

TEST REPORT

Lucideon Reference: 18125 (QT-49195/1/GMB)/Ref. 1

Project Title: Testing of OnLevel TL6020 Balustrade System in Accordance with BS 6180:2011

Client: OnLevel Ltd
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Purchase Order No.: -

Work Location: Lucideon UK



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1 INTRODUCTION

Lucideon were commissioned by the client, OnLevel 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 BS 6180:2011 Barriers in and about buildings – Code of Practice.

The testing was carried out at Lucideon test facilities, 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 aluminium channel tested was designated as System TL 6020. The system is shown in Figures 1-6

The channel was installed by OnLevel personnel.

3 TEST PROGRAMME

A horizontal line load was carried out on the aluminium channel with the following glass types installed:

- Laminated Tempered Glass with PVB Foil 10/10/4 21.52 mm – size (w x h): 1000 mm x 1250 mm.
- Laminated Tempered Glass with DG 41 Foil 10/10/4 21.52 mm – size (w x h): 1000 mm x 1250 mm.
- Laminated Tempered Glass with PVB Foil 8/8/4 16.52 mm – size (w x h): 1000 mm x 1250 mm.
- Monolithic Toughened Glass 19 mm – size (w x h): 1000 mm x 1250 mm.
- Monolithic Toughened Glass 15 mm – size (w x h): 1000 mm x 1250 mm.

4 TEST METHOD

The channel was bolted to the top of a concrete block, nominally 0.5 m x 0.5 m x 3.5 m which was fixed to the floor of the test facility. The channel was bolted to the block using the following configurations:

4.1 Chemical Anchors

- Fischer FIS AM M10 x 150 mm Chemical Anchors 100 mm Centres.
- Fischer FIS AM M10 x 150 mm Chemical Anchors 200 mm Centres.
- Fischer FIS AM M10 x 150 mm Chemical Anchors 400 mm Centres.

- Fischer FIS AM M10 x 150 mm Chemical Anchors 600 mm Centres.

4.2 Mechanical Anchors

- Fischer FAZ II 12 Mechanical Anchors 200 mm Centres.
- Fischer FAZ II 12 Mechanical Anchors 400 mm Centres.
- Fischer FAZ II 12 Mechanical Anchors 600 mm Centres.

The appropriate thickness glass panel was fitted into the channel using 'Flex Fit' fixing clips at nominally 312.5 mm centres such that the plastic clip was to the outside face of the glass.

A horizontal imposed line load was applied to the glass panel at a height specified by the client. Deflection was recorded at the same height and at the mid span of the panel. The load was applied via a hydraulic ram and the deflection measured using a digital electronic displacement transducer, (see Plate 1).

Loads and deflections were recorded using calibrated 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 OnLevel glazing systems tested under horizontal imposed line load to the maximum deflection of 25 mm are given in Table 1.

All figures quoted in Tables 1 and 2 contain no safety factors and are direct loads as achieved by the system under test conditions.

Tables 3-7 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

**Table 1** - Tested under Horizontal Imposed Line Load Chemical Fix

Base Rail	Glass	Fixing Centres (mm)	Height of Applied Load (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)
System TL6020	10 10 4 DG Foil	100	1292	1.55	1.50	24.12
	10 10 4	400	1150	1.55	1.50	24.48
	10 10 4	600	1150	0.75	0.74	24.97
	10 10 4	400	1242	1.42	0.74	13.21
	8 8 4	200	1292	0.76	0.74	24.33
	19 mm	400	1150	1.50	1.50	24.96
	19 mm	200	1242	1.55	1.50	24.48
	19 mm	600	1242	0.89	0.74	18.14
	19 mm	200	1292	1.33	0.74	13.69
15 mm	200	1292	0.78	0.74	24.41	

Table 2 - Tested under Horizontal Imposed Line Load Mechanical Fix

Base Rail	Glass	Fixing Centres (mm)	Height of Applied Load (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)
System TL6020	10 10 4	400	1150	1.57	1.5	23.93
	10 10 4	200	1200	1.82	1.5	20.34
	10 10 4	600	1242	0.83	0.74	19.55
	19 mm	200	1242	1.53	1.5	24.51
	19 mm	400	1150	1.52	1.62	22.92
	19 mm	600	1242	0.74	25.00	25.00

Table 3 - Summary of Suitability of OnLevel Balustrade TL-6020 Systems Chemical Fix 10 10 4 Glass 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)	TL-6020 Chemical Fix			
			10 10 4 DG (100mm centres 1292mm)	10 10 4 (400mm centres 1150mm)	10 10 4 (400mm Centres 1242mm)	10 10 4 (600mm Centres 1150mm)
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	✓	✓	x	x
Areas with tables or fixed seating	(vii) restaurants and 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 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	✓	✓	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
	(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
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
	(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 4 - Summary of Suitability of OnLevel Balustrade TL-6020 Systems Chemical Fix 10 10 4 Glass 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)	TL-6020 Chemical Fix	
			8 8 4 (200mm Centres 1292 mm)	15 mm (200mm Centres 1292 mm)
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	x	x
Areas with tables or fixed seating	(vii) restaurants and 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 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	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 and stadia	(Note 1)	-	-
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	1.50 (Note 2)	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”

Table 5 - Summary of Suitability of OnLevel Balustrade TL-6020 Systems Chemical Fix 19 mm Glass 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)	TL-6020 Chemical Fix			
			19mm (200mm centres 1292mm)	19mm (200mm centres 1242mm)	19mm (400mm Centres 1150mm)	19mm (600mm Centres 1242mm)
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	x	✓	✓	x
Areas with tables or fixed seating	(vii) restaurants and 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 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	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
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
	(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 OnLevel Balustrade TL-6020 Systems Chemical Fix 10 10 4 Glass 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)	TL-6020 Chemical Fix		
			10 10 4 (200mm Centres 1200mm)	10 10 4 (400mm Centres 1150mm)	10 10 4 (600mm Centres 1242mm)
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	✓	✓	x
Areas with tables or fixed seating	(vii) restaurants and bars	1.50	✓	✓	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 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	✓	✓	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
Vehicular	(xiv) pedestrian areas in car parks, including stairs, landings, ramps, edges of internal floors, footways, edges of roofs	1.50 (Note 2)	✓	✓	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”

Table 7 - Summary of Suitability of OnLevel Balustrade TL-6020 Systems Chemical Fix 19 mm Glass 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)	TL-6020 Chemical Fix		
			19mm (200mm Centres 1242mm)	19mm (400mm Centres 1150mm)	19mm (600mm Centres 1242mm)
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	✓	✓	x
Areas with tables or fixed seating	(vii) restaurants and bars	1.50	✓	✓	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 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	✓	✓	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
Vehicular	(xiv) pedestrian areas in car parks, including stairs, landings, ramps, edges of internal floors, footways, edges of roofs	1.50 (Note 2)	✓	✓	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”

PLATE



Plate 1 - Generic Test Arrangement

Chart 1 - Load Versus Defelction Curves for OnLevel Balustrades System TL-6020 Chemical Fix 10 10 4 Glass

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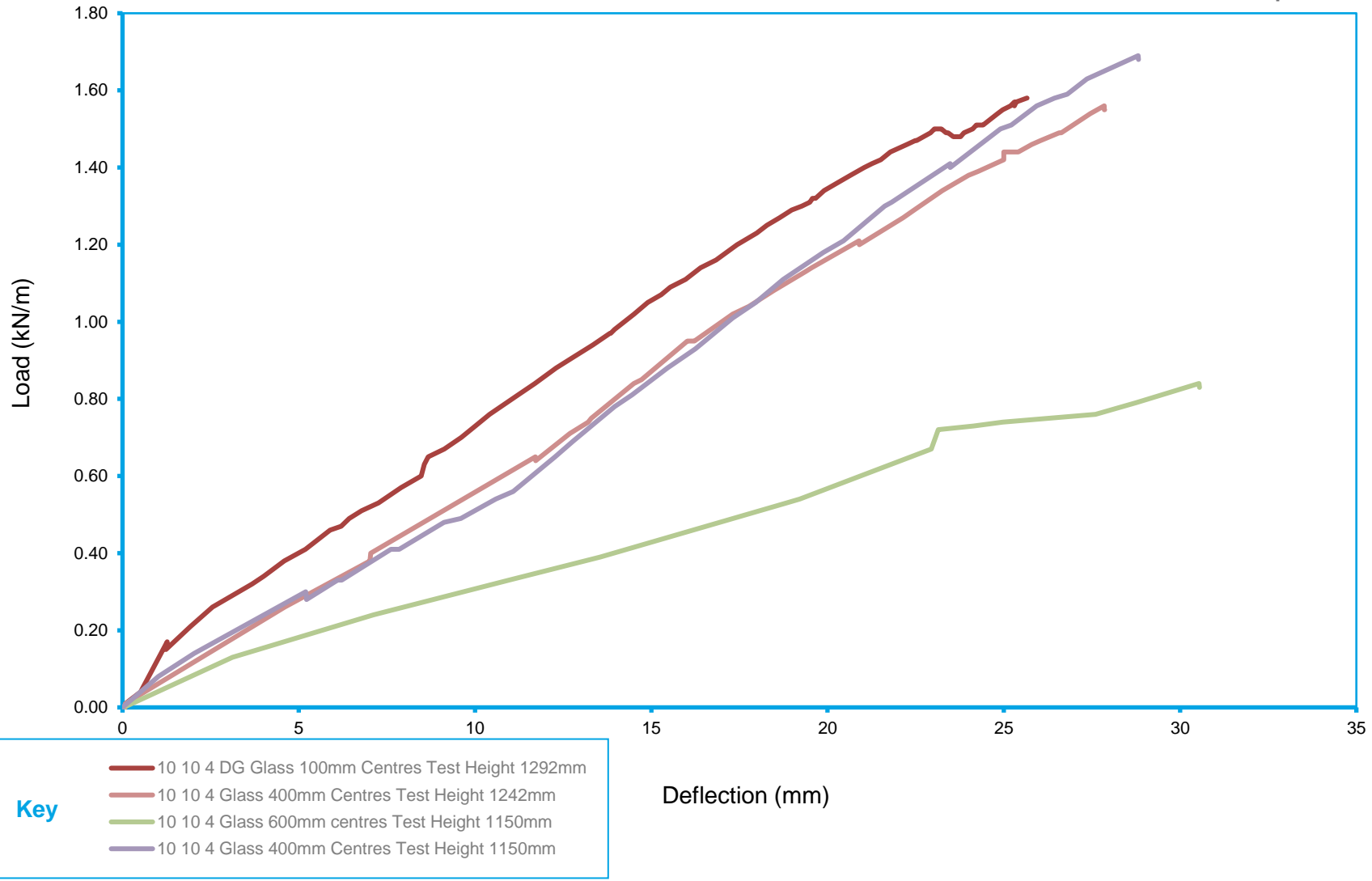


Chart 2 - Load Versus Defelction Curves for OnLevel Balustrades System TL-6020 Chemical Fix

Test Report: 18125/Ref. 1

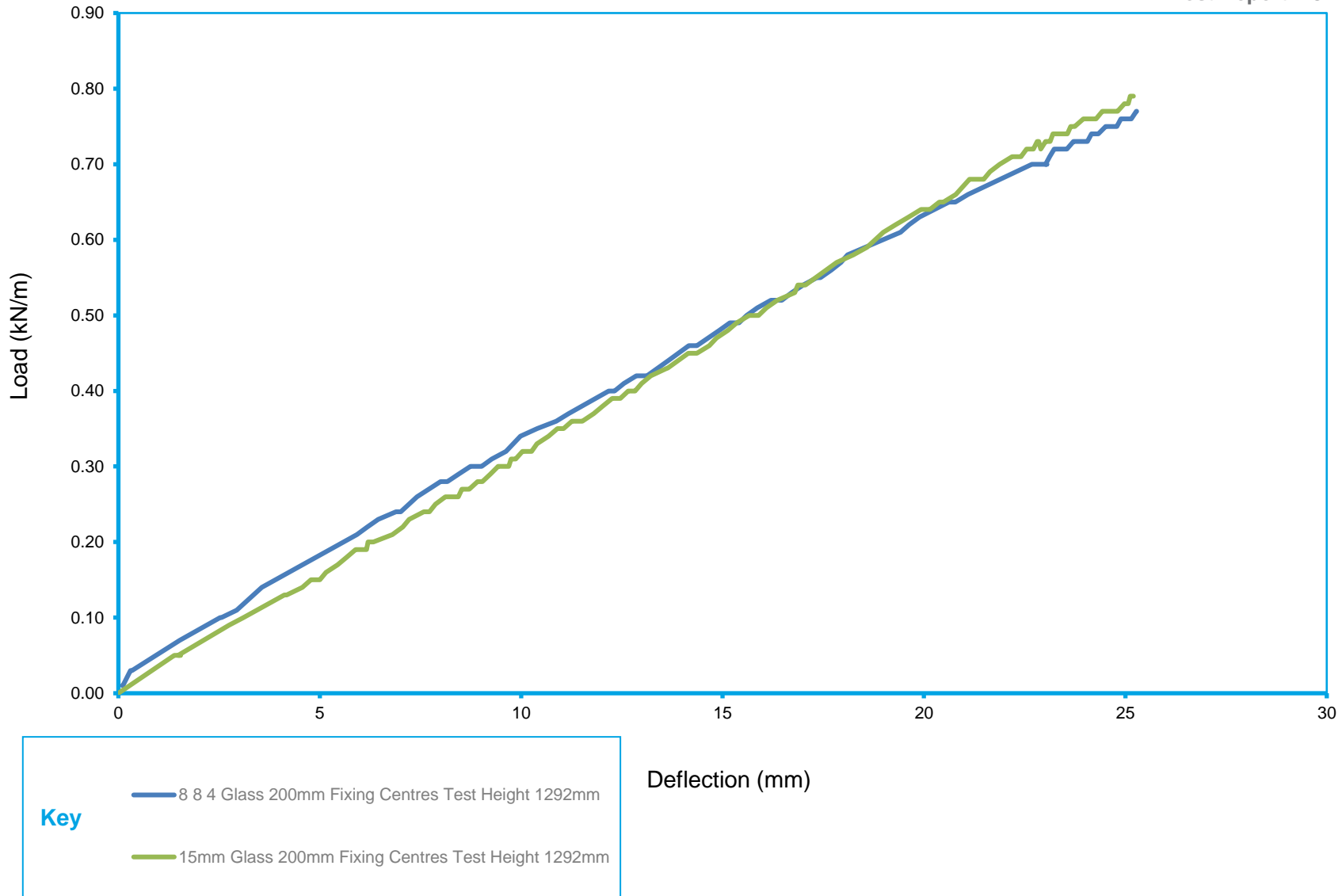


Chart 3 - Load Versus Defelction Curves for OnLevel Balustrades System TL-6020 Chemical Fix 19 mm Glass

Test Report: 18125/Ref. 1

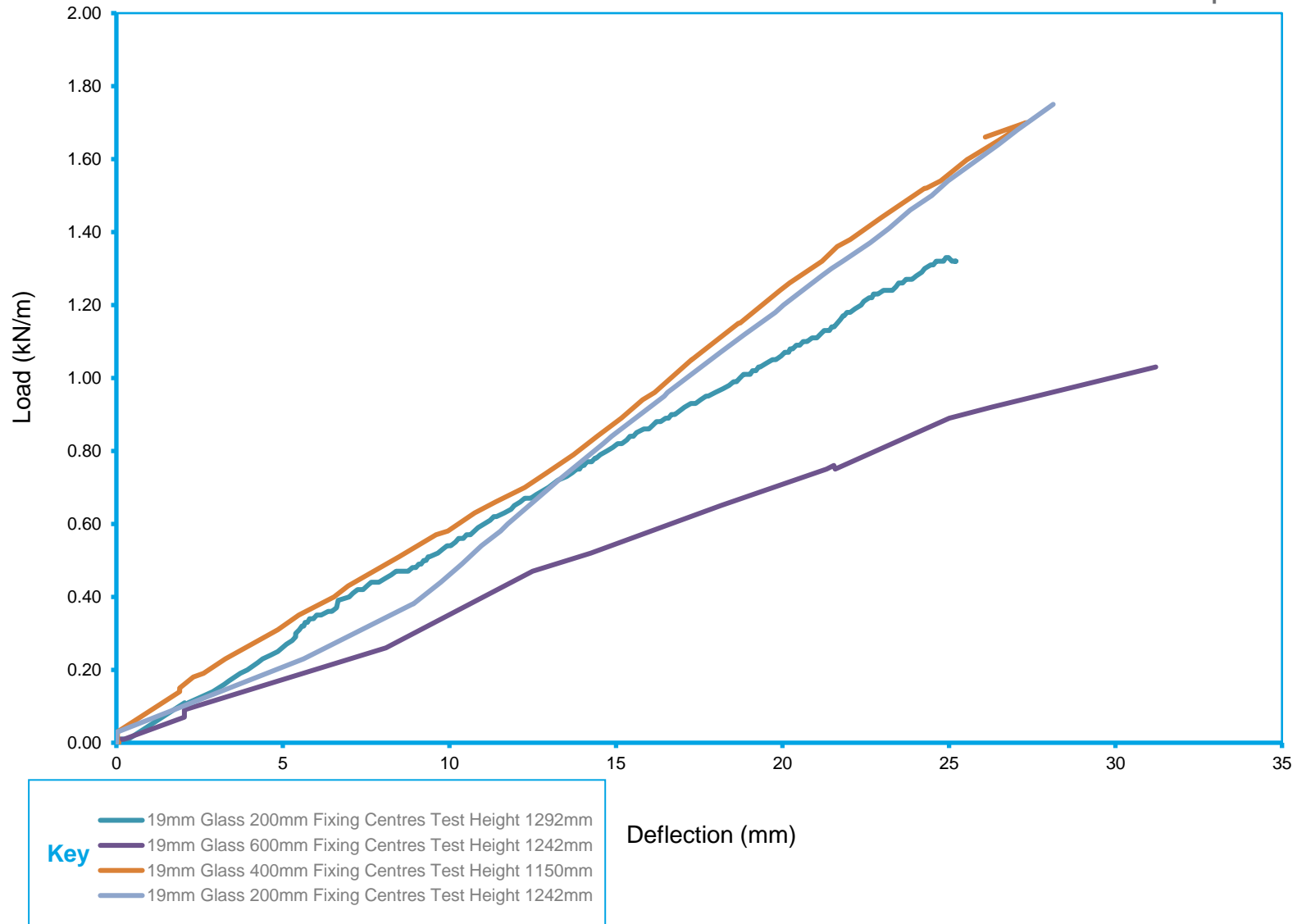
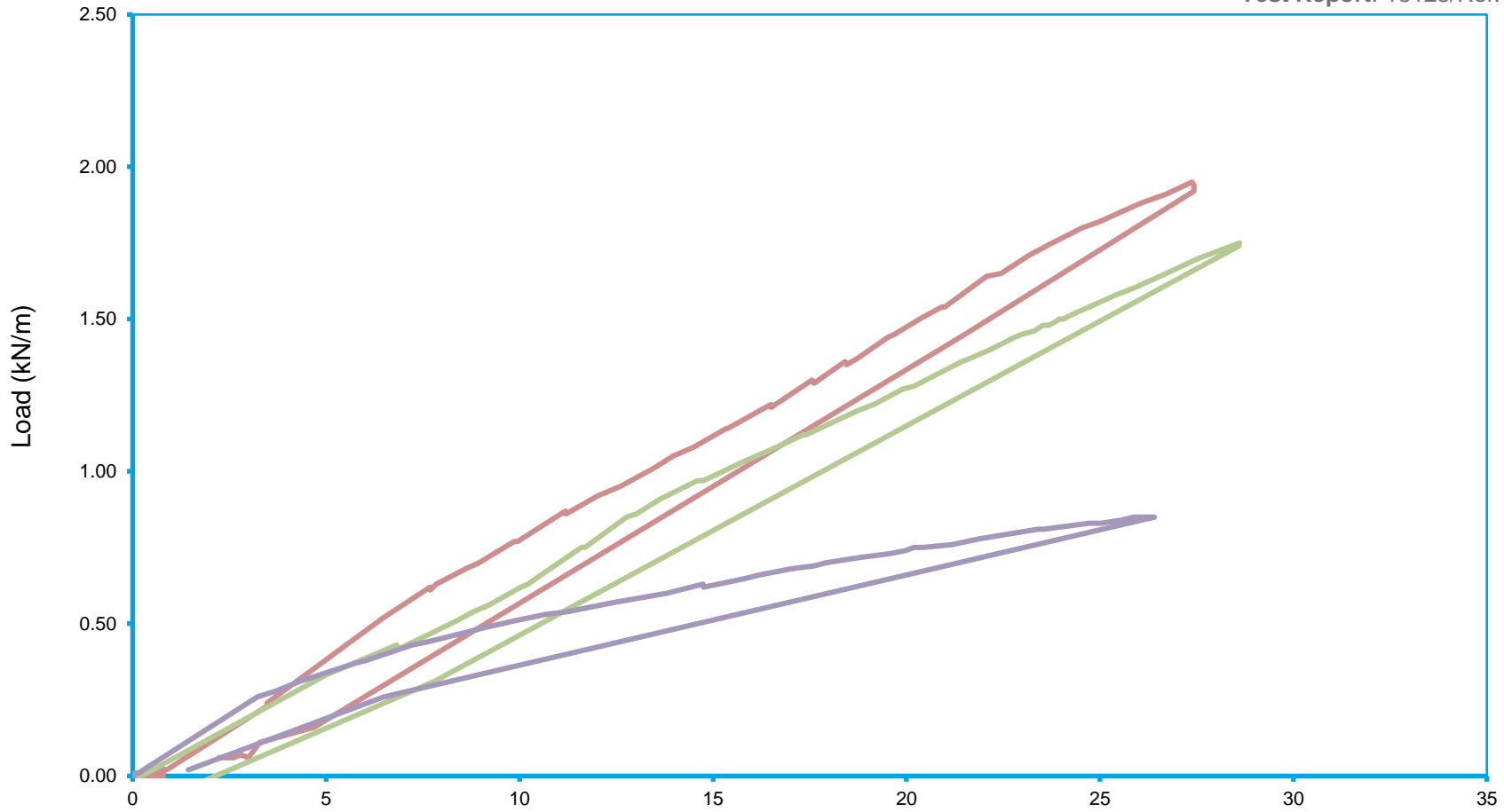


Chart 4 - Load Versus Defelction Curves for OnLevel Balustrades System TL-6020 Mechanical Fix 10 10 4 Glass

Test Report: 18125/Ref. 1



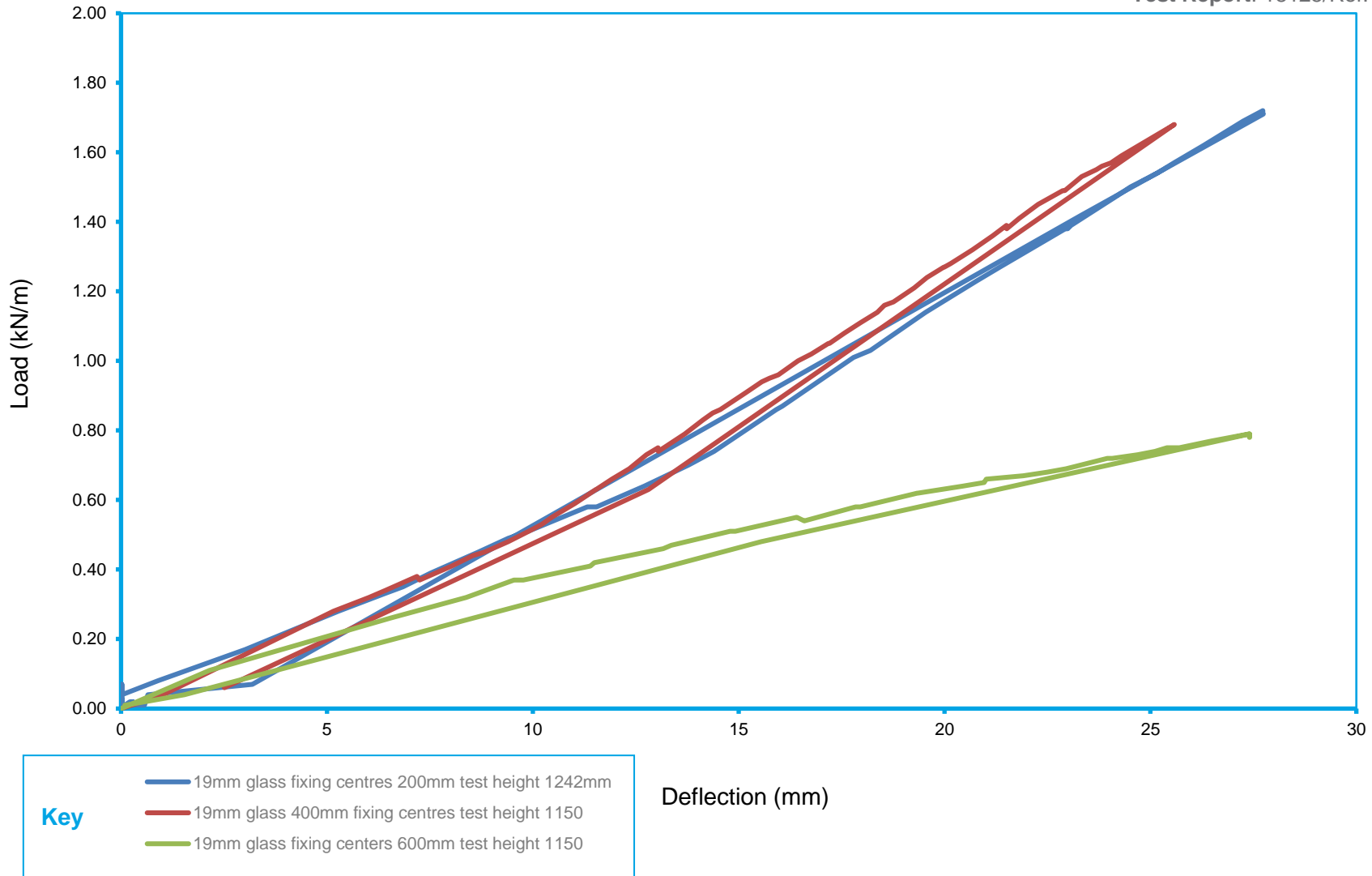
Key

- 10 10 4 glass 200mm fixing centres test height 1200mm
- 10 10 4 glass 400mm fixing centres test height 1150mm
- 10 10 10 4 glass 600mm fixing centres test height 1242mm

Deflection (mm)

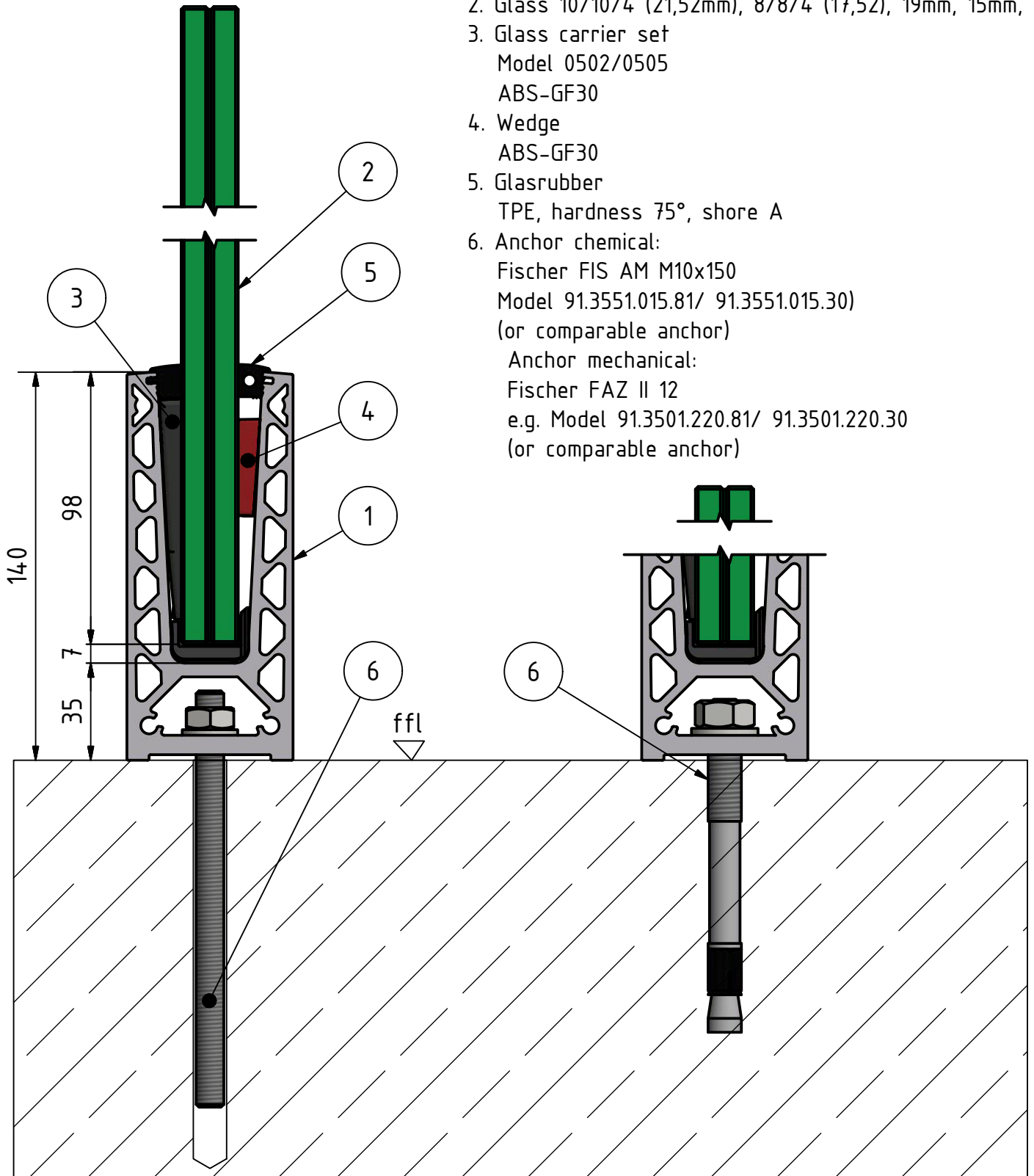
Chart 5 - Load Versus Defelction Curves for OnLevel Balustrades System TL-6020 Mechanically Fixed 19 mm Glass


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APPENDIX A - Figures

1. Glass profile TL-6020, top mount
Aluminium 6063-T6
2. Glass 10/10/4 (21,52mm), 8/8/4 (17,52), 19mm, 15mm,
3. Glass carrier set
Model 0502/0505
ABS-GF30
4. Wedge
ABS-GF30
5. Glasrubber
TPE, hardness 75°, shore A
6. Anchor chemical:
Fischer FIS AM M10x150
Model 91.3551.015.81/ 91.3551.015.30
(or comparable anchor)
Anchor mechanical:
Fischer FAZ II 12
e.g. Model 91.3501.220.81/ 91.3501.220.30
(or comparable anchor)



Designed by FV	Created 26-1-2018	Modified	Comment
		Description Detail:Figure 1	
		Article number TL-6020 (top mount)	Size A4

LINE LOAD

Laminated Tempered Glass with DG 41 Foil /
Laminated Tempered Glass with PVP Foil /
Monolithic Tempered Glass


H1 = height ffl (height glass + 42mm)
above the datum level of the floor

H2 = height glass

42

ffl

Glass	Line Load	H1 Height ffl	H2 Height Glass	Anchor Distance
15mm	0,74kN/m	max.1292	max.1250	max.200
19mm	0.74kN/m	max.1292	max.1250	max.200
19mm	0.74kN/m	max.1242	max.1200	max.600
19mm	1.50kN/m	max.1242	max.1200	max.200
19mm	1.50kN/m	max.1150	max.1108	max.400
8/8/4	0.74kN/m	max.1292	max.1250	max.200
10/10/4	0.74kN/m	max.1242	max.1200	max.400
10/10/4	0.74kN/m	max.1150	max.1108	max.600
10/10/4	1.50kN/m	max.1150	max.1108	max.400
10/10/4 (DG 41)	1.50kN/m	max.1292	max.1250	max.100

Designed by FV	Created 26-1-2018	Modified	Comment
		Description Detail: Figure 2 (Line Load / Glass Heights with chemical anchors)	
		Article number TL-6020 (top mount)	Size A4

LINE LOAD

Laminated Tempered Glass with PVP Foil /
Monolithic Tempered Glass

H1 = height ffl (height glass + 42mm)
above the datum level of the floor

H2 = height glass

42

ffl

Glass	Line Load	H1 Height ffl	H2 Height Glass	Anchor Distance
19mm	0.74kN/m	max.1242	max.1200	max.600
19mm	1.50kN/m	max.1150	max.1108	max.400
19mm	1.50kN/m	max.1242	max.1200	max.200
10/10/4	0.74kN/m	max.1242	max.1200	max.600
10/10/4	1.50kN/m	max.1200	max.1158	max.200
10/10/4	1.50kN/m	max.1150	max.1108	max.400

Designed by

FV

Created

26-1-2018

Modified

Comment

Description

Detail: Figure 3

(Line Load / Glass Heights with mechanical anchors)

ONLEVE

Article number

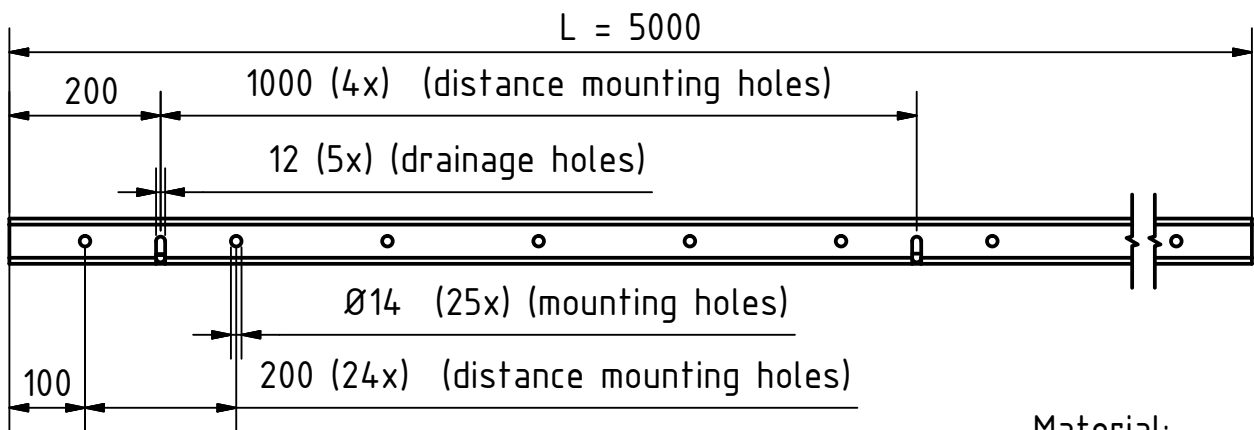
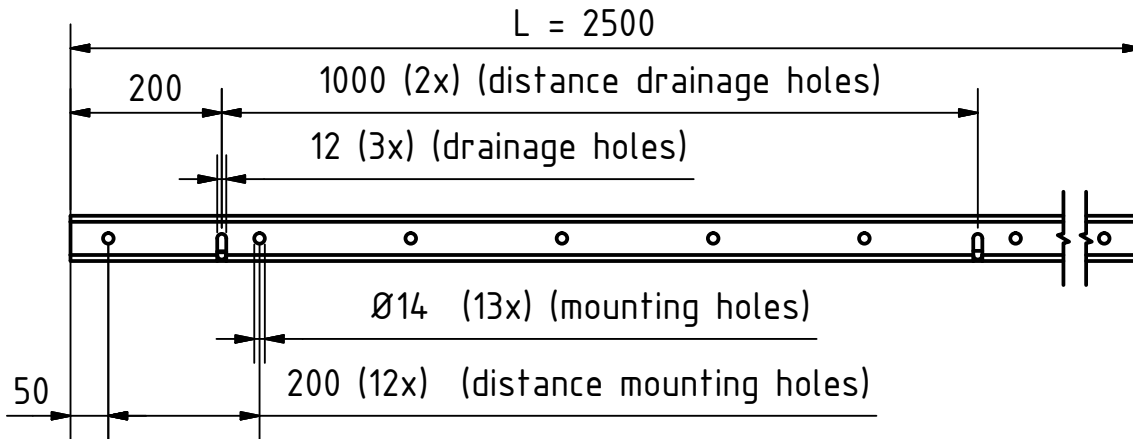
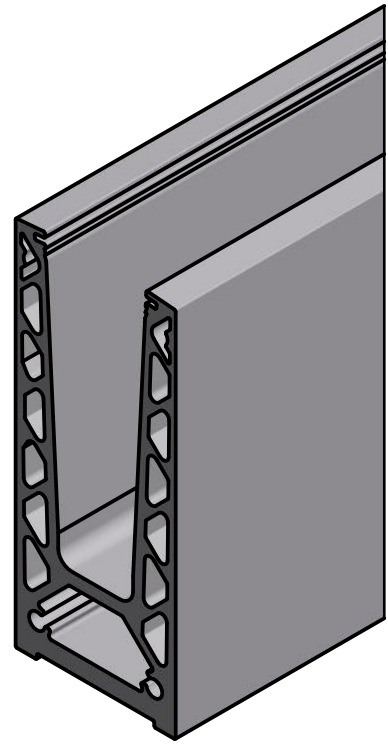
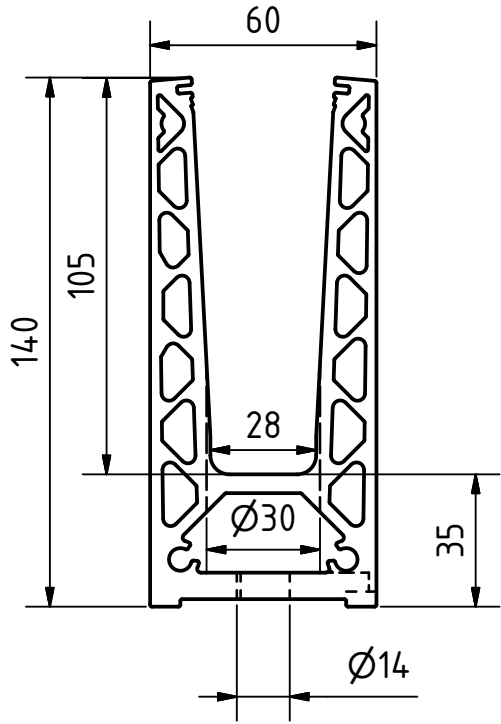
TL-6020 (top mount)

Size


A4

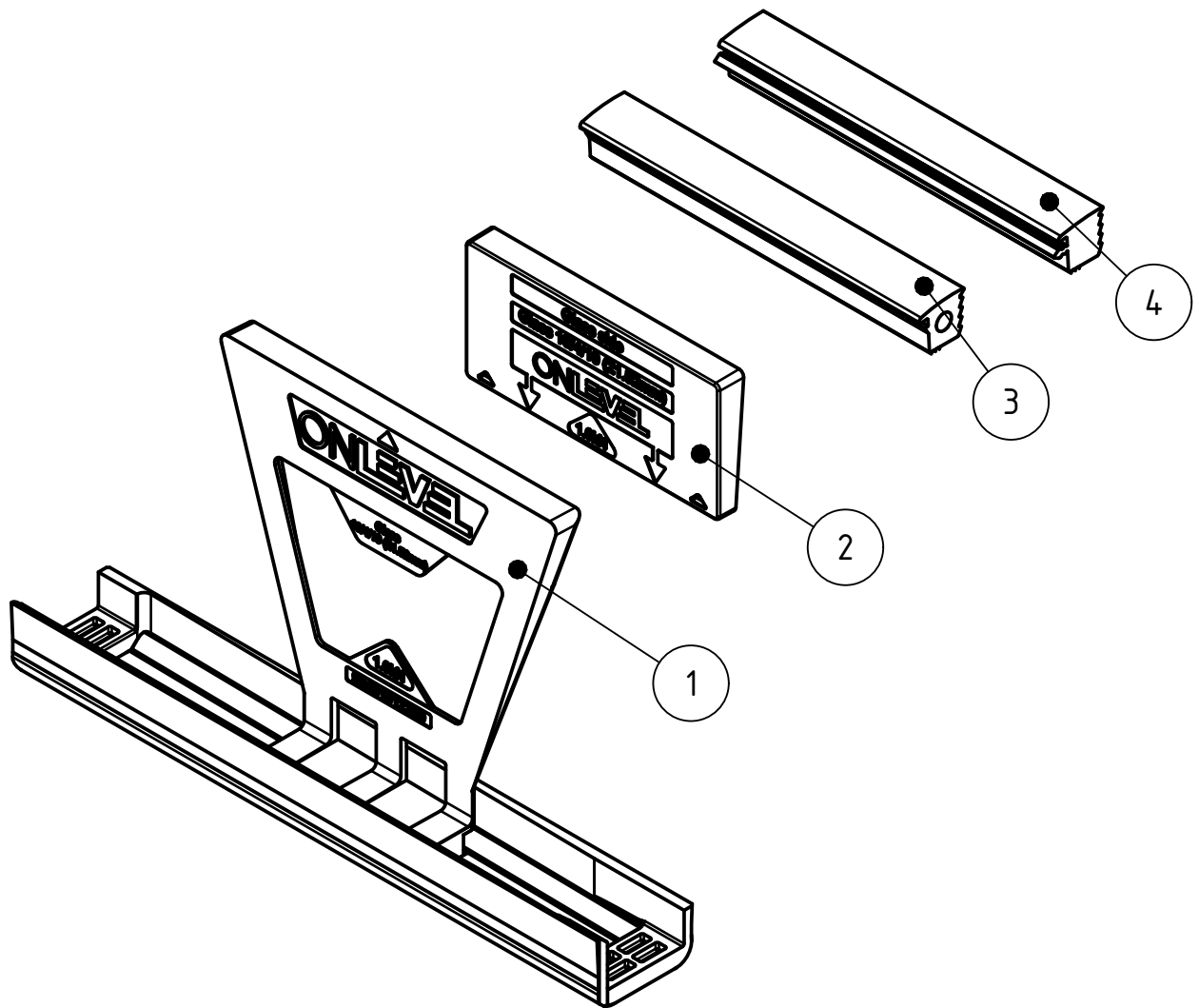
Scale

1 : 2



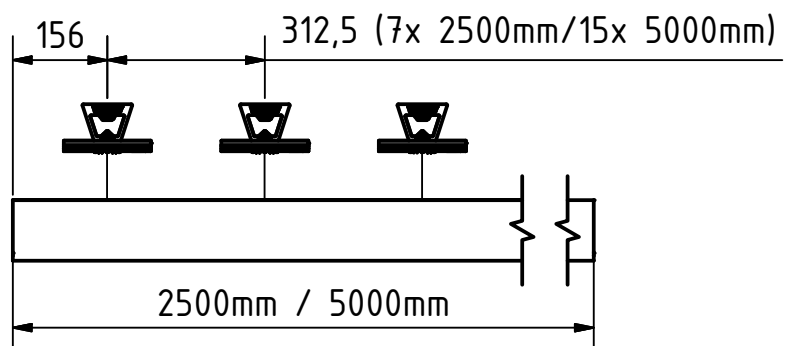
Material:
Aluminum 6063-T6


Designed by FV	Created 26-1-2018	Modified	Comment
		Description Profile TL-6020 L =2500mm / L=5000mm	
		Article number TL-6020 (top mount)	Size A4



ITEM	PCS (L=2500mm)	PCS (L=5000mm)	Description
1	8	16	Flex-Fit 1.0KN
2	8	16	Glass Wedge 1.0KN
3	1 (L=2500mm)	1 (L=5000mm)	Rubber User Side
4	1 (L=2500mm)	1 (L=5000mm)	Rubber Falling Side

Distance Glass Carrier
/ Glass Wedges :



Designed by FV	Created 26-1-2018	Modified	Comment
		Description Flex-Fits sets (quantity and distance)	
		Article number TL-6020 (top mount)	Size A4