

TEST REPORT

Lucideon Reference: 164962 (QT39584/2/JPS)/Ref. 10/Supp1

Project Title: Testing of Balustrade System TL-6020 in Accordance with BS 6180:2011 Barriers In and About Buildings

Client: OnLevel Gmbh
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Work Location: Lucideon UK

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Miss Joanne Booth
Consultancy Team
Reviewer



Miss Lisa Cobden
Consultancy Team
Project Manager



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1 INTRODUCTION

Lucideon were commissioned by the client, OnLevel Gmbh, 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 OnLevel's facilities at Innovatielaan 25 8447 SN Heerenveen The Netherlands.

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 Figure 1 and Figure 2.

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 17.52 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:

- Standard Anchors 100 mm Centres.
- Standard Anchors 200 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 (see Figure 3 and Figure 4).



A horizontal imposed line load was applied to the glass panel at a height of between 1150 mm and 1292 mm above the datum level of the floor and the deflection measured at the top central point of the panel. The exact height at which the load was applied and the deflection measured for each individual panel can be found in Table 1. The load was applied via a hydraulic ram and the deflection measured using a digital electronic displacement transducer, (see Plate 1).

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 system tested under horizontal imposed line load to the maximum deflection of 25 mm are given in Table 1.

All figures quoted in Table 1 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.

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 OnLevel Balustrade System
Tested under Horizontal Imposed Line Load

| 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 TL-6020 | 10/10/4 DG Foil | 100 | 1292 | 1.55 | 1.50 | 24.12 |
| | 10/10/4 | 200 | 1200 | 1.25 | 0.74 | 13.74 |
| | 10/10/4 | 100 | 1150 | 1.58 | 1.50 | 22.68 |
| | 8/8/4 | 200 | 1292 | 0.76 | 0.74 | 24.33 |
| | 19 mm | 200 | 1292 | 1.33 | 0.74 | 13.69 |
| | 19 mm | 100 | 1200 | 1.50 | 1.50 | 24.94 |
| | 15 mm | 200 | 1292 | 0.78 | 0.74 | 24.41 |



Table 2 - Summary of Suitability of OnLevel Balustrade Systems 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 Anchors 100 mm Centres | | |
|---|--|---|--------------------------------|-------------------|-----------------|
| | | | 10 10 4 DG (1292 mm) | 10 10 4 (1150 mm) | 19 mm (1200 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 | ✓ | ✓ | ✓ |
| 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 | 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 | ✓ | ✓ | ✓ |
| 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 3 - Summary of Suitability of OnLevel Balustrade Systems 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 Anchors 200 mm Centres | | | |
|---|--|---|--------------------------------|-----------------|-----------------|-----------------|
| | | | 10 10 4 (1200 mm) | 8 8 4 (1292 mm) | 19 mm (1292 mm) | 15 mm (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 | 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 | ✓ | ✓ | ✓ | ✓ |
| | (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 | 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 | 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) | - | - | - | - |

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”

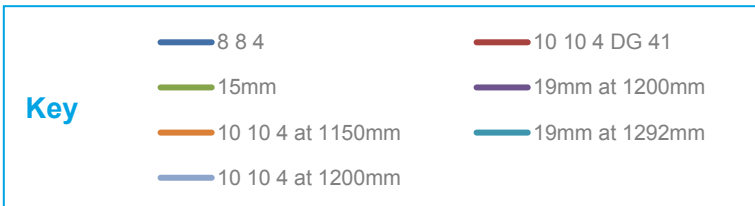
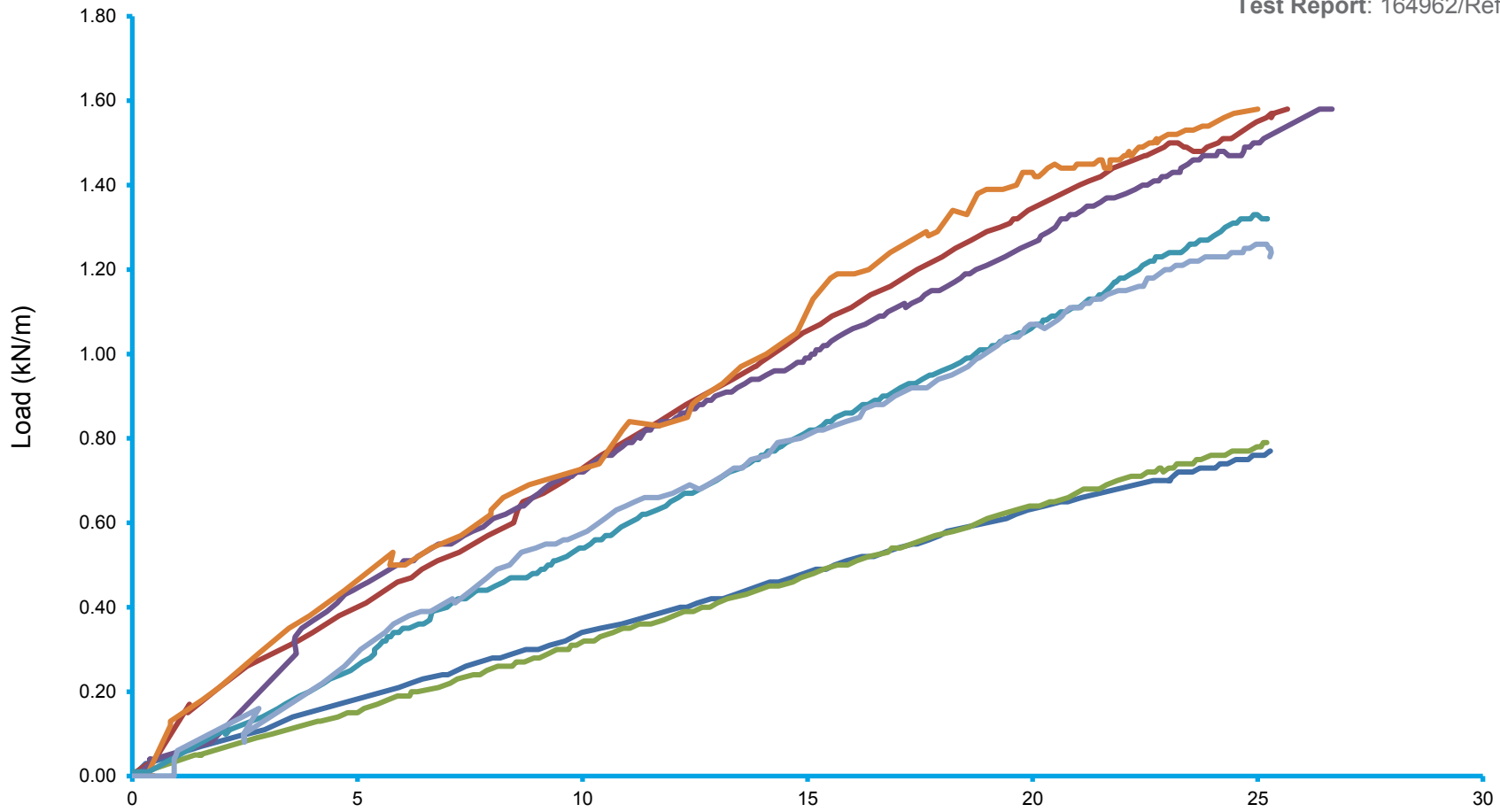


Plate 1 - Generic Test Arrangement

Chart 1 - Load Versus Deflection Curves for OnLevel Balustrades System TL-6020

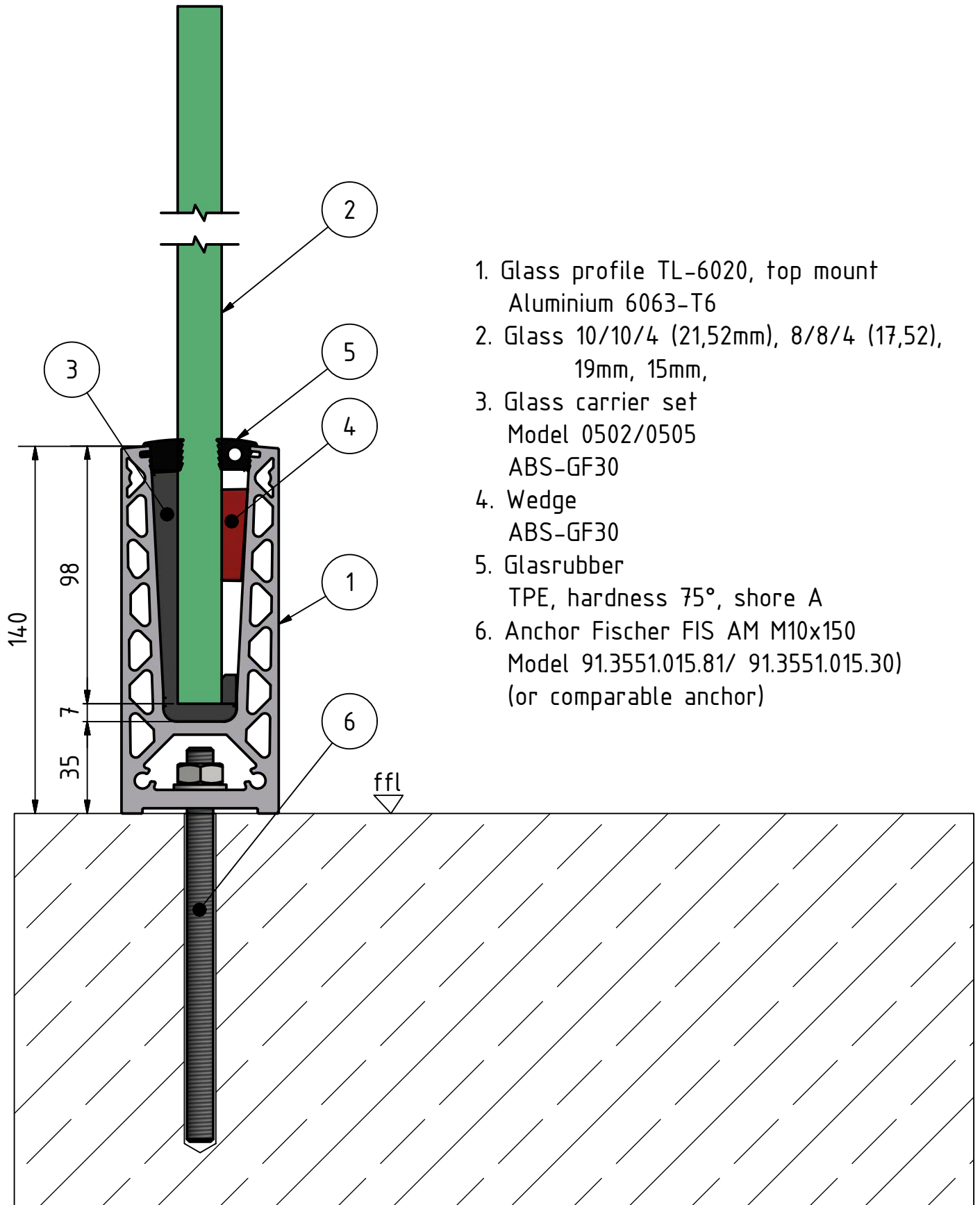


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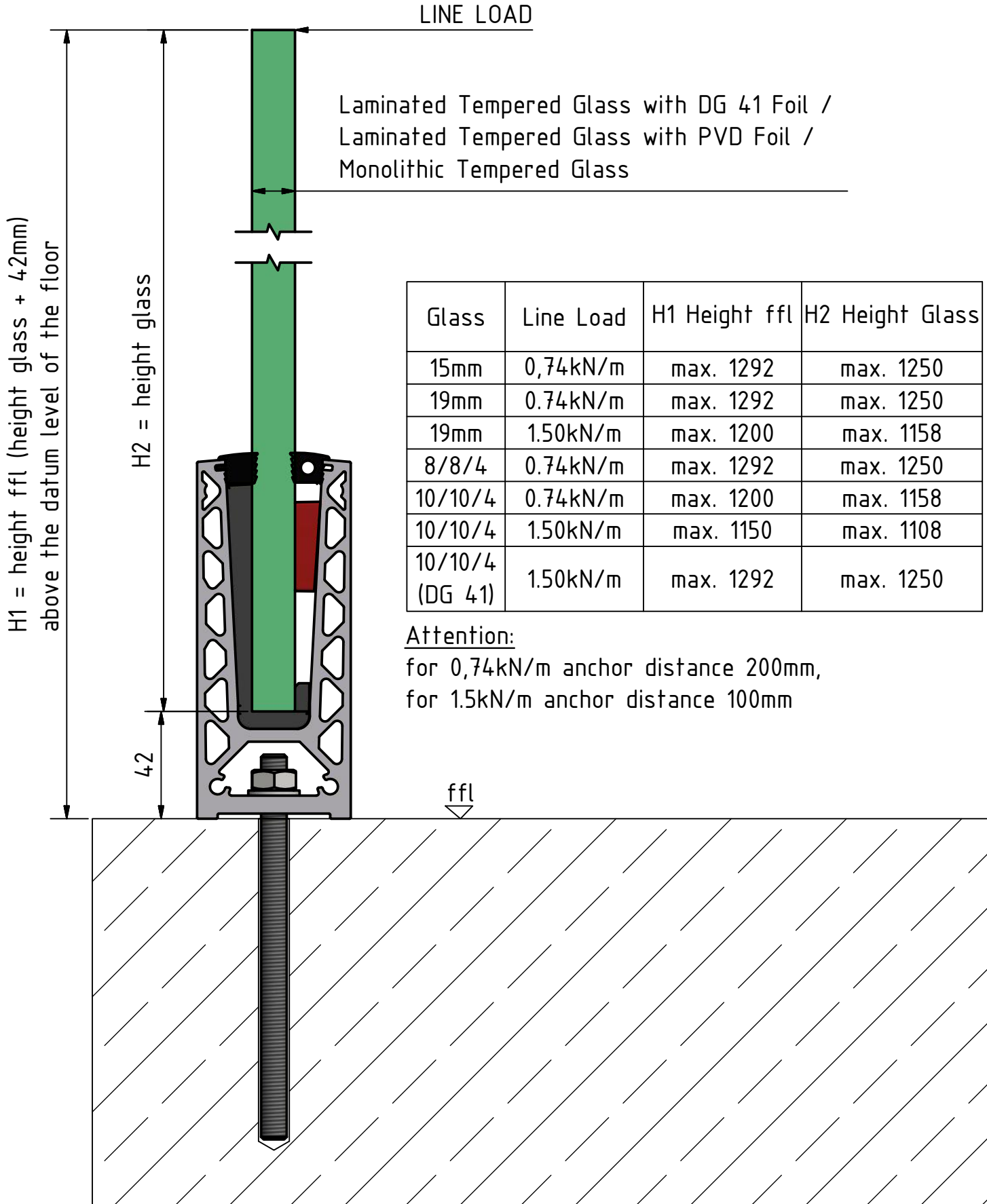
Deflection (mm)

APPENDIX - 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 Fischer FIS AM M10x150
Model 91.3551.015.81/ 91.3551.015.30
(or comparable anchor)

| | | | |
|---|----------------------|---------------------------------------|------------|
| Designed by FV | Created 09-Dec-16 | Modified | Comment |
|  | | Description Detail:Figure 1 | |
| | | Article number TL-6020 (top mount) | Size A4 |



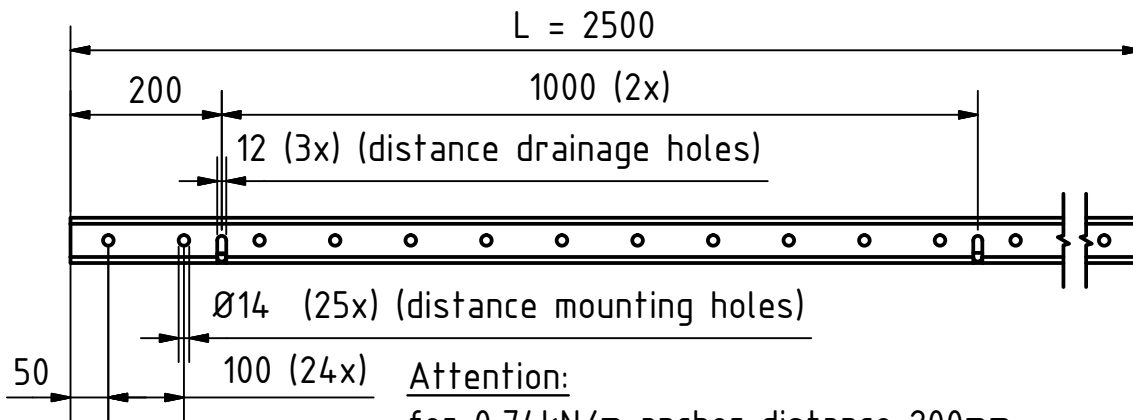
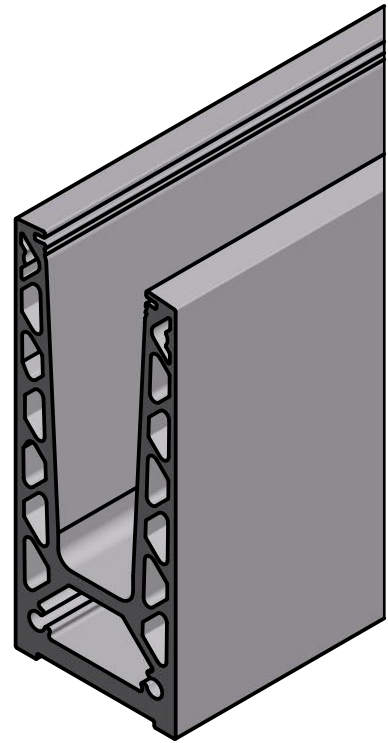
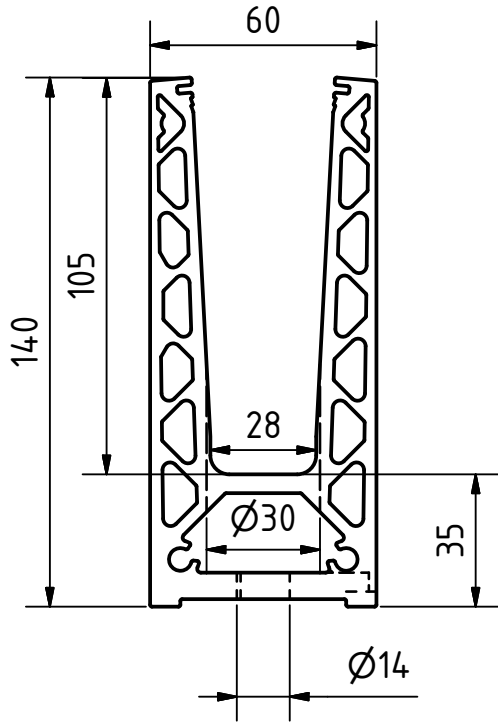
Laminated Tempered Glass with DG 41 Foil /
 Laminated Tempered Glass with PVD Foil /
 Monolithic Tempered Glass

| Glass | Line Load | H1 Height ffl | H2 Height Glass |
|-----------------|-----------|---------------|-----------------|
| 15mm | 0,74kN/m | max. 1292 | max. 1250 |
| 19mm | 0.74kN/m | max. 1292 | max. 1250 |
| 19mm | 1.50kN/m | max. 1200 | max. 1158 |
| 8/8/4 | 0.74kN/m | max. 1292 | max. 1250 |
| 10/10/4 | 0.74kN/m | max. 1200 | max. 1158 |
| 10/10/4 | 1.50kN/m | max. 1150 | max. 1108 |
| 10/10/4 (DG 41) | 1.50kN/m | max. 1292 | max. 1250 |

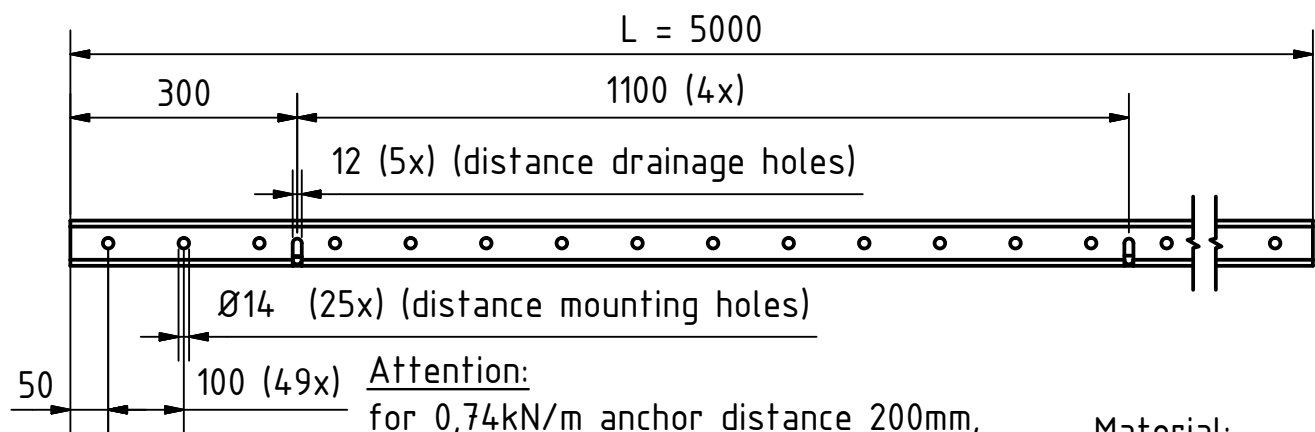
Attention:
 for 0,74kN/m anchor distance 200mm,
 for 1.5kN/m anchor distance 100mm

| | | | |
|-------------------|----------------------|---|----------------|
| Designed by FV | Created 09-Dec-16 | Modified | Comment |
| | | Description Detail: Figure 2 (Line Load / Glass Heights) | |
| | | Article number TL-6020 (top mount) | Scale 1 : 2 |

Figure 3



Attention:
 for 0,74kN/m anchor distance 200mm,
 for 1.5kN/m anchor distance 100mm



Attention:
 for 0,74kN/m anchor distance 200mm,
 for 1.5kN/m anchor distance 100mm

Material:
 Aluminum 6063-T6


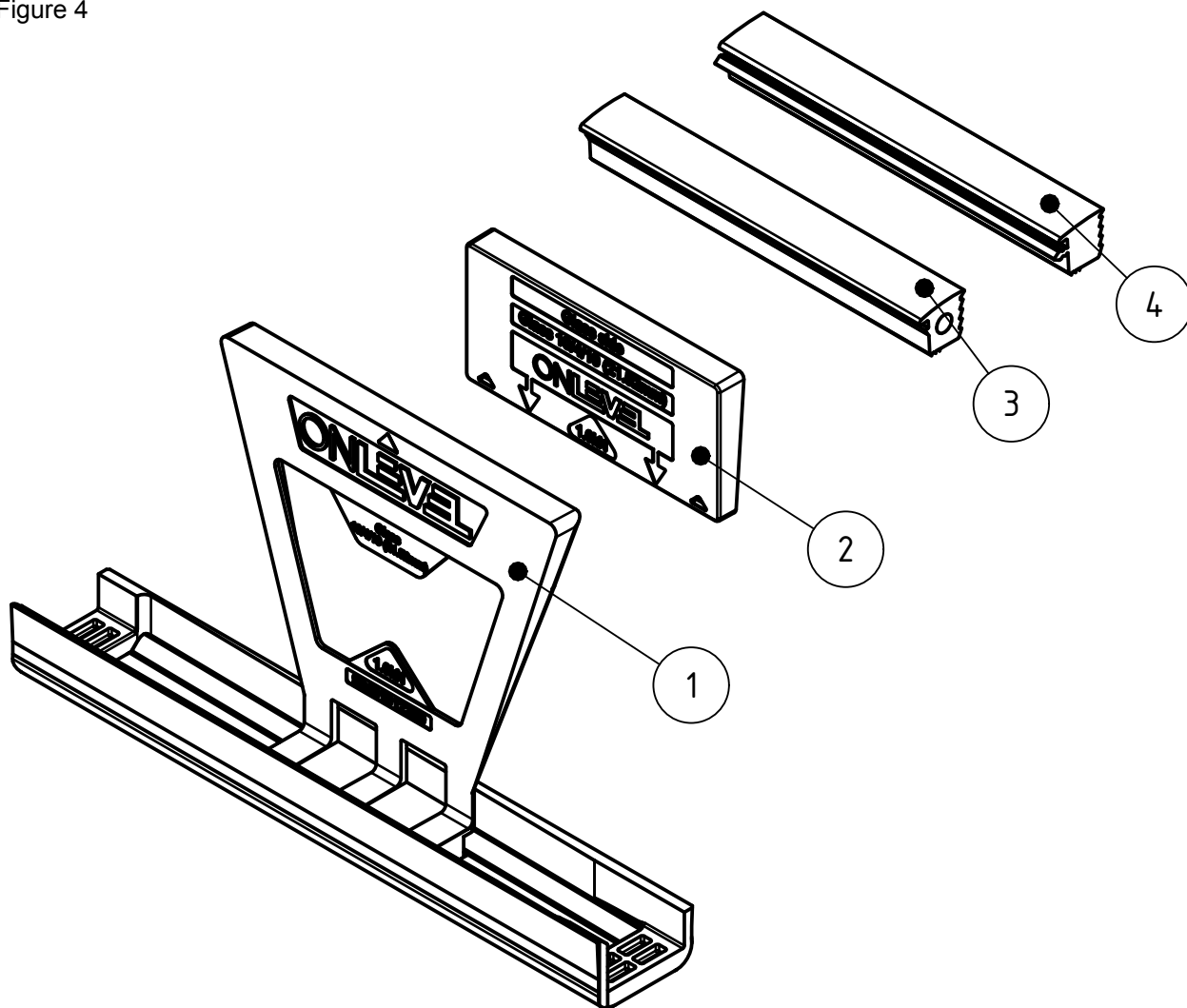
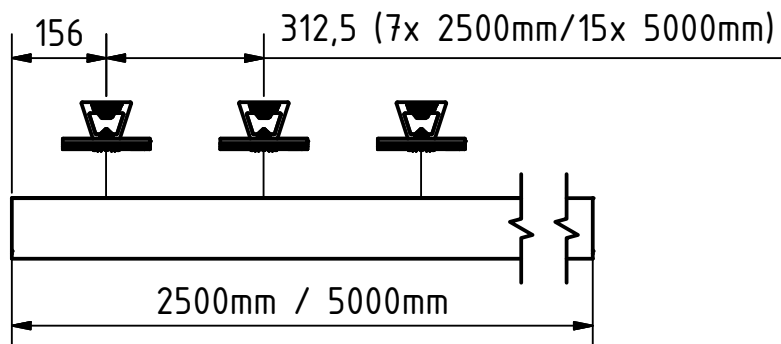
| | | | |
|---|----------------------|---|------------|
| Designed by FV | Created 09-Dec-16 | Modified | Comment |
|  | | Description Profile TL-6020 L =2500mm / L=5000mm | |
| | | Article number TL-6020 (top mount) | Size A4 |


Figure 4



| 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 09-Dec-16 | Modified | Comment |
|  | | Description Flex-Fits sets (quantity and distance) | |
| | | Article number TL-6020 (top mount) | Size A4 |