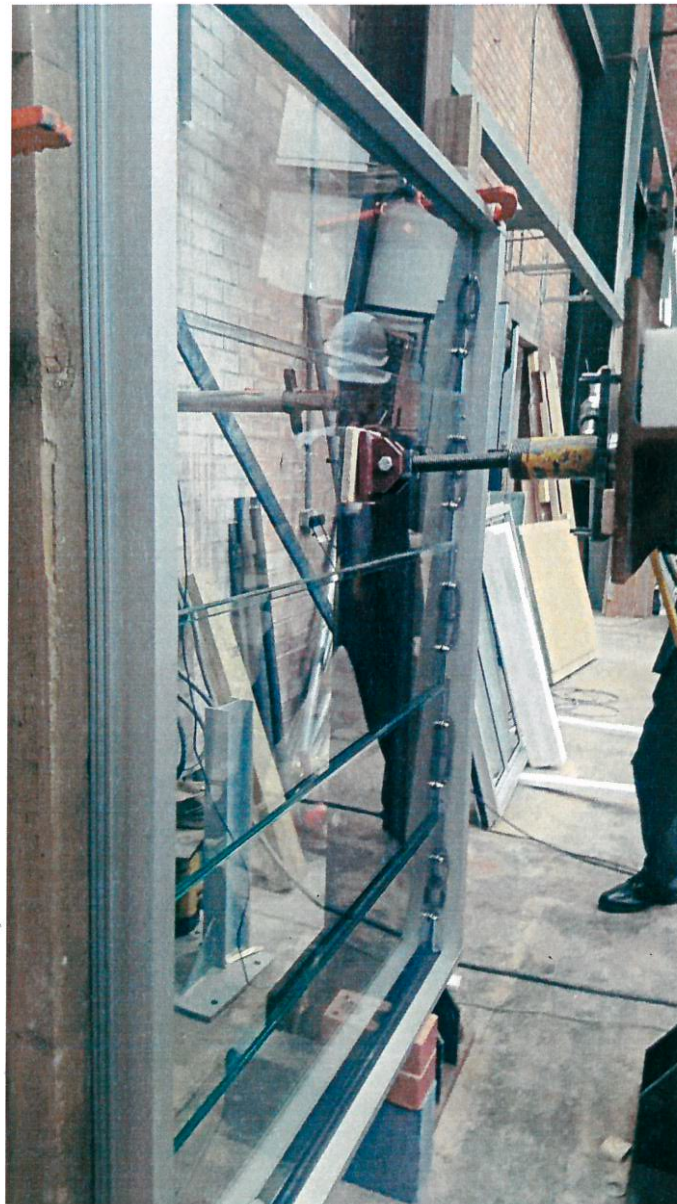


Plate 2 - Generic Test Arrangement Point Load



Plate 3 - Generic Test Arrangement Uniformly Distributed Load



Chart 1 - Load Versus Deflection Curves Fieger Louvre Window Systems (Horizontal Line Load)

Test Report: 17716/Ref. 1/CR1

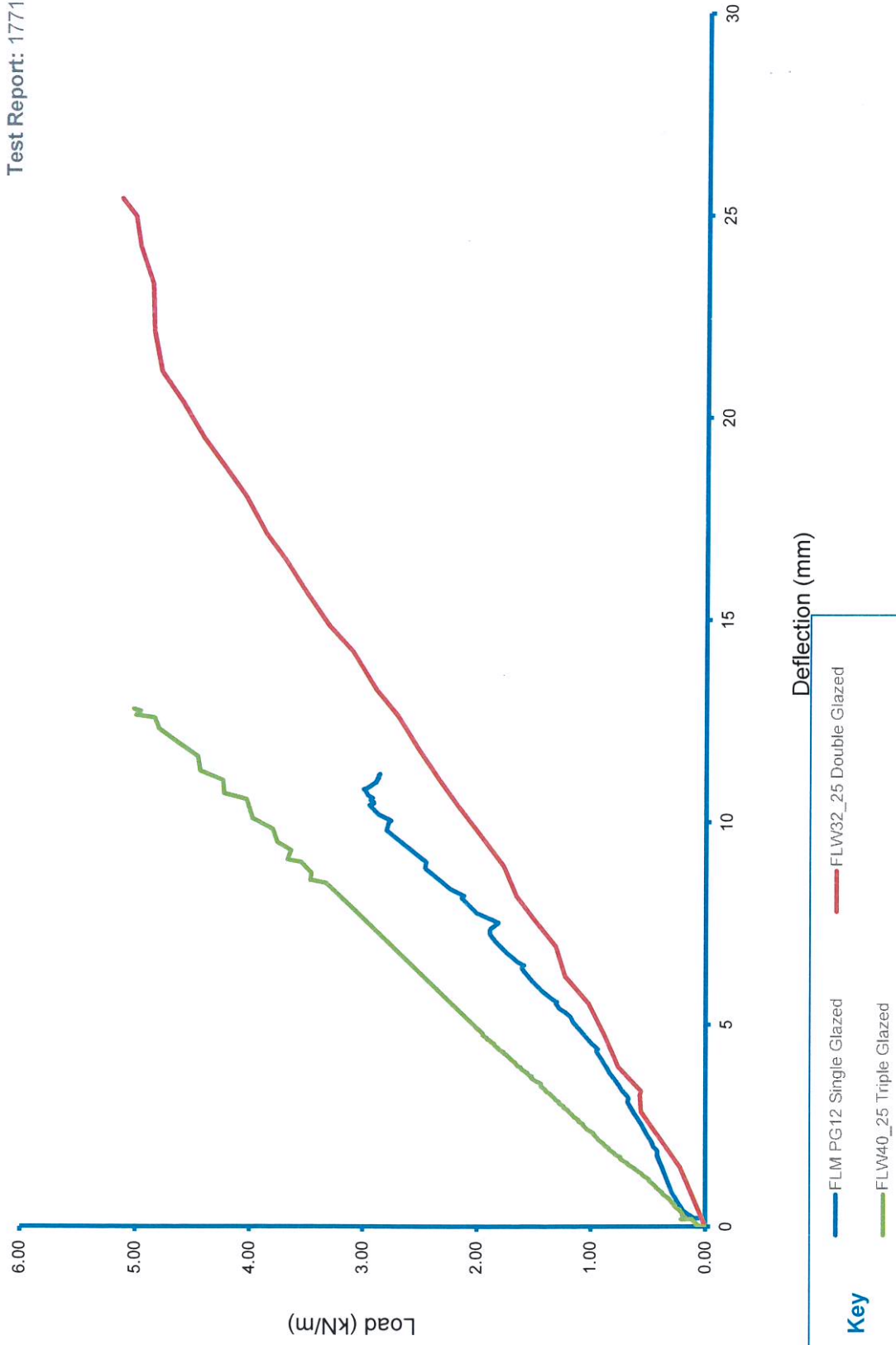


Chart 2 - Load Versus Deflection Curves Fieger Louvre Window Systems (Point Load)

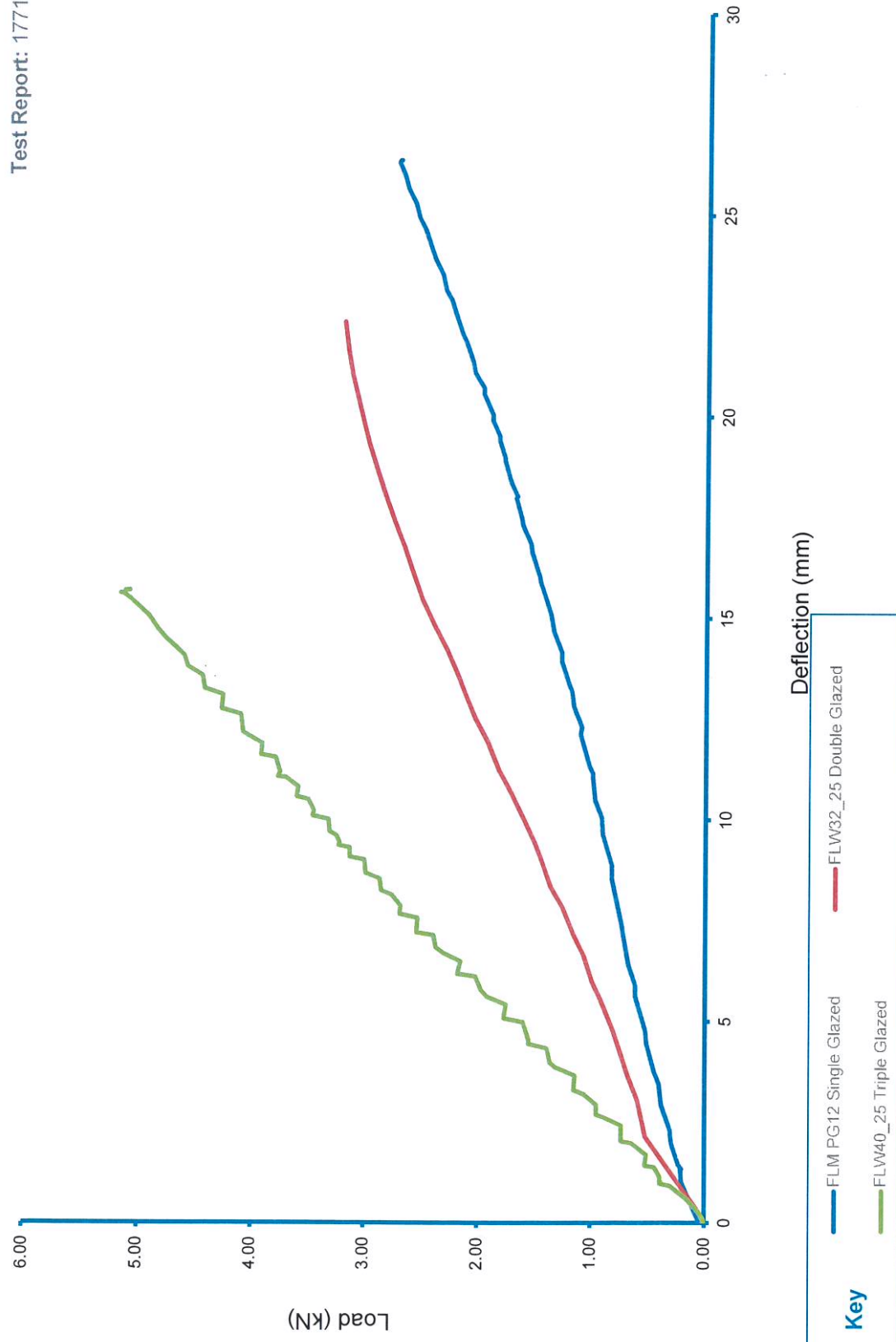
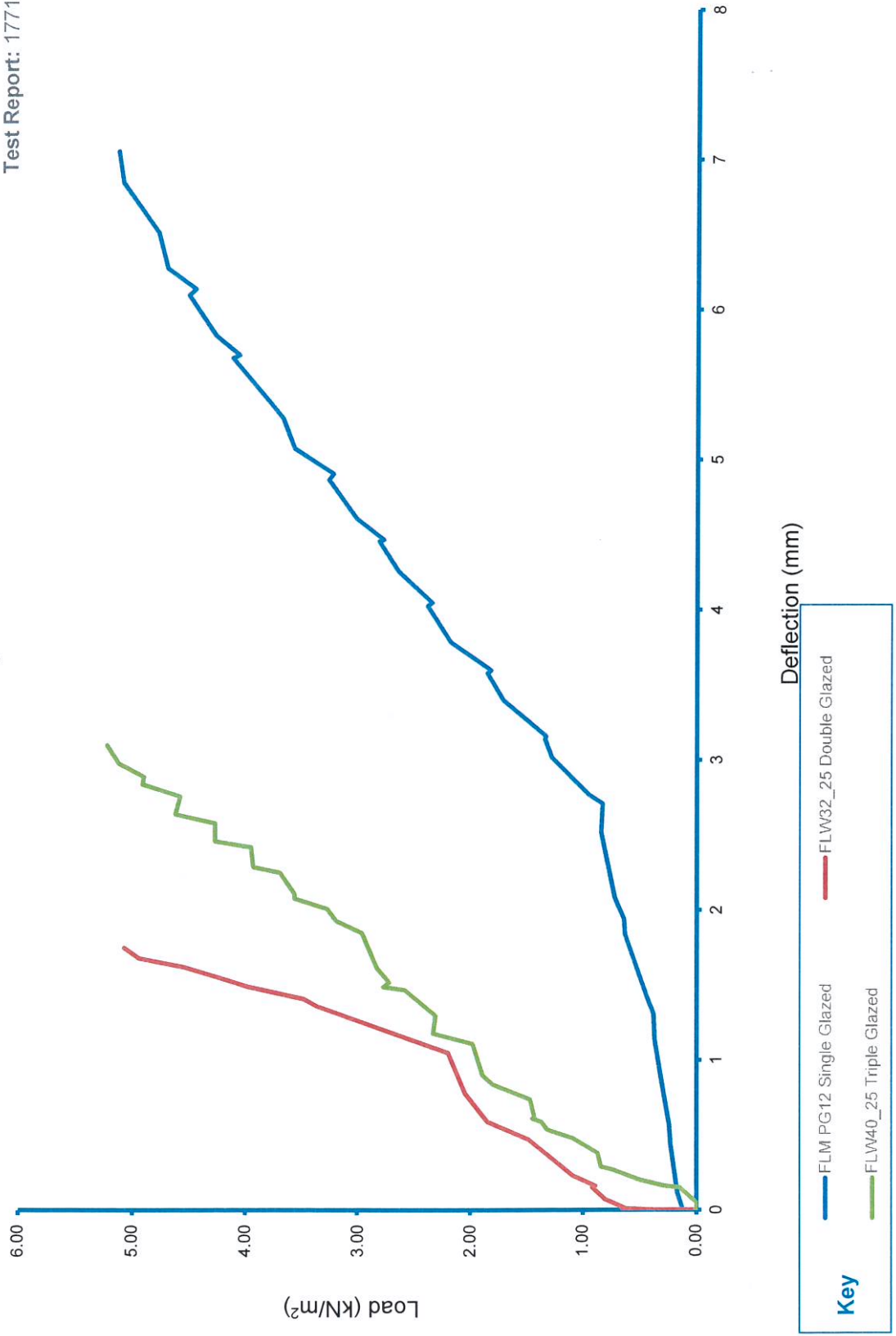
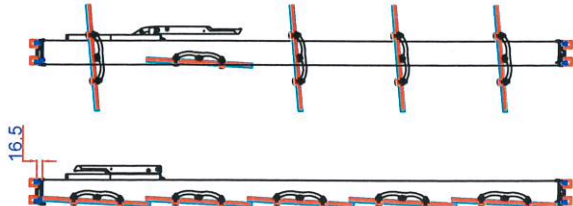




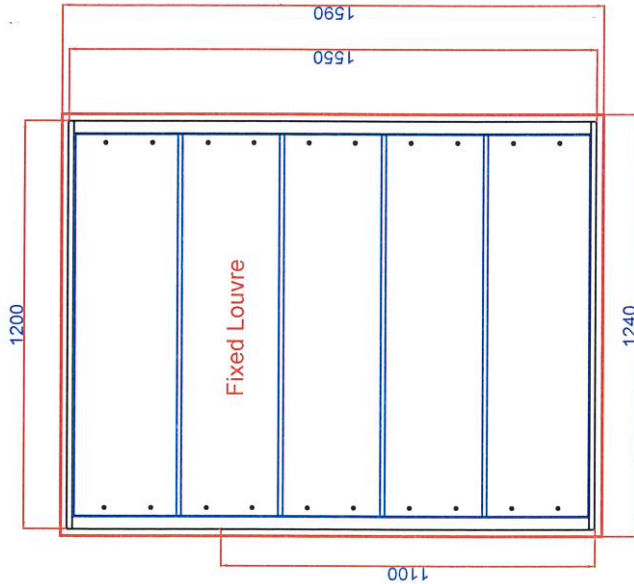
Chart 3 - Load Versus Deflection Curves Fieger Louvre Window Systems (UDL)



FLM PG 12 Vertical section



External Elevation



Plan View



Equipment Schedule:

Fieger Louvre Window, type FLM PG 12.

1 no. FLM PG 12: 1200 mm x 1550 mm complete with 5 no. 12.76mm laminated single-glazed louvres in an overlapping arrangement. Comprising 2 x 6mm toughened glass with a 0.76mm clear foil laminate. One fixed louvre blade.
Silver anodized finish.
Complete with 20 x 20 x 2mm extruded aluminium installation adapters, fitted to the front & rear of the vent frames.
Overall dimensions: 1240 mm x 1590 mm.
Including 1 no. GEZE OL 90 Hand Lever, mounted on the internal top right hand side.
Weight: 55 kg

Installation Notes:

- 1 Offloading. Packing crates should be offloaded using a fork-lift truck or similar device.
- 2 Storage. If removed from the crates, the vents must be stored vertically & protected from the weather.
- 3 Hoisting. Vacuum hoists must not be used. Slings can be used around the vent frame or lifting hooks can be provided on request at time of order. The vents must not be lifted by the louvre blades as this will damage the pinions and void the guarantee.
- 4 Vents must be installed true & square.
- 5 Packers must only be located under the side frames & centre mullion.
- 6 Louvres must only be opened using the actuator. Opening the louvres manually can damage the pinions.
- 7 Fixing screws must not be inserted into the back of the side frames. Only the dedicated fixing holes should be used. In some cases, the louvre blades must be opened to access these.

Revisions		Tolerances		Material Gauge		Scale:	NTS
						Client: Fieger Lamellenfenster GmbH	
						Title: FLM PG 12 Test Vent	
						Drawing No. 1612-BS6810--001	
B	Adapters added	12/01/2017	LE	Sheet 1 of 1			
A	First Drawing	16/12/2016	LE	B			
Index	Revision	Date	Name	Ersatz fuer		Ersetzt durch	
				Urspr.			
				F Auf der Aue 10 D-69486 Birkenau Tel. +49 6201 844340 Lamellenfenster Fax. +49 6201 8443419			

Equipment Schedule:

Fieger Louvre Window, type FLW 32_25.

1 no. FLW 32_25: 1200 mm x 1600 mm complete with 5 no. double-glazed louvres, comprising: 6mm toughened/20mm Argon/6mm laminated low-E. Silver anodized finish.

Including 1 no. GEZE OL 90 Hand Lever, mounted on the internal top right hand side.

Weight: 60 kg

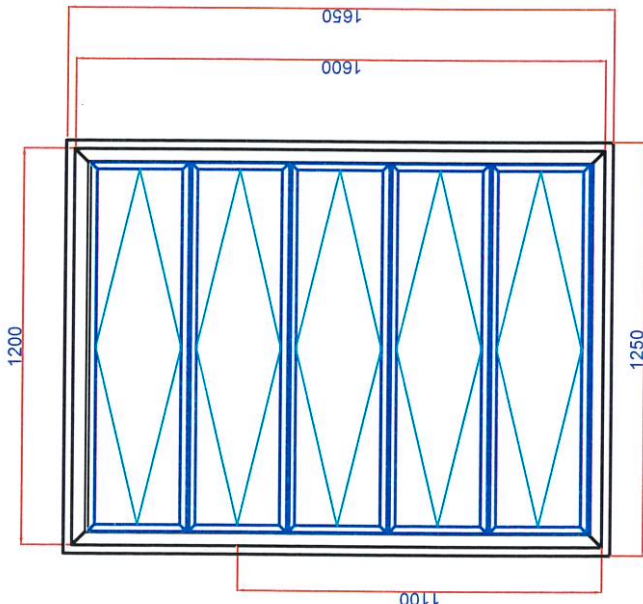
Complete with integral 25 x 32 mm installation adapter.

Overall dimensions: 1250 mm x 1650 mm.

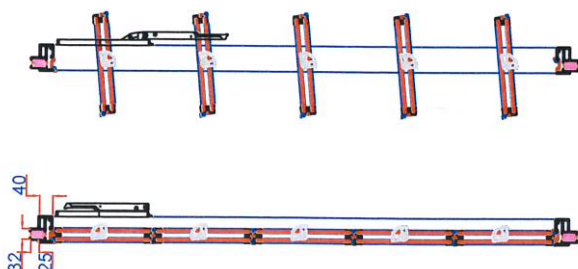
Installation Notes:

- 1 Offloading. Packing crates should be offloaded using a fork-lift truck or similar device.
- 2 Storage. If removed from the crates, the vents must be stored vertically & protected from the weather.
- 3 Hoisting. Vacuum hoists must not be used. Slings can be used around the vent frame or lifting hooks can be provided on request at time of order. The vents must not be lifted by the louvre blades as this will damage the pinions and void the guarantee.
- 4 Vents must be installed true & square.
- 5 Packers must only be located under the side frames & centre mullion.
- 6 Louvres must only be opened using the actuator. Opening the louvres manually can damage the pinions.
- 7 Fixing screws must not be inserted into the back of the side frames. Only the dedicated fixing holes should be used. In some cases, the louvre blades must be opened to access these.

External Elevation



FLW 32 Vertical section

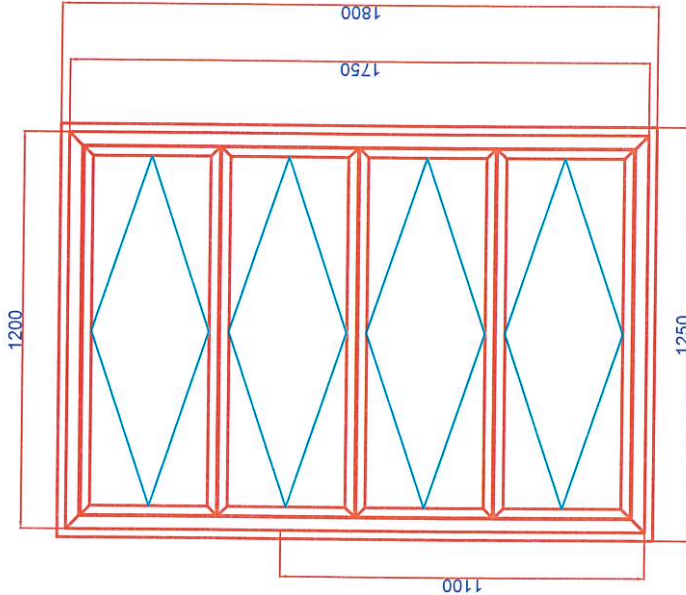


Plan View

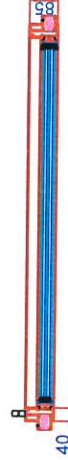
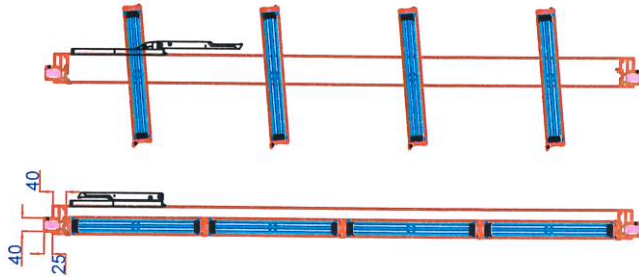


Revisions		Tolerances	Material Gauge	Scale:	NTS
				Client: Fieger Lamellenfenster GmbH	
				Title: FLW 32 Test Vent	
				Drawing No. 1612-BS6810--002	
				Sheet 1 of 1	
				B	
				Ersatz fuer	
				Ersetzt durch	
				Auf der Ave 10 D-69489 Birkenau Tel. +49 6201 844340 Fax. +49 6201 8443419	
				FIEGER Lamellenfenster	
				Date Name	
				12/01/2017 LE	
				16/12/2016 LE	
				Adapters added	
				First Drawing	
				Revision	
				Index	

External
Elevation



FLW 40 Vertical section



Equipment Schedule:

Fieger Louvre Window, type FLW 40_25.

1 no. FLW 40_25: 1200 mm x 1750 mm complete with 4 no. triple-glazed louvres, comprising: 6mm toughened/12mm Argon/4mm Float/12mm Argon/6.38mm laminated low-E.

Silver anodized finish.

Including 1 no. GEZE OL 90 Hand Lever, mounted on the internal top right hand side.

Weight: 83 kg

Complete with integral 25 x 40 mm installation adapter.

Overall dimensions: 1250 mm x 1800 mm.

Installation Notes:

- 1 Offloading. Packing crates should be offloaded using a fork-lift truck or similar device.
- 2 Storage. If removed from the crates, the vents must be stored vertically & protected from the weather.
- 3 Hoisting. Vacuum hoists must not be used. Slings can be used around the vent frame or lifting hooks can be provided on request at time of order. The vents must not be lifted by the louvre blades as this will damage the pinions and void the guarantee.
- 4 Vents must be installed true & square.
- 5 Packers must only be located under the side frames & centre mullion.
- 6 Louvres must only be opened using the actuator. Opening the louvres manually can damage the pinions.
- 7 Fixing screws must not be inserted into the back of the side frames. Only the dedicated fixing holes should be used. In some cases, the louvre blades must be opened to access these.

Revisions		Tolerances		Material Gauge		Scale:		NTS	