

## Technical Report

**Report No** R16712

**Product Tested:** VEKA Halo – IMAGINE Patio Doors with Low Threshold

**Test Conducted for:** MI Products  
4020 Siskin Parkway East  
Middlemarch Business Park  
Coventry  
CV3 4SU

**Standard Specified:** BS 6375 Part 2:2009  
BS EN 12046-2:2000,  
BS EN 12217:2003,  
BS EN 948:1999,  
BS EN 949:1999,  
BS EN 950:1999,  
BS EN 1191:2000 and  
BS EN 1192:2000

**Project No:** 16712

**Date Samples Received:** 17<sup>th</sup> November 2016



**Date of Test:** 22<sup>nd</sup> December 2016 – Mechanical Strength  
14<sup>th</sup> December 2016 – 30<sup>th</sup> January 2017 – Repeated Opening and Closing

**Test Conducted at:** Wintech Engineering Limited  
Halesfield 2  
Telford  
Shropshire  
TF7 4QH

**Test Conducted by:** D Woodcock Laboratory Technician  
D Knight Laboratory Technician

**Report Compiled by:** S Tawn  
Laboratory Apprentice

**Authorised by:** M Wass  
Technical Director



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## 1. Introduction

This report describes tests conducted at the test laboratory of Wintech Engineering Ltd to a Door sample on behalf of MI Products.

The test sequence was conducted between 22<sup>nd</sup> December and 30<sup>th</sup> January 2017 in order to determine the durability of the sample with respect to operating forces, mechanical strength and resistance to repeated operation. The test methods were in accordance with the following standards as per the request of MI Product.

BS 6375 Part 2: 2009	Performance of Windows & Doors, Classification for operation and strength characteristics and guidance on selection and specification
BS EN 12046-2:2000	Operating forces test method
BS EN 12217:2003	Operating forces classification
BS EN 948:1999	Resistance to static torsion test method
BS EN 949:1999	Resistance to soft and heavy body impacting test method
BS EN 950:1999	Resistance to hard body impacting test method
BS EN 1192:2000	Doors classification of strength requirements
BS EN 1191:2000	Windows and doors – Resistance to repeated opening and closing – Test method

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 the relevant testing & classification standards.

<b>Test Method &amp; Classification Standard</b>	<b>Description</b>	<b>Classification</b>
BS EN 12046-2:2000 BS EN 12217:2003	Operating forces	Class 2
BS EN 1192:2000	Mechanical Strength	Class 2
BS EN 948:1999 BS EN 1192:2000	Static torsion	250 N
BS EN 949:1999 BS EN 1192:2000	Soft & heavy impacting	60 J
BS EN 950:1999 BS EN 1192:2000	Hard body impacting	3 J
BS EN 1191:2000	Repeated opening and closing	Class 4

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

Name of System –	VEKA Halo IMAGINE Patio Doors with Low Threshold
Manufactured By –	VEKA Technical Department
Sample Size –	3000 x 2400
Door Material Type –	PVC Frame and Sashes Aluminium Low Threshold 2002324 Steel Reinforcing
Joining Method –	Mitre and welded top frame sashes Mechanical joint btm frame to threshold
Locking Points –	Mila Fearkess 6 point lock to slider 108305 Mila 3 point mush cam espag to interlock 109000
Glass Make Up & Thickness –	MI Secure 4 Life interlock protectors and corner bolt 2002333/109020 28mm clear 4/20/4 toughened glass
Gasket –	Co-extruded seals to all glazing VSW401G aluminium thresh brush seal
Hardware Used –	Mila – locks handle and cylinder (30-30) 108305/108908/4040ETMNF6 MI Products – top corner bolt, aluminium interlock and protectors 109020/2002333 Mila – handle to interlock mechanism 109048
Drainage –	2 slots bottom of each sash 5 x 25 1 centre of threshold 30 x 30 1 each end of connecting blocks
Sealants Used –	Low modulus sealant around ends of connecting blocks at threshold frame joints
Sub Frame Fixings –	5 x 80mm screw fixings for frame 4.3 x 25 screw fixings for threshold
Hardware Fixings –	4.3 x40 gimlet point screws for lock 3.9 x 45 drill point for strikers 3.9 x 32 drill point for interlock protectors

The description of the test sample in this section has been supplied by the customer and has not been verified by Wintech Engineering Limited.

See Section 7 for test sample drawings as supplied by MI Products.

#### **4. Test Arrangement**

##### **4.1 Test Rig**

The test sample was mounted in to a 100 x 75 mm timber sub-frame in accordance with manufacturer's installation requirements and was secured into the test rig ready for testing.

##### **4.2 Instrumentation**

###### **4.2.1 Force Measurement**

Calibrated force gauges and load cells were used to measure operation forces to +/- 5%.

###### **4.2.2 Time**

A calibrated stop watch was used to measure/record time

###### **4.2.3 Torque**

A calibrated torque meter was used for recording forces required to operate any finger operated hardware with an accuracy of +/- 5%

###### **4.2.4 Scales**

The mass of the opening leaf was measured using scales accurate to +/- 2%

###### **4.2.5 Measuring Tape**

A measuring tape and rule accurate to +/- 0.5mm were used

###### **4.2.6 Impactor**

###### **4.2.6.1 Soft & heavy Impactor**

A spherical leather bag with a total body mass of 30 Kg  $\pm$  0.6Kg of an approximately 350mm diameter was used for soft and heavy body impacts

###### **4.2.6.2 Hard body Impactor**

A 50mm  $\pm$  1mm steel ball was used for hard body impacts

###### **4.2.7 Temperature & Humidity**

A digital data logger capable of measuring temperature with an accuracy of  $\pm$  1°C and humidity with an accuracy of  $\pm$  5 %Rh was used.

### 5. Test Procedures

#### 5.1 Sequence of Testing

##### Sample 1

1. Operating Forces
2. Static Torsion
3. Soft & Heavy Body Impact Resistance
4. Hard Body Impact Resistance

##### Sample 2

5. Operating Forces
6. Resistance to Repeated Opening and Closing
7. Operating Forces

#### 5.2 Operating forces

##### 5.2.1 Dynamic closing

Prior to testing the door, all moving parts were manually operated 5 times as required by the test standard

A pulley system used together with a nylon cord and a series of weights was attached adjacent to the door handle in order to create a dynamic closing action.

The weight was adjusted in 1N increments in order to determine the minimum force required to latch the door from a distance of 200mm.

This method was repeated three times with the results averaged to obtain the final value.

##### 5.2.2 Operating hardware

The minimum force to engage the latch, lock and unlock the hardware before finally unlatching the hardware was recorded.

The sequence was repeated three times with the results averaged to obtain the final value.

##### 5.2.3 Opening forces

The minimum force to commence and maintain the motion of the door leaf to a distance of 200mm was recorded.

The sequence was repeated three times with the results averaged to obtain the final value.

#### 5.3 Resistance to static torsion

Without any vertical restraint, the door leaf was positioned at an angle of 90° to the plane of the frame, with the top lock side corner secured.

A pre-load was applied horizontally to the plane of the leaf to the lower lock side corner and held for a period of 60 secs, the load was then removed and following a rest period of 60 secs the location of the lower lock side corner recorded.

The test force was then applied to the same loading point and held for a period of 5 mins. On completion of the 5 mins a measurement of the location of the lower lock side corner was recorded then the load removed.

Following a 3 min period in which no load was applied to the sample, a further measurement of the lower lock side corner location recorded.

With the door leaf closed, and where applicable secured in accordance with its normal operating mode, the centre of the door was identified as the impact point.

Using a reference bar and Digital depth gauge, any deviation in the flatness of the door leaf was recorded. The Impactor was then suspended so that it made light contact with the surface of the door leaf, and its centre of gravity was positioned on a line perpendicular to the door leaf.

The Impactor was released and the door leaf impacted following which the reference bar and Digital depth gauge were used to determine any change to the flatness of the door leaf.

This procedure was conducted 3 times with the flatness being recorded following each impact.

The same sequence of impacting was then repeated on the other face of the door sample.

### 5.5 Hard body impacting

With the door leaf positioned horizontally and supported under its two longest edges, pattern 4 was selected from the four aiming patterns shown in the test standard. The impact positions contained within this pattern were deemed to coincide with theoretically the weakest points on the door leaf, with any glazed areas being omitted from the test, reducing the number of impact points.

The impactor was dropped on each impact point and any indentation measured and recorded for diameter, depth and cracking.

### 5.6 Resistance to Repeated Opening and Closing

#### 5.6.1 Prior to the test

The mass of the casement, sash or leaf was measured prior to any testing.

With the test sample installed in accordance to clause 6 of EN 1191:2000, the sample was subject to 5 manual operations before the following initial measurements were taken:

- a) The dead load applied by the operating equipment on the casement, sash or leaf
- b) The stroke of the casement, sash or leaf in degrees or millimetres
- c) Dimensions at datum points were taken in order to establish a nominal set of dimensions
- d) The operating forces, measured in accordance with BS EN 12046-2:2000

The cylinders were adjusted in accordance with the operation of the hardware its reference velocity and attainment of forces within the specified limits, the rest times and strokes.

#### 5.6.2 Cyclic test

The test was configured for the correct amount of cycles according to the required classification as outlined in BS EN 12400:2002.

At every period equal to 25% of the specified total test cycles (or less if specified by the manufacturer for lubrication) the test was stopped and the test specimen examined. The test was continued and paused at the examination periods throughout its duration as defined above.

#### 5.6.3 Following the test

Following the completion of the defined number of cycles, the following measurements were taken:

- a) The dead load applied by the operating equipment on the casement, sash or leaf
- b) The stroke of the casement, sash or leaf in degrees or millimetres
- c) Dimensions at datum points were taken in order to establish a nominal set of dimensions
- d) The operating forces, measured in accordance with BS EN 12046-2:2000

## 6. Test Results

### 6.1 Lab Conditions

The conditions measured inside the laboratory were as follows:

Temperature - °C	Humidity - %rh
26	25

### 6.2 Operating forces

The results of the tests carried out are as follows:

	Result	Class
Closing Force (N)	41.20	2
Latch Hardware (N)	32.43	2
Lock Hardware (Nm)	0.4	4
Unlock Hardware (Nm)	0.4	4
Unlatch Hardware (N)	27.53	2
Commence Opening (N)	45.90	2

Following testing the sample was opened, closed and all hardware operated to ensure the sample remained fully functional, which it was.

The overall classification for operating forces is: **CLASS 2**

### 6.3 Mechanical Strength

#### 6.3.1 Resistance to static torsion

Test Load	250 N
Deformation Under Load	0.36 mm
Residual Deformation Following Test	0.09 mm

Following the test, there were no signs of any damage to the test sample and it remained functional.

#### 6.3.2 Resistance to soft and heavy body impacting

Inside Face of Doorset

	Sliding Leaf			Fixed Light		
	Energy (J)	Deviation in flatness (mm)	Damage caused to the sample	Energy (J)	Deviation in flatness (mm)	Damage caused to the sample
Impact 1	60	0.19	None	60	0.12	None
Impact 2	60	0.12	None	60	0.11	None
Impact 3	60	0.07	None	60	0.09	None

Following the test, there were no signs of any damage to the test sample and it remained functional.

Weather Face of Doorset

	Sliding Leaf			Fixed Light		
	Energy (J)	Deviation in flatness (mm)	Damage caused to the sample	Energy (J)	Deviation in flatness (mm)	Damage caused to the sample
Impact 1	60	0.11	None	60	0.05	None
Impact 2	60	0.15	None	60	0.06	None
Impact 3	60	0.15	None	60	0.05	None

Following the test, there were no signs of any damage to the test sample and it remained functional.



### 6.3.3 Resistance to hard body impacting

Aiming pattern	3
Impact Energy (J)	3

Impact Number	Depth of Indent (mm)	Diameter of Indent (mm)	Diameter of cracking (mm)
1	0.3	2.00	0.0
2	0.2	2.00	0.0
3	0.2	2.00	0.0
4	0.2	2.00	0.0
5	0.3	2.00	0.0
6	0.2	2.00	0.0
Mean	0.23	2.00	0.0
Co-efficient of variation	22.13	0.0	0.0

Following the test, there were no signs of any damage to the test sample and it remained functional.

### 6.4 Overall Classification for Mechanical Strength

Resistance to:	Class 1	Class 2	Class 3	Class 4
Vertical Load (N)	400	600	800	1000
Static Torsion (N)	200	250	300	350
Soft and heavy body impact (J)	30	60	120	180
Hard body impact (J)	1.5	3	5	8

The overall classification for operating forces is: **CLASS 2**

**6.5 Resistance to Repeated Opening and Closing****6.5.1 Initial Measurements**

Weight of casement (kg)	86.5
Dead load applied by the operating equipment (kg)	0.035
Stroke of casement	1165mm

	Result	Class
Closing Force (N)	31.1	2
Latch Hardware (N)	10.1	3
Lock Hardware (Nm)	0.23	4
Unlock Hardware (Nm)	0.17	4
Unlatch Hardware (N)	11.4	3
Commence Opening (N)	33.7	2

**6.5.2 Cycle Test**

The number of cycles completed by the sample was **50,000** as required by **Class 4** of the standard.

**6.5.3 Datum Measurements**

Observations and measurement of the datum points were measurement from a point 50mm from each edge of the casement in relation to the outer frame.

Description	Dimension in mm							
	1	2	3	4	5	6	7	8
Before cyclic test	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4
After cyclic test	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4
Difference	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

**6.5.4 Final Measurements**

	Result	Class
Closing Force (N)	27.5	2
Latch Hardware (N)	11.4	3
Lock Hardware (Nm)	0.1	4
Unlock Hardware (Nm)	0.1	4
Unlatch Hardware (N)	7.6	4
Commence Opening (N)	40.6	2

The following calculation is used to assess the variation in performance as a result of the repeated opening and closing test

$$V(\%) = 100 \left( \frac{Pe}{Pi} - 1 \right)$$

**V** is the percentage variation in performance

**Pe** is the operating forces measured after the test

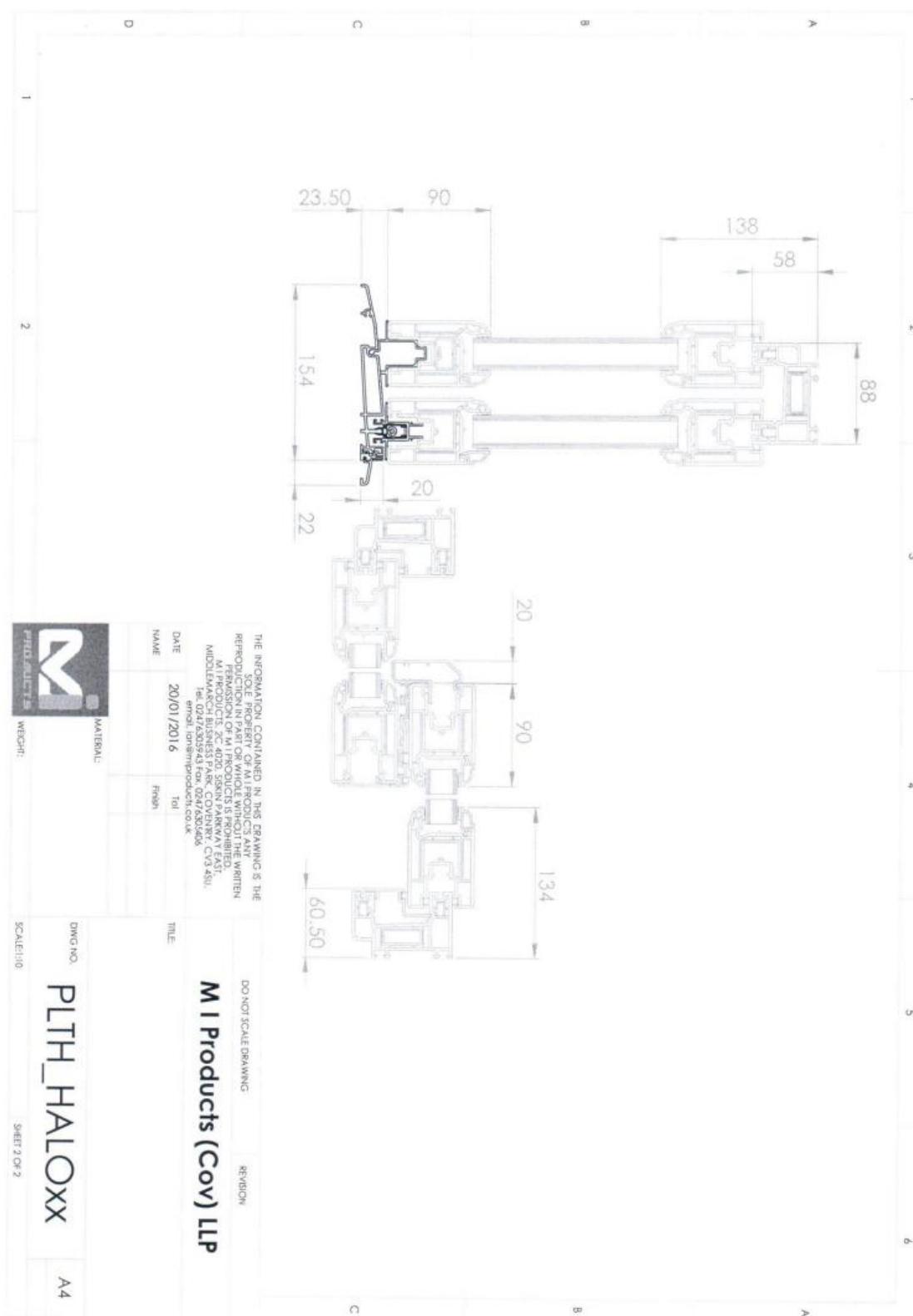
**Pi** is the operating forces measure before the test

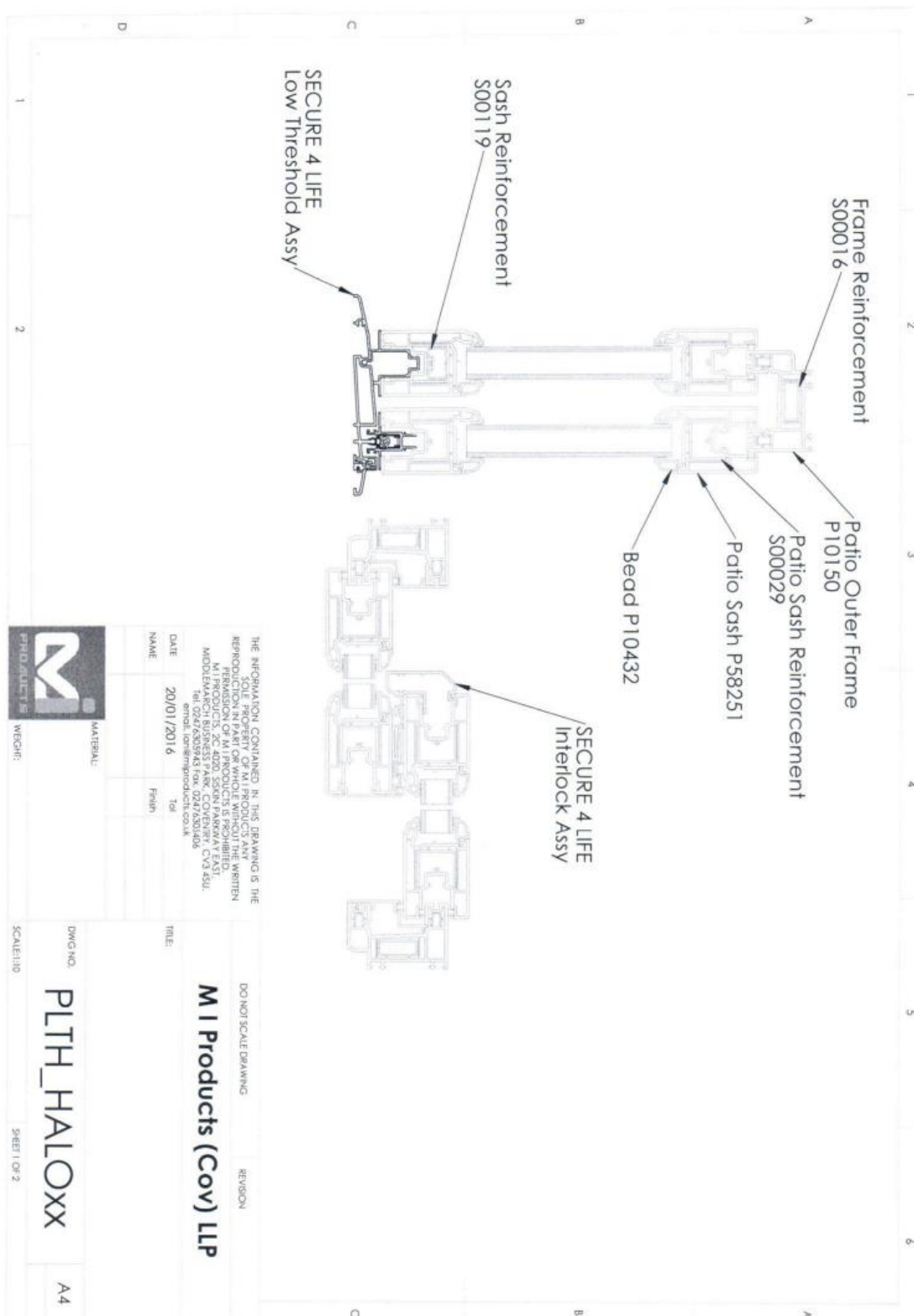
Description	Variation in performance %
Closing Force	-11.58
Latch Hardware	12.87
Lock Hardware	-56.52
Unlock Hardware	-41.18
Unlatch Hardware	-33.33
Commence Opening	20.47

The overall classification for repeated opening and closing is:

**CLASS 4**

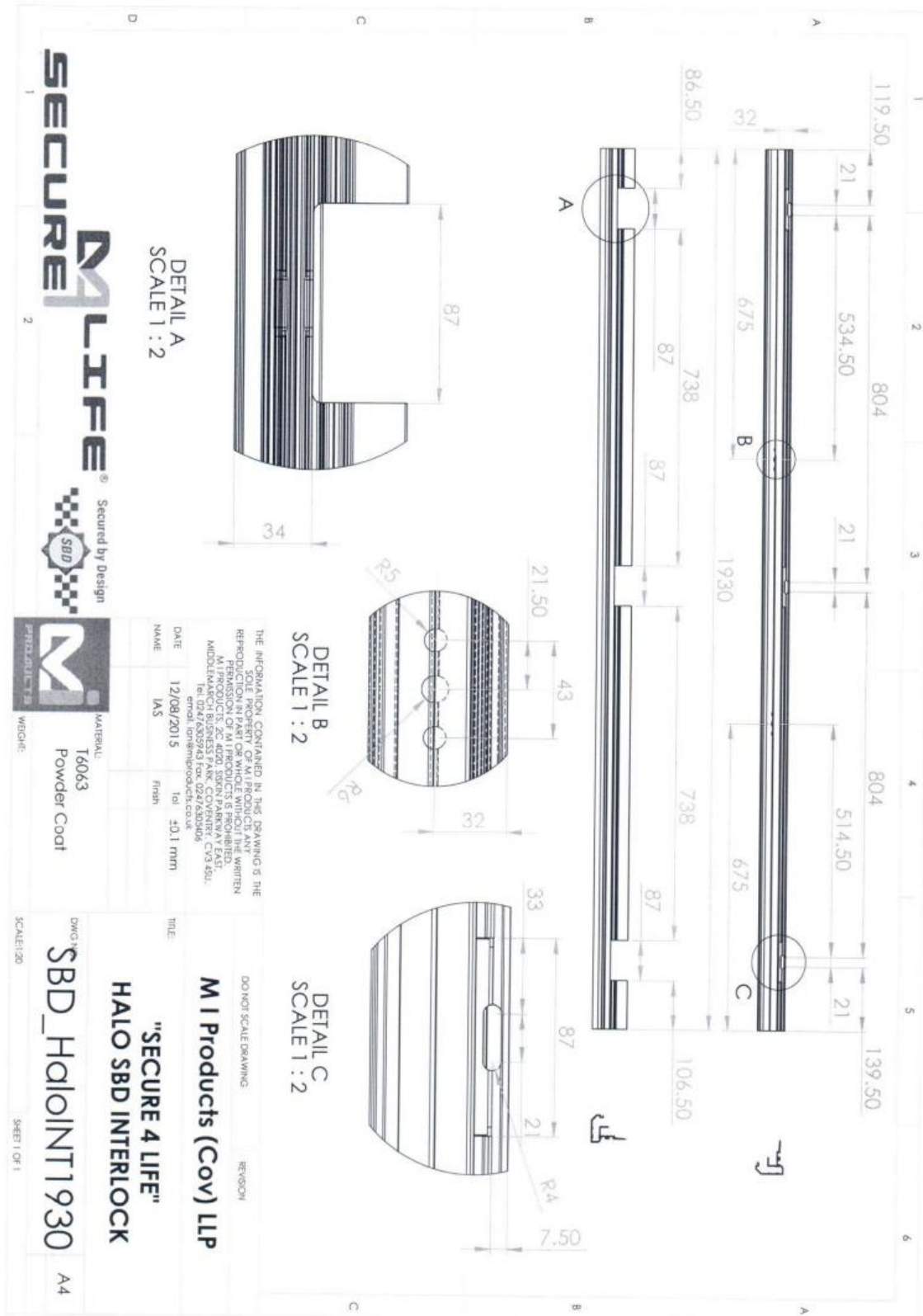
## 7. System Drawings



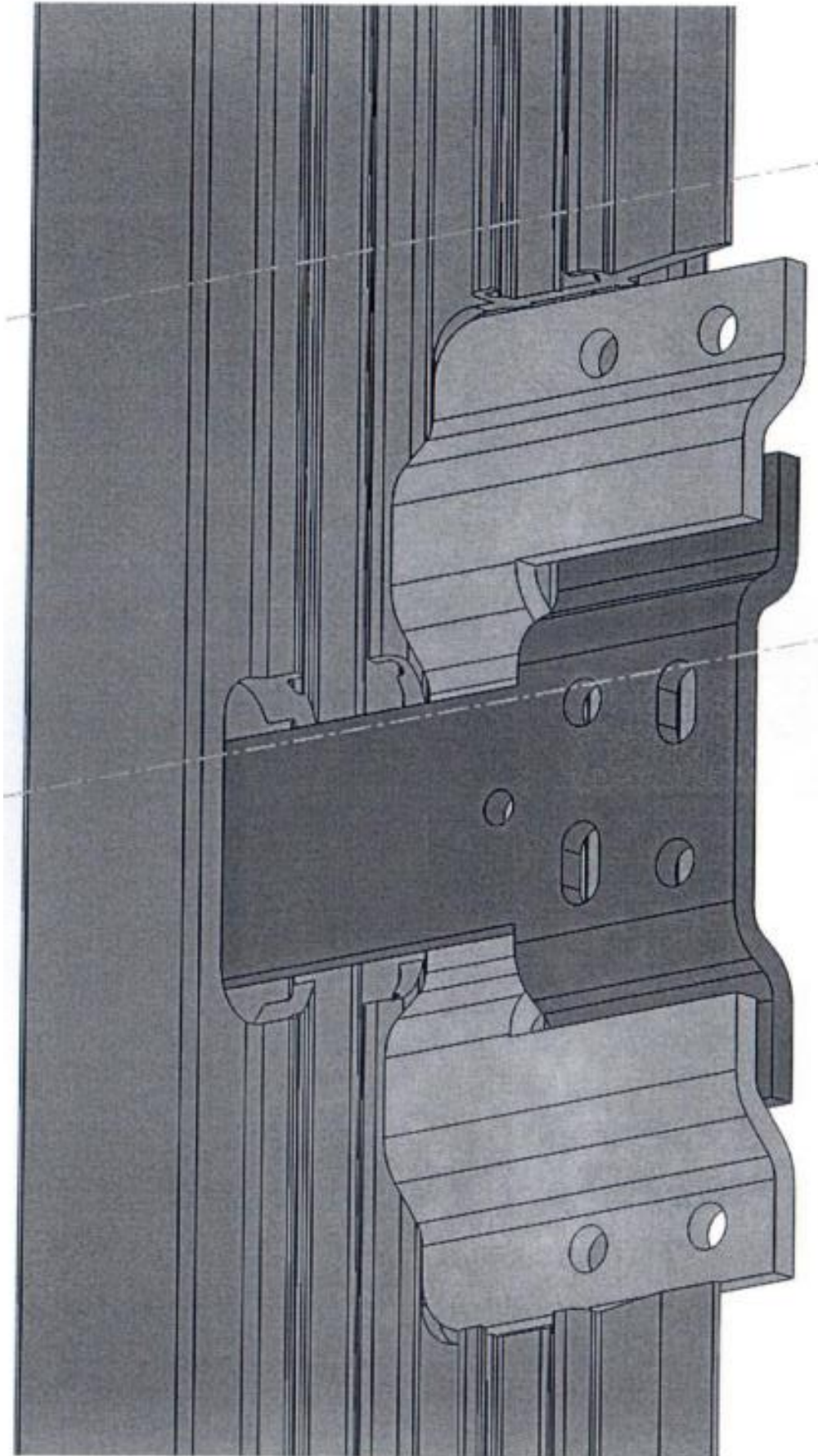




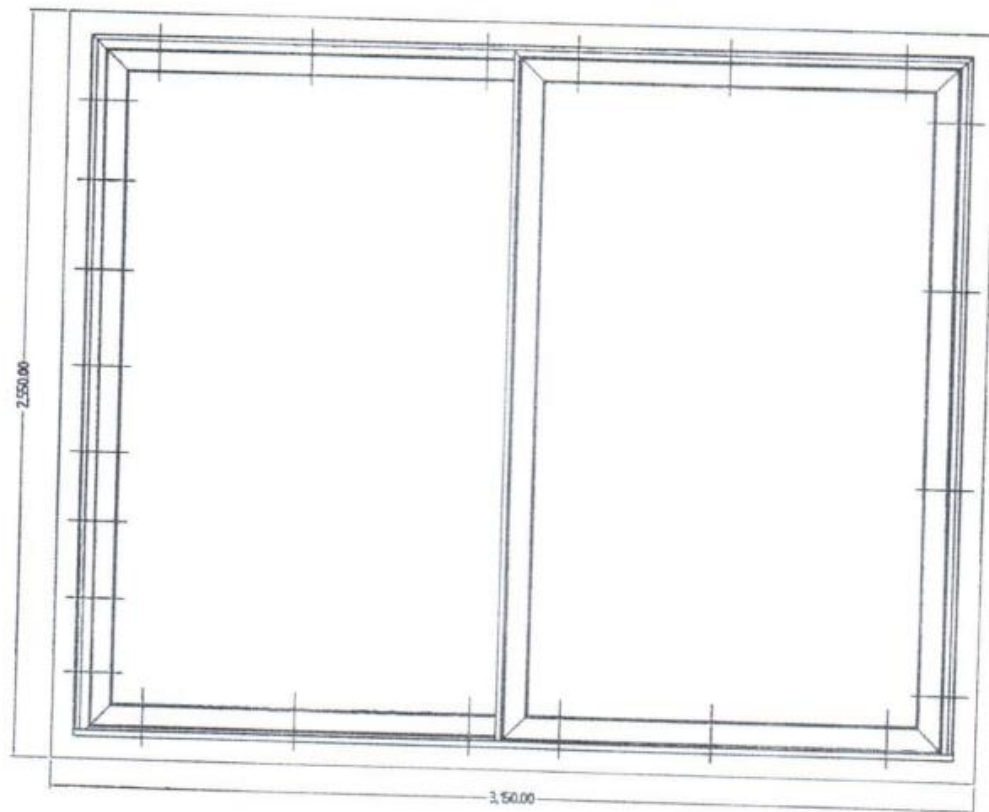




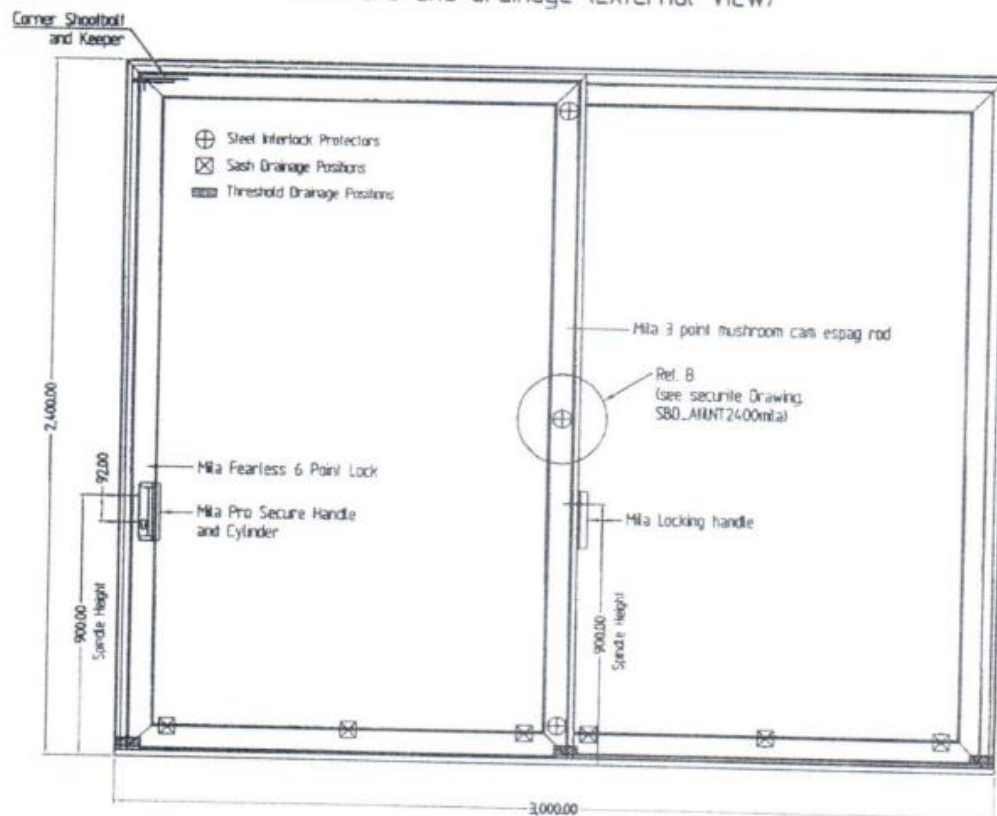




Subframe Fixing (Internal View)



Hardware and drainage (External View)



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