

Technical Report

Report No R17038

Product Tested: Xlafold – Bi-Fold door

Test Conducted for: Kaye Building Systems Ltd
Ogden Road
Wheatley Hills
Doncaster
South Yorkshire
DN2 4SG

Standard Specified: PAS 24:2016 – Enhanced security performance requirements for doorsets and windows in the UK

Project No: 17038

Date of Test: 12th January 2016

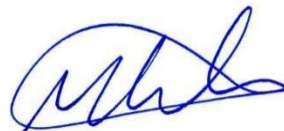
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Rev 1 – Customer wanted to change the name from 'Xfold' to 'Xlafold'.

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1. Introduction

This report describes testing of a door sample conducted at the test laboratory of Wintech Engineering Ltd on behalf of Kaye Building Systems Ltd in order to determine compliance with PAS 24:2016.

Wintech Engineering Ltd is accredited by the United Kingdom Accreditation Service as UKAS Testing Laboratory No. 2223

2. Summary of Results

The following summarises the results of testing carried out, in accordance with PAS 24:2016

Test Description	Result
Annex A – Security hardware and cylinder test	Pass
B.4.6 - Manual check test	Pass
B.4.4.3 - Infill – mechanical test	Pass
B.4.3 - Manipulation test (a)	Pass
B.4.4.4 - Manual cutting test	Pass
B.4.5 - Mechanical loading test	Pass
B.4.4.2 - Infill – manual test	Pass
B.4.8 - Soft body impact test	Pass
B.4.9 - Hard body impact test	Pass
Overall Classification in accordance with PAS 24:2016	D

More comprehensive details are reported in Section 6.

Note: These results are valid only for the conditions under which the test was conducted

Note: All measurement devices, instruments and other relevant equipment were calibrated and traceable to National Standards.

3. Description of Test Sample

Product range name:	Xlafold – Bi-Fold door
Configuration:	3 Pane (3-3-0)
Opening direction:	Right to Left

Outer Frame

Outer frame width:	2768mm	Outer frame material:	Aluminium/Polyamide
Outer frame height:	2200mm	Outer frame gasket	
Outer frame Part Numbers		Gasket type:	EPDM / Polypile
Top:	KBF7101	Manufacturer:	Exlabesa / Schlegel
Bottom:	KBF7101	Product name:	Frame Gasket / Frame Woolpile
Lock side:	KBF7101	Product code:	KGF01 / KWP48825WF
Hinge side:	KBF7101	Threshold	N/A
Outer frame section size		Manufacturer:	
Width:	90mm	Product name:	
Depth:	48mm	Product code:	
Reinforcing:	N/A	Material:	
Manufacturer:		Outer frame joint method	Mitred and Cleated
Product name:		Head:	4 x CLT1817
Product code:		Foot:	4 x CLT1817
Material:			

Leaf

Leaf width:	887mm	Leaf material:	Aluminium/Polyamide
Leaf height:	2118mm	Leaf gasket	
Leaf Part Numbers		Gasket type:	EPDM
Top:	KBF7103	Manufacturer:	Exlabesa
Bottom:	KBF7103	Product name:	Frame Gasket
Lock side:	KBF7103	Product code:	KGF01
Hinge side:	KBF7103	Leaf midrail:	N/A
Leaf section size		Manufacturer:	
Width:	75mm	Product name:	
Depth:	62mm	Product code:	
Reinforcing:	N/A	Material:	
Manufacturer:		Leaf joint method	
Product name:		Head:	4 x CLT1328
Product code:		Foot:	4 x CLT1328
Material:			

Glazing

Glass unit		Glazing gasket	
Manufacturer:	Glasscraft	Gasket type:	Captive Outer / Wedge Inner
Inner thickness:	4mm	Manufacturer:	Exlabesa
Spacer material:	20mm	Product name:	
Outer thickness:	4mm	Product code:	KGW20C / KGW045
Unit sizes:	28mm	Glazing clip	
Bead		Manufacturer:	N/A
Manufacturer:	Exlabesa	Product name:	
Product name:	28mm Bead	Product code:	
Product code:	KBF005	Glazing tape details	
Bead size:	20 x 17.5	Manufacturer:	N/A
Bead material:	Aluminium	Product name:	
		Product code:	

Hardware				
	Manufacturer:	Product description:	Product code:	Quantity:
Hinges:	Exlabesa	Bi-Fold Hinge-Black	KBFHB	10
Hinge fixing:	Anixter	M5 x 10 M/C Screws No 8 x 1" Self Tapping csk	KFMC0510 KFSC0825	8 each 2 each
Hinge protectors:	N/A			
Hinge protector fixings:	N/A			
Master Door Lock				
Door lock:	Fuhr	856 Type 10 Multi-Lock	M6302DBOSJ	1
Door lock fixings:	Anixter Components Direct Anixter	M4 x 45 csk screws M4 Tee Nuts No 8 x 1-1/4" Self Tap csk	M4 x 45 N/S JNA002A-NAT KFSC0830	8 8 2
Master Lock Keeps:	Fuhr	One piece keep	RL59602RX	1
Keep fixings:	Anixter Components Direct Anixter	M4 x 40 csk screws M4 Tee Nuts No 8 x 1-1/4" Self Tap csk	MTMFHM40CM400P500 JNA002A-NAT KFSC0830	9 9 7
Shoot Bolts:	Fuhr	Top shoot bolt Bottom shoot bolt	Top – MV150186S Btm – MV1508B6S	1 1
Shoot Bolt fixings	Anixter	No 8 x 2" Self Tapping csk	KFSC0850	2 EA
Shoot Bolt Keep	Fuhr	Top Keep / Strike Plt Btm Keep / Strike Plt	RUD84662LX / RD5185X RUD84662RX / RD5518X	1 EA 1 EA
Shoot Bolt Keep fixings	Anixter	No 8 x 1" Self Tapping csk	KFSC0820 KFSC0830	2 EA 2 EA

		No 8 x 1-1/4" Self Tap csk		
Cylinder:	DGS	Anti Bump – 50/50	KB5050C	1
Cylinder fixing:	Part of Cylinder Set			
Handle:	Hoppe	Atlanta SBD	3685501	1
Handle fixings:	Part of Handle Set			
Touch Bar	N/A			
Cylinder Support	N/A			
Cylinder Escutcheon	N/A			
Drip bar:	N/A			
Drip bar fixings:	N/A			
Rolling Gear:	Exlabesa	Top Guide	KBFTGB	1
	Exlabesa	Bottom Roller	KBFB RB	1
Intermediate Panel Locking:	Exlabesa	Shoot Bolt	KBFLKS	1
	Exlabesa	Shoot Bolt Rods	KBFSBKS	2
	Exlabesa	Verso Handle	KBVHEB	1
	Exlabesa	Half Cylinder	K4510HC	1

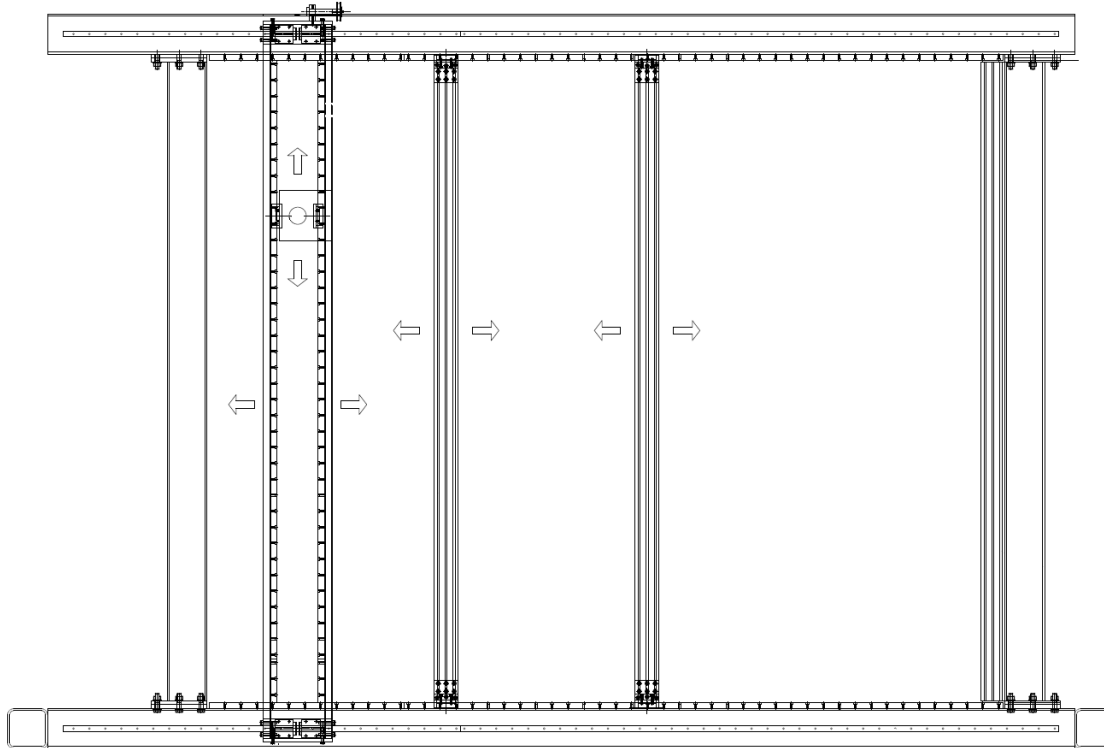
The details shown in Section 3 and drawings shown in Section 7 have been supplied by and confirmed as typical of normal production by Kaye Building Systems Ltd and have not been verified by Wintech Engineering Limited.

4. Test Arrangement

4.1 Test Rig

The test sample was supplied mounted in 100 x 75 mm sub-frame in accordance with manufacturer's installation requirements. It was fitted into the test rig, shown below which was constructed to meet the requirements of the test specification and was fitted plumb, square and without twist or bends.

Figure 1 – Test rig used for testing



5. Test Procedures

5.1 Annex A – Security hardware and cylinder test

The objective of this test was to assess the lock and cylinder and its resistance to manual attack when using Tools group A, Tools group B and Tools group C of PAS 24:2016. The test was broken in to 2 parts as follows:

Part 1 – the hardware was attacked for a total of 3 minutes which consisted of the following activities

- i. Attempts to remove, dislodge or otherwise gain access to the cylinder and lock by attacking any protective item
- ii. Attempts to break or defeat the cylinder by applying a twisting or bending force
- iii. Attempts to operate any accessible mechanism in order to gain entry

Part 2 – the hardware was attacked for a total of 3 minutes which consisted of the following activities

- i. Attempts to remove, dislodge or otherwise gain access to the cylinder and lock by attacking any protective item
- ii. Attempts to screw self-cutting screws in to the exposed part of the cylinder in order to provide a suitable fixing force for activity iii.
- iii. Attempts to break and defeat the cylinder by applying a nominally axial force to the screw using a hooked head crowbar attachment
- iv. Attempts to operate any accessible mechanism in order to gain entry

5.2 Manual check test – determine additional mechanical loading

The objective of the manual check test is to explore the possibility that there might be weaknesses and vulnerabilities in the product that are not covered in the standard cases.

The objective of this test was to assess any vulnerabilities of the sample that are not covered by the standard loading cases assessed in the mechanical loading test B.4.5. The tools described in Section B.4.6.2 of PAS 24:2016 were used for a maximum period of 15 minutes in an attempt to gain entry through the sample. No single location was tested for more than 6 minutes with no single attack technique being used for more than 3 minutes.

5.3 Infill – Mechanical test

The objective of this test was to assess the ability of the infill to withstand a specified sequence of loading without gaining entry through the sample. The loads and loading sequence were in accordance with Section B.4.4.3 of PAS 24:2016.

5.4 Manipulation test (a)

The objective of this test was to highlight any inherent vulnerability in the design of the door which, from the outside, would permit entry by the hardware being operated, released or disengaged when tested using all of Tools group A from Section A.2.1 of PAS 24:2016 and, where applicable, tools specified in A.2.2.3, A.2.2.5 and A.2.2.6 in Tools group B from Section A.2.2 of PAS 24:2016. The overall attack time was limited to 15 minutes with no single test technique being used for more than 3 minutes.

5.5 Manual cutting test

The objective of this test was to cut an aperture in the infill or fabric of the door leaf in order to gain entry using the tools described in section A.2.1.3, A.2.1.4, A.2.2.1 and A.2.2.2. Two tests were conducted; one in Zone 1 and a second in Zone 2. The overall attack time for each test was 3 minutes.

Zone 1 is a horizontal band with an upper limit 400 mm (+0 mm / -10 mm) above the centre of rotation of the upper hardware unlocking point and a lower limit 400 mm (+0 mm / -10 mm) below the centre of the rotation of the lower unlocking point as shown below. In the case of a single hardware unlocking

point zone 1 is a horizontal band with limits 400 mm (+0 mm / -10 mm) above and below the centre of rotation of the hardware unlocking point. Zone 2 covers any point of the doorset not in zone 1.

5.6 Mechanical loading test

The objective of this test was to assess the ability of the sample to withstand a specified sequence of loading without gaining entry through the sample. The loads and loading sequence were in accordance with Section B.4.5 of PAS 24:2016.

5.7 Additional mechanical loading test

The objective of this test was to assess the ability of the sample to withstand the application of loads identified during the manual check test. The loads and loading sequence were in accordance with Section B.4.5 of PAS 24:2016.

5.8 Manipulation test (b)

The objective of this test was to release threaded fasteners exposed as a result of the mechanical loading test using all of Tools group A from Section A.2.1 of PAS 24:2016 and, where applicable, tools specified in A.2.2.3, A.2.2.5 and A.2.2.6 in Tools group B from Section A.2.2 of PAS 24:2016. The overall attack time was limited to 3 minutes.

5.9 Infill – Manual test

The objective of this test was to attempt to remove gaskets, beads, security devices (if applicable) and the infill, using Tools group A and Tools group B described in section A.2.1 & A.2.2 of PAS 24:2016 for a maximum period of 3 minutes.

5.10 Soft body impact test

The objective of this test was to assess the ability of the sample to resist impacts using a soft body impactor as shown in Figure B.11 of PAS 24:2016 and at various impact locations specified in Section B.4.8.2 of PAS 24:2016.

5.11 Hard body impact test

The objective of this test was to assess the hardware, infill medium and its retention system to hard body impacts using the impactor as shown in Figure B.12 of PAS 24:2016. Impacts were conducted at various locations specified in Section B.4.9.2 of PAS 24:2016.

6. Test Results

6.1 Laboratory Conditions

Prior to the start of the test, the laboratory conditions were measured as follows:

Temperature (°C)	24.5
Humidity (% RH)	38

Note The test samples were stored in a non-destructive environment at a temperature of 15 – 30°C and a r.h. of 25 – 75 % for a minimum of 12 hours, testing was also conducted at those conditions. Prior to testing, the door was closed and locked from the outside and any keys were removed.

6.2 Security Hardware & Cylinder Test

Attempts were made from the external face to operate, release and disengage the security hardware in order to gain entry through the sample in accordance with Section A.3 of PAS 24:2016.

No entry was be gained during this test.

6.3 Manual check test

Attempts were made from the external face to gain entry through the sample by applying load combinations not covered by the standard loading cases for the mechanical loading test. The overall attack time was limited to 15 minutes with no single attack technique being used for more than 3 minutes and no single location being attacked for more than 6 minutes.

No entry was be gained during this test.

6.4 Infill – Mechanical test

A series of loads were applied to the external face of the infill as defined in Section B.4.4.3 of PAS 24:2016. A perpendicular-to-plane load of 2.0kN was applied and held for 8-12 seconds at each corner of the infill.

No entry was be gained during this test.

6.5 Manipulation test (a)

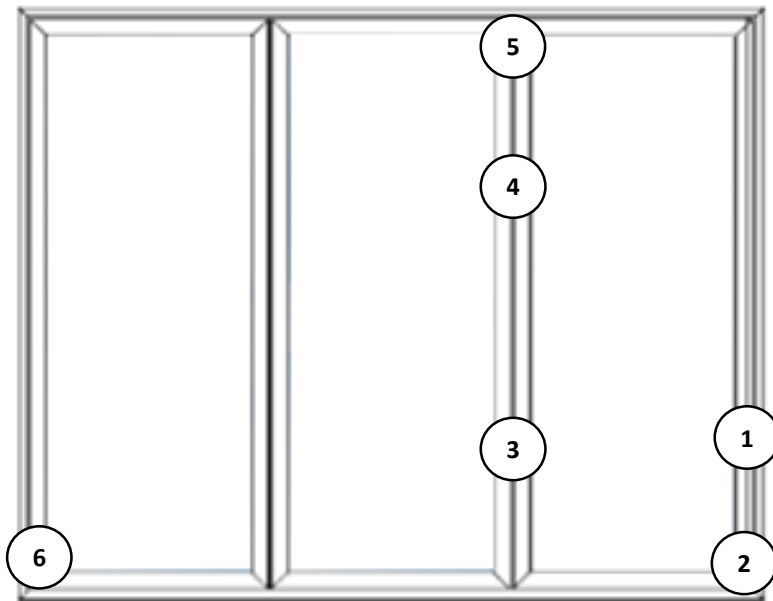
Attempts were made from the external face to operate, release and disengage the system hardware in order to gain entry through the sample in accordance with Section B.4.3 of PAS 24:2016. The results are as follows:

Table 1 – Manipulation test (a)

Location	Tools Used	Method	Time
Point 1 Cam	Scrapers	Levered in between the sash and the frame in an attempt to gain access to the locking point but could not.	03:00
Point 2 Dead bolt	Scrapers	Levered in between the sash and the frame in an attempt to disengage the dead bolt from its keep but could not.	03:00
Point 3 Hook bolt	Scrapers	Levered in between the sash and the frame in an attempt to gain access to the locking point but could not.	03:00
Point 4 Shoot bolt	Scrapers	Levered in between the sash and the frame in an attempt to disengage the shoot bolt from its keep.	03:00
Point 5 Lower roller and hinge	Scrapers	Levered under the sash and between the sashes in an attempt to lift the roller of its rail and to try to separate the hinge but could not, lower gasket removed during the test.	03:00

Point 6	X2 paint scrapers	Used paint scrapers in attempt to lever shootbolt over keep, no entry gained.	03:00
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Figure 2 – Attack locations



6.6 B.4.4.4 – Manual cutting test

Attempts were made from the external face to cut an aperture in the infill or fabric of the door leaf in order to gain access using tools as described in section A.2.1.3, A.2.1.4, A.2.2.1 and A.2.2.2 of PAS 24:2016. Two 3 minutes tests were carried out; one in Zone 1 and one in Zone 2 as defined in Section B.4.4.4 of PAS 24:2016.

No entry was gained during this test.

6.7 B.4.5 – Mechanical loading test

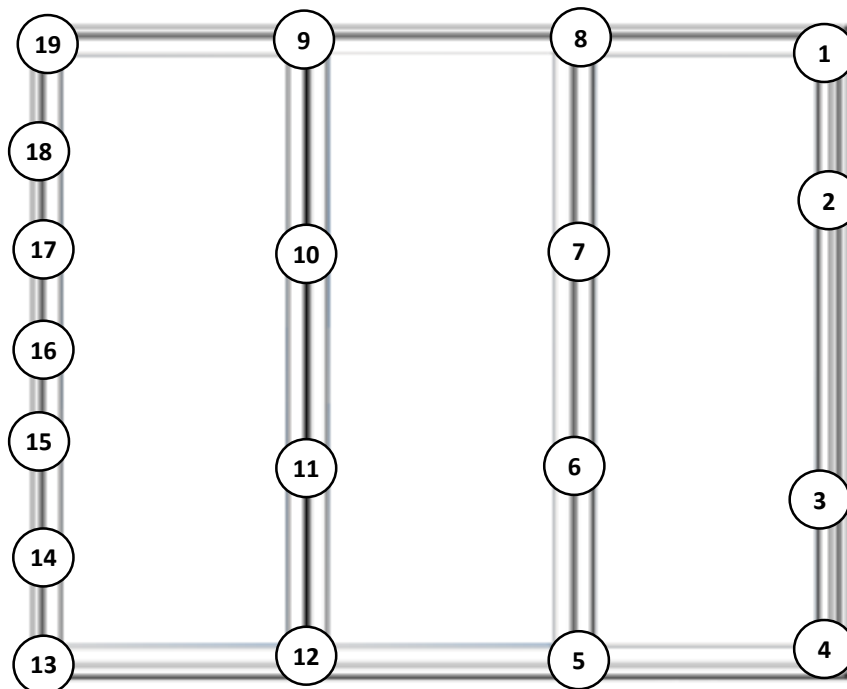
A series of loads were applied to the internal face of the sample as defined in Section B.4.5 of PAS 24:2016. The loading combinations used were as defined in Table B.1 to Table B.6 of PAS 24:2016 for the applicable door type and as shown in Table 2. The results are as follows:

Table 2 – Mechanical Loading

Loading Point	Parallel-to-plane Load		Perpendicular-to-plane Load		Result
	Load	Direction	Load	Direction	
1 – Hinge	1.5	←	4.5 kN	-	Pass
2 – Hinge	1.5	←	4.5 kN	-	Pass
3 – Hinge	1.5	←	4.5 kN	-	Pass
4 – Hinge	1.5	←	4.5 kN	-	Pass
5 – Shoot bolt	1.5	↑	4.5 kN	-	Pass
5 – Hinge	1.5	↔	4.5 kN	-	Pass
6 – Hinge	1.5	↔	4.5 kN	-	Pass
7 – Hinge	1.5	↔	4.5 kN	-	Pass
8 – Hinge	1.5	↔	4.5 kN	-	Pass
8 – Shoot bolt	1.5	↓	4.5 kN	-	Pass
9 – Roller	4.5	↓	4.5 kN	-	Pass
9 – Hinge	1.5	↔	4.5 kN	-	Pass

10 – Hinge	1.5	↔	4.5 kN	-	Pass
11 – Hinge	1.5	↔	4.5 kN	-	Pass
12 – Hinge	1.5	↔	4.5 kN	-	Pass
12 – Roller	4.5	↑	4.5 kN	-	Pass
13 – Shoot	1.5	↑	4.5 kN	-	Pass
14 – Cam	1.5	→	4.5 kN	-	Pass
14 – Cam	1.5	↑	4.5 kN	-	Pass
15 – Hook	1.5	→	4.5 kN	-	Pass
15 – Hook	1.5	↓	4.5 kN	-	Pass
16 – Dead bolt	1.5	→	4.5 kN	-	Pass
17 – Hook	1.5	→	4.5 kN	-	Pass
17 – Hook	1.5	↓	4.5 kN	-	Pass
18 – Cam	1.5	→	4.5 kN	-	Pass
18 – Cam	1.5	↑	4.5 kN	-	Pass
19 – Shoot bolt	1.5	↓	4.5 kN	-	Pass

Figure 3 – Loading points



6.8 B.4.4.2 – Infill manual test

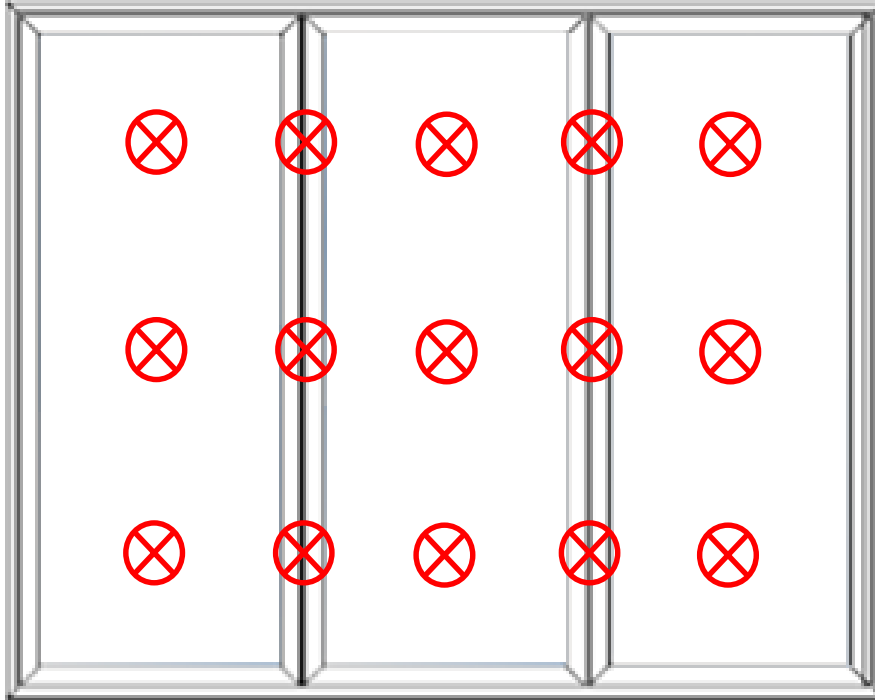
Attempts were made from the external face to remove gaskets and beading in order to gain access to and remove the infill using tools A.2.1 & A.2.2 in accordance with Section B.4.4.2 of PAS 24:2016.

No entry was gained during this test.

6.9 B.4.8 – Soft body impact test

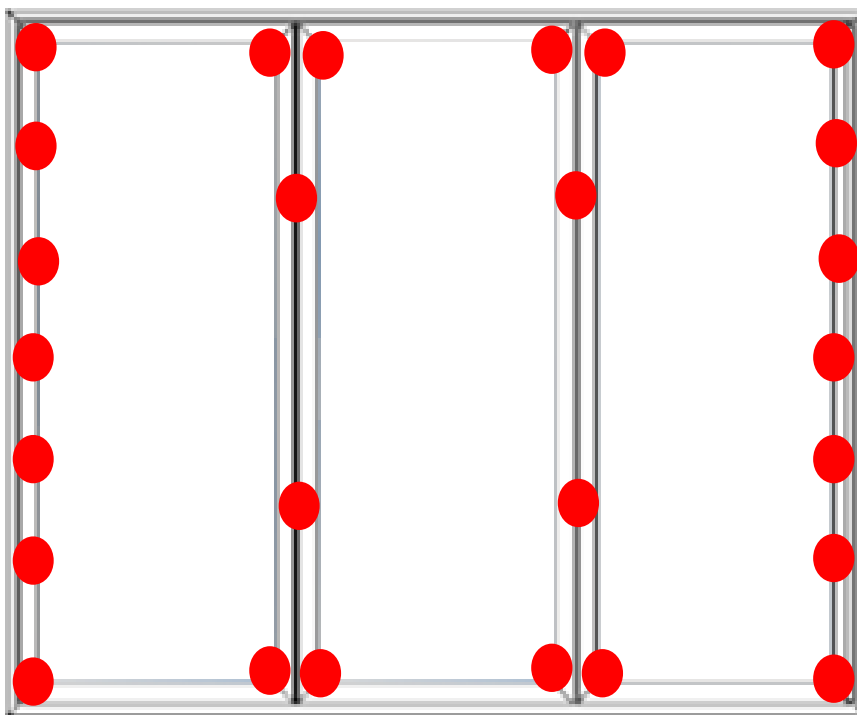
The test sample was subject to soft body impacts on the external face as shown in Figure 4. Each of the locations was subject to 3 impacts from a drop height of 800mm, following which no damage was observed.

Figure 4 – Impact locations

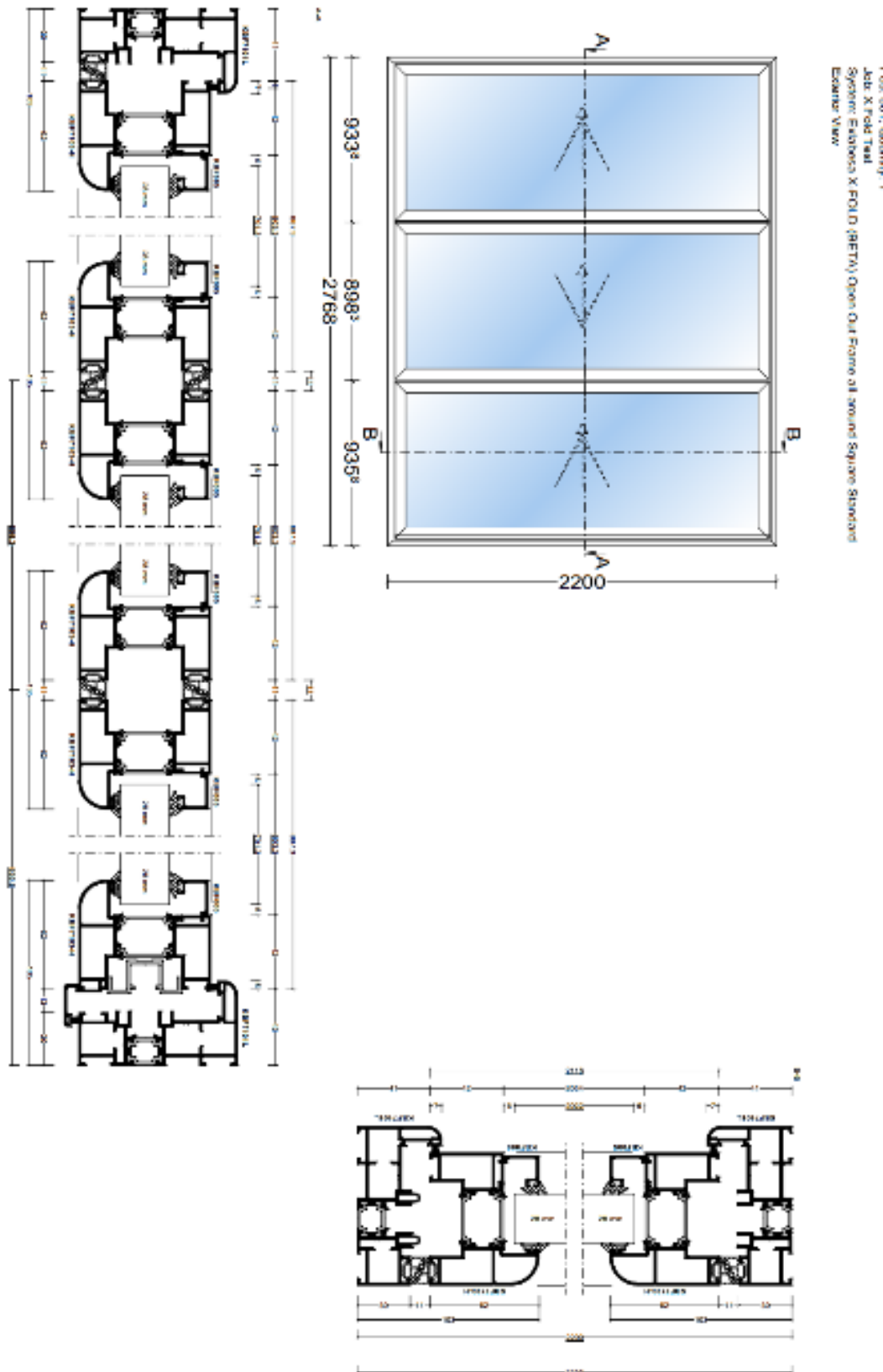


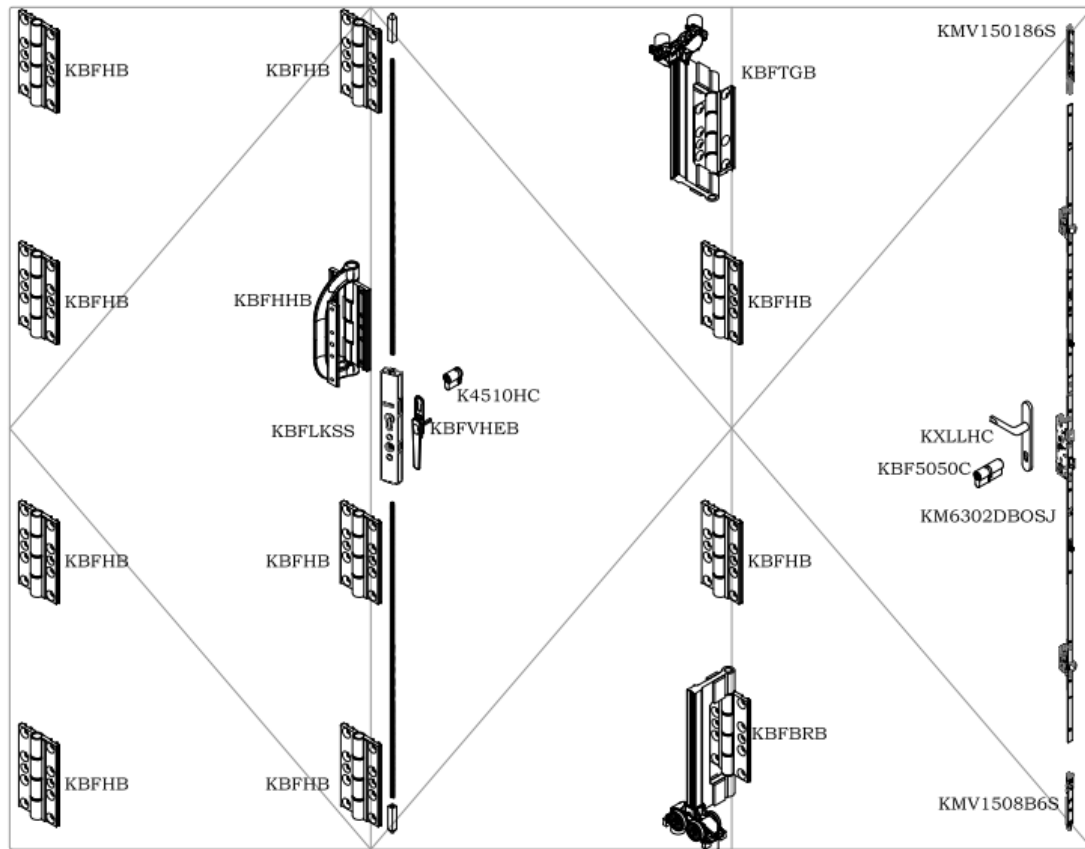
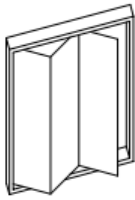
The test sample was subject to hard body impacts on the external face as shown in Figure 5. Each of the impact locations was subject to 3 impacts from a drop height of 165 mm following which no entry was gained through the sample.

Figure 5 – Impact locations



7. System Drawings





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