

Technical Report

Report No R15310

Product Tested: Eurocell – Euroslide Patio Doors with Low Threshold

Test Conducted for: Eurocell Profiles
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Standard Specified: BS 6375 Part 2:2009
BS EN 12046-2:2000,
BS EN 12217:2003,
BS EN 947:1999,
BS EN 948:1999,
BS EN 949:1999,
BS EN 950:1999,
BS EN 1191:2000 and
BS EN 1192:2000

Project No: 15310

Date Samples Received: 23rd September 2015

Date of Test: 29th September 2015 – Mechanical Strength
15th October – 1st December 2015 – Repeated Opening and Closing

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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 Eurocell Profiles.

The test sequence was conducted between 29th September and 1st December 2015 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 Eurocell Profiles.

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 947:1999	Resistance to vertical load test method
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.

Test Method & Classification Standard	Description	Classification
BS EN 12046-2:2000 BS EN 12217:2003	Operating forces	Class 1
BS EN 1192:2000	Mechanical Strength	Class 2
BS EN 947:1999 BS EN 1192:2000	Vertical load	N/A
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	Eurocell Euroslide Patio Doors with Low Threshold
Manufactured By	Eurocell Technical Department
Sample Size	3000 x 2400
Material Type	PVC Frame and Sashes Aluminium low Threshold Steel Reinforcing
Joining Method	Mitre and welded top frame and sashes Mechanical joint btm frame to threshold
Locking Points	Mila Fearless 6 point lock to slider Mila 3 point mush cam espag to interlock MI Securite interlock protectors and corner bolt
Glass Make Up & Thickness	28mm Clear 6-16-6 toughened glass
Gaskets	Co-extruded seals to all glazing EWS452G interlock brush seal EWS451G sash brush seal EWS450G frame cover brush seal VSW401G aluminium thresh brush seal EWS453G top centre frame brush seal
Hardware Used	Mila – locks handle and cylinder (30-30) MI Products – top corner bolt, aluminium interlock and protectors Mila – handle and interlock mechanism
Drainage	2 slots bottom of each sash 5 x 25 1 centre of threshold 30 x 30 1 each end off connecting blocks
Sealants Used	Low modulus sealant around ends of connecting blocks at threshold frame joints
Sub Frame Fixings	5 x 80mm screw fixing for frame 4.3 x 25 screw fixing for threshold
Hardware Fixings	4.3 x 40 gimlet point screws for lock 3.9 x 45 drill point for strikers 3.9 x 32 drill point to interlock protectors

See Section 7 for test sample drawings as supplied by Eurocell Profiles.

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 opened and the top lockside corner of the door was secured.

A pre-load of 200N was applied horizontally to the plane of the leaf to the lower lock side corner in the direction to close the door and was 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.

A force of 250N 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.

5.4 Soft and heavy impacting

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 from a height of 203.87 mm (which was calculated to result in an impact energy of 60 J) 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 release tower was positioned vertically over each of the impact points in turn, and the Impactor release from a height of 612.24 mm (which was calculated to result in an impact energy of 3 J) with 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
18.0	54.0

6.2 Operating forces – Main Leaf

The results of the tests carried out are as follows:

	Test 1	Test 2	Test 3	Average	Class
Closing Force (N)	46.40	47.40	44.20	46.00	2
Engage Hardware (N)	38.40	44.20	38.20	40.27	2
Lock Hardware (Nm)	0.40	0.40	0.40	0.40	4
Un-Lock Hardware (Nm)	0.40	0.40	0.40	0.40	4
Disengage Hardware (N)	34.20	28.20	27.40	29.93	2
Commence Opening (N)	47.60	57.10	53.00	52.5	1
Maintain Opening (N)	49.00	45.60	46.60	47.07	2

Operating forces – Interlock Hardware

The results of the tests carried out are as follows:

	Test 1	Test 2	Test 3	Average	Class
Engage Hardware (Nm)	38.40	44.20	38.20	40.27	2
Disengage Hardware (Nm)	34.20	28.20	27.40	29.93	2

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

Resistance to:	Class 0	Class 1	Class 2	Class 3	Class 4
Closing force or force to commence motion, maximum value. (N)	-	75	50	25	10
Hand operated hardware:	-	10	5	2.5	1
- Maximum torque. (Nm)		100	50	25	10
- Maximum force. (N)					
Finger operated hardware:	-	5	2.5	1.5	1
- Maximum torque (Nm)		20	10	6	4
- Maximum force (N)					

The overall classification for operating forces is: **CLASS 1**

6.3 Mechanical Strength

6.3.1 Resistance to static torsion

Lower corner of door deformation following 5 minute load of 250 N	1.97 mm
Lower corner of door deformation following 3 minute rest period	0.49 mm
Was any damage caused by the test	No
Did sample still function correctly	Yes

6.3.2 Resistance to soft and heavy body impacting – Main Leaf

Inside face of door

	Drop Height (mm)	Energy (J)	Any deviation in flatness of the door face (mm)	Any damage caused to the sample
Initial reference			-	-
Impact 1	203.87	60	0.25	None
Impact 2	203.87	60	0.23	None
Impact 3	203.87	60	0.21	None

Was any damage caused by the impacting	No
Did sample still function correctly	Yes

Weather face of door

	Drop Height (mm)	Energy (J)	Any deviation in flatness of the door face (mm)	Any damage caused to the sample
Initial reference			-	-
Impact 1	203.87	60	0.17	None
Impact 2	203.87	60	0.1	None
Impact 3	203.87	60	0.07	None

Was any damage caused by the impacting	No
Did sample still function correctly	Yes

Resistance to soft and heavy body impacting – Slave Leaf

Inside face of door

	Drop Height (mm)	Energy (J)	Any deviation in flatness of the door face (mm)	Any damage caused to the sample
Initial reference			-	-
Impact 1	203.87	60	0.12	None
Impact 2	203.87	60	0.17	None
Impact 3	203.87	60	0.07	None

Was any damage caused by the impacting	No
Did sample still function correctly	Yes

Weather face of door

	Drop Height (mm)	Energy (J)	Any deviation in flatness of the door face (mm)	Any damage caused to the sample
Initial reference			-	-
Impact 1	203.87	60	0.16	None
Impact 2	203.87	60	0.1	None
Impact 3	203.87	60	0.01	None

Was any damage caused by the impacting	No
Did sample still function correctly	Yes

6.3.4 Resistance to hard body impacting

Aiming pattern	4
Impact Energy (J)	3
Drop Height (mm)	612.24

Impact Number	Depth of Indent (mm)	Diameter of Indent (mm)	Diameter of cracking (mm)
1	0.15	0.10	0.0
2	0.09	0.05	0.0
3	0.03	0.00	0.0
4	0.03	0.00	0.0
5	0.13	0.08	0.0
Mean	0.086	0.05	-
Standard deviation	0.055	0.05	-
Co-efficient of variation	64.53	99.15	-

Following impacting was the sample still 'Fit for purpose'	Yes
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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)	110
Dead load applied by the operating equipment (kg)	-
Stroke of casement	1275mm

Description	Test 1 result (N)	Test 2 result (N)	Test 3 result (N)	Average (N)	Average (Nm)
Closing Force	53.2	61.0	58.4	57.5	-
Engage hardware	49.4	49.8	44.6	47.9	-
Lock Hardware	1	1	1	-	1
Un-Lock Hardware	1	1	1	-	1
Disengage hardware	34.2	31.2	29.6	31.7	-
Opening force	47.6	57.1	53.0	52.5	-

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

Description	Test 1 result (N)	Test 2 result (N)	Test 3 result (N)	Average (N)	Average (Nm)
Closing Force	41.2	36.2	38.6	38.6	-
Engage hardware	44.2	42.6	43.4	43.4	-
Lock Hardware	1	1	1	-	1
Un-Lock Hardware	1	1	1	-	1
Disengage hardware	35.6	32.2	33.4	33.7	-
Opening force	46.0	48.2	49.8	48.0	-

6.5.6 Variation in Performance

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

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

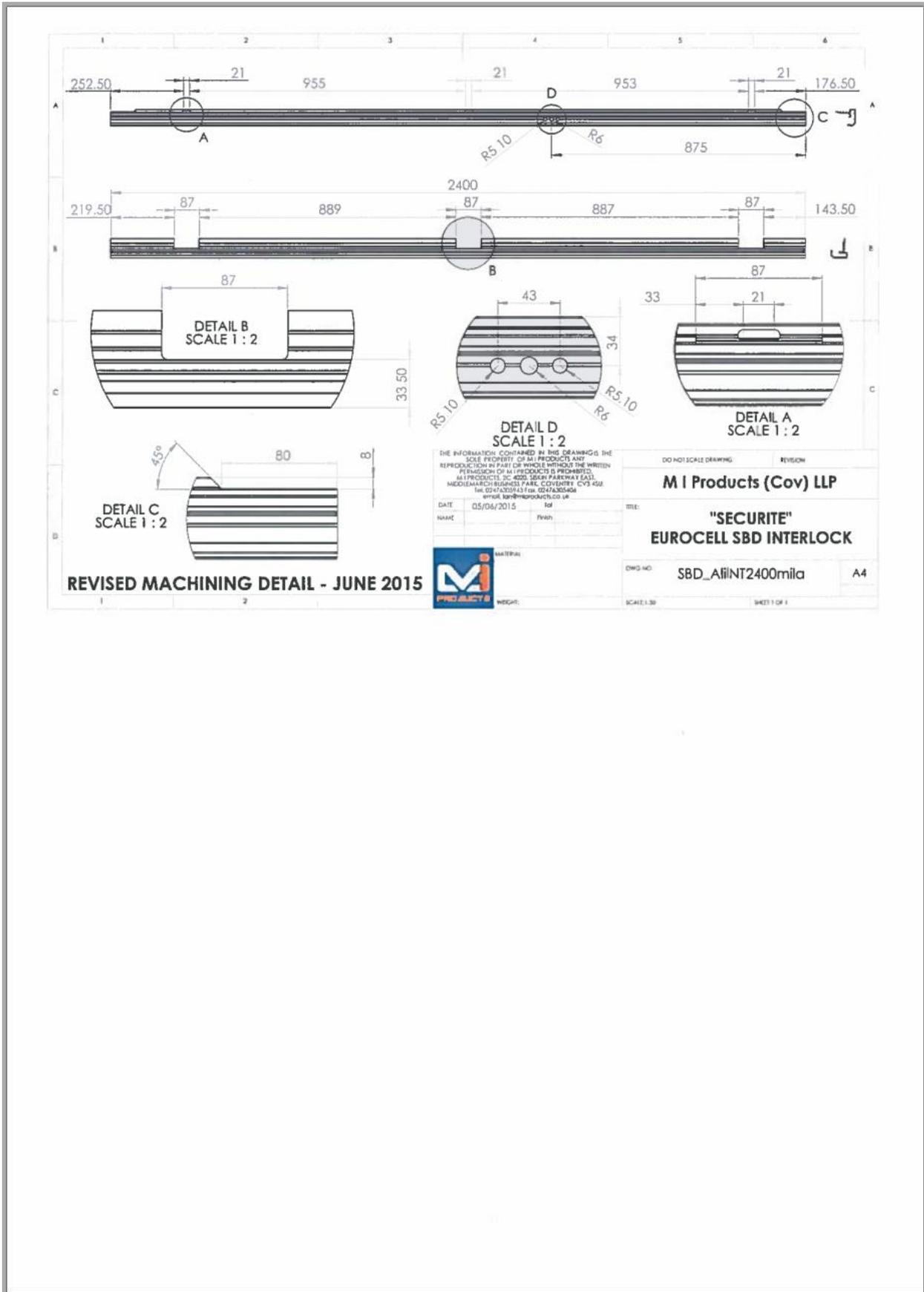
V is the percentage variation in performance

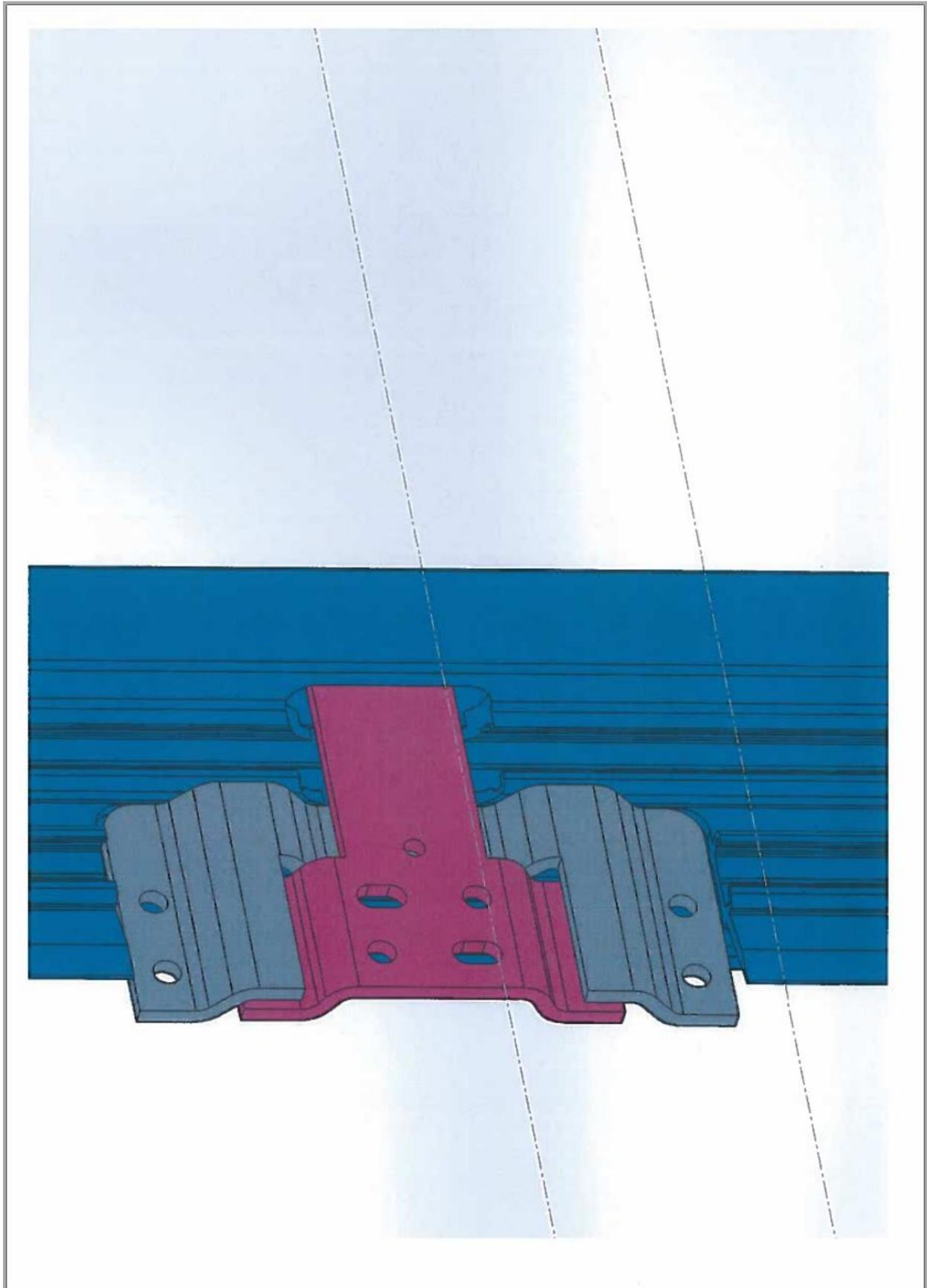
Pe is the operating forces measured after the test

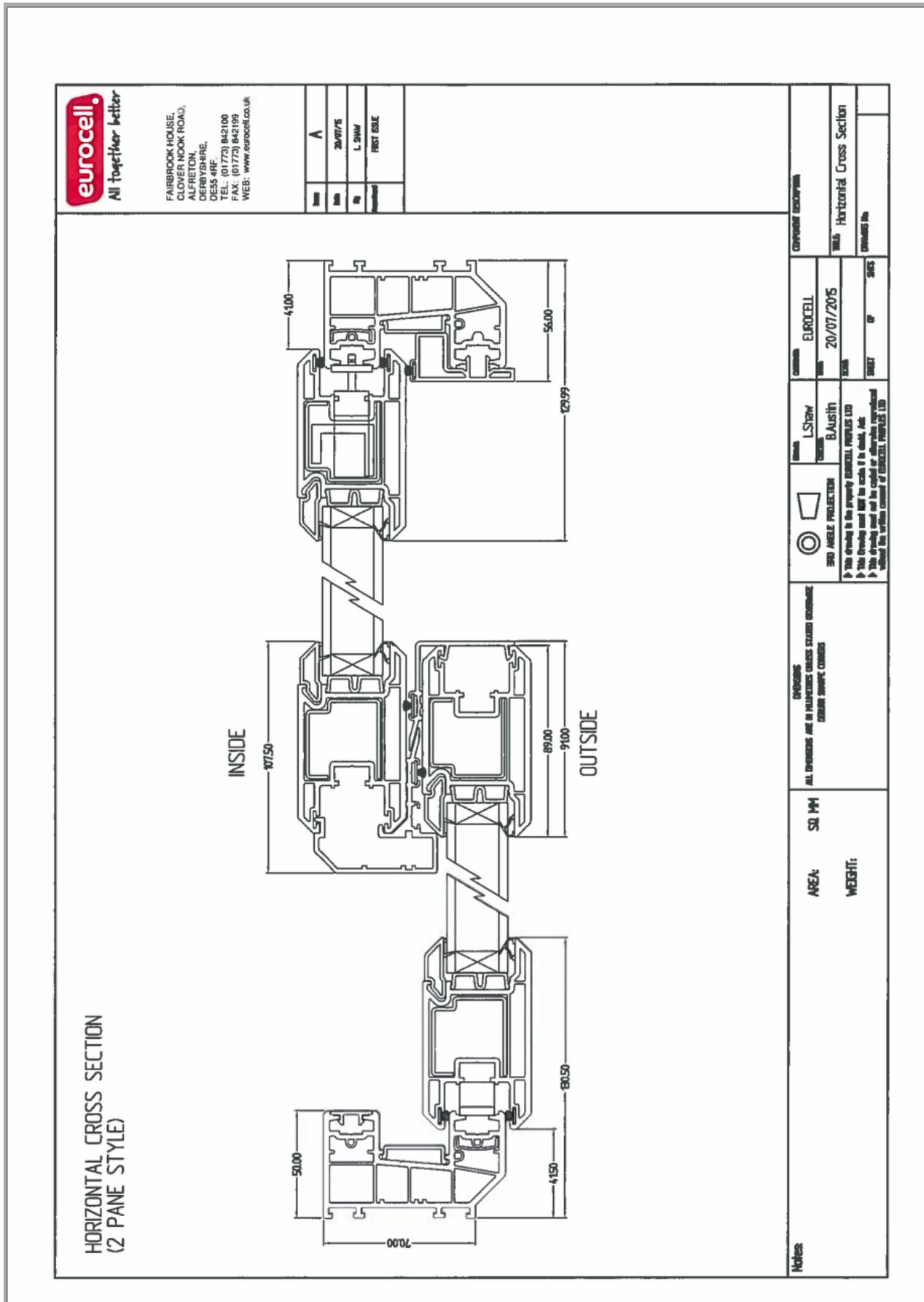
Pi is the operating forces measure before the test

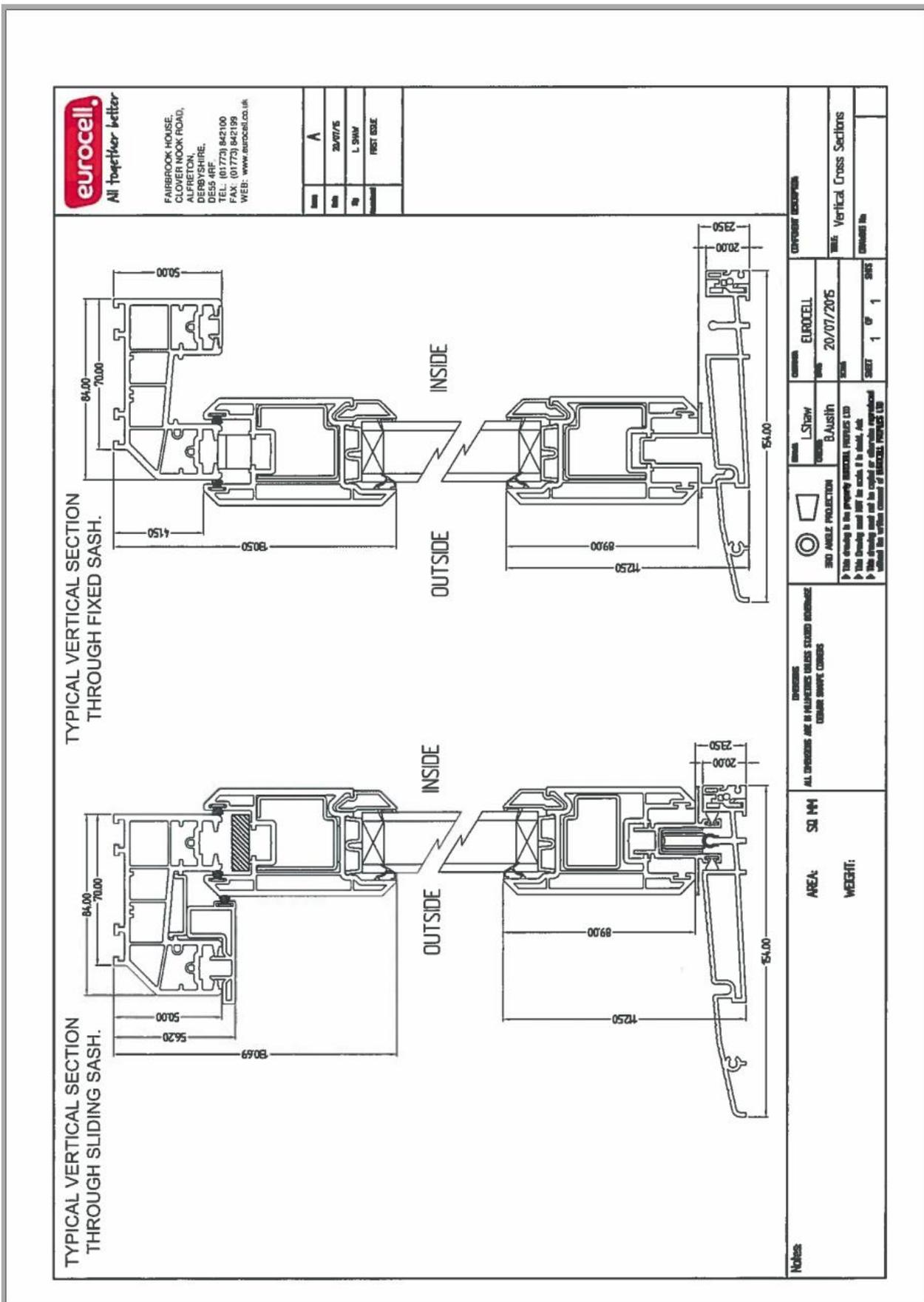
Description	Variation in performance %
Closing Force	-32.86
Engage hardware	-9.39
Lock Hardware	0.0
Un-Lock Hardware	0.0
Disengage hardware	6.3
Opening force	9.37

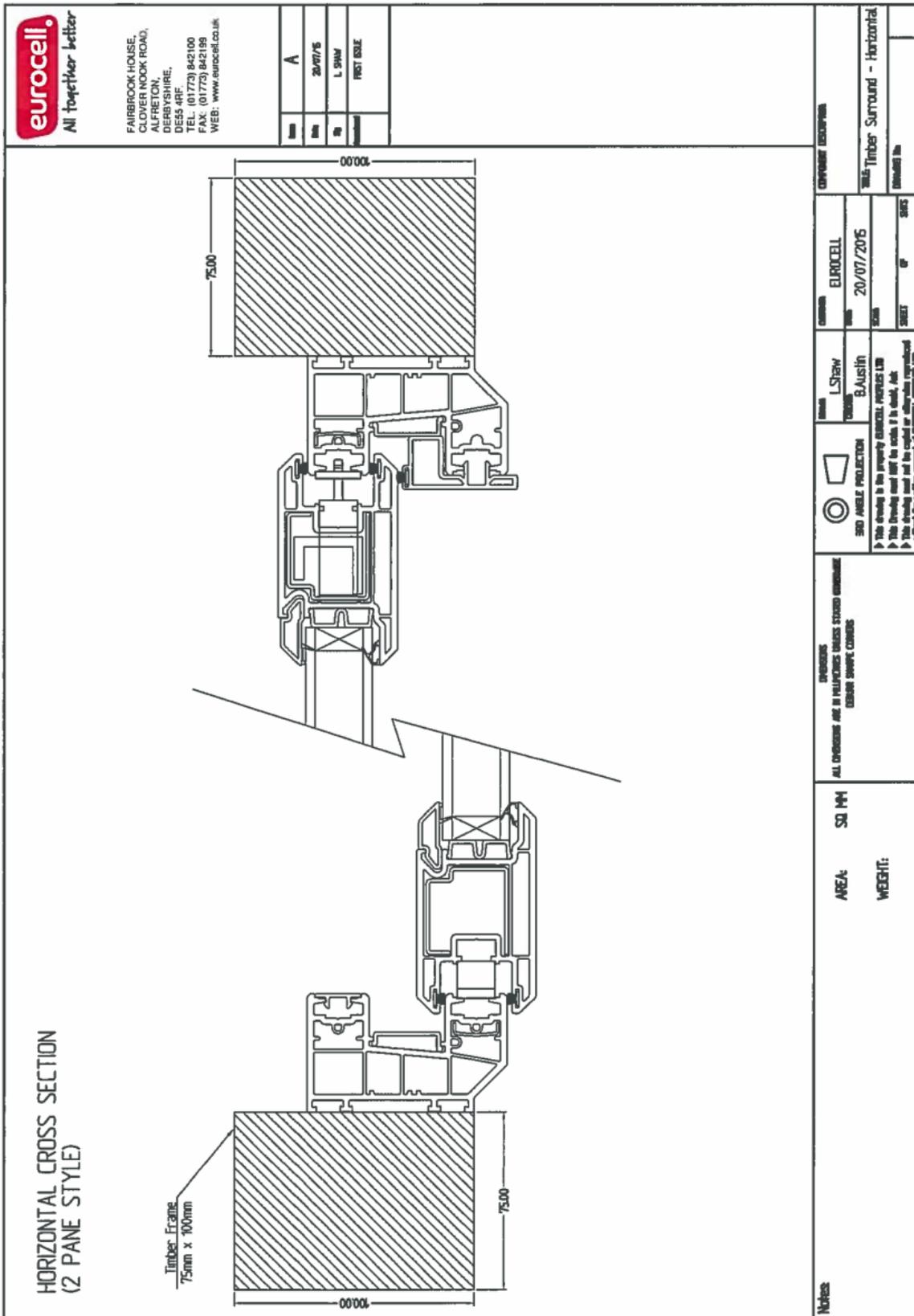
The overall classification for repeated opening and closing is: **CLASS 4**











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By	L SHAW
Checked	FRIST BSE

Notes	AREA:	SD MH	ALL DIMENSIONS ARE IN MILLIMETRES UNLESS STATED OTHERWISE DESIGN SHOWN IN CROSS SECTION	500 ANGLE PROJECTION 1st ANGLE PROJECTION 2nd ANGLE PROJECTION	DRAWN BY: L Shaw CHECKED BY: B Austin DATE: 20/07/2015	COMPANY:	EUROCELL
	WEIGHT:					TITLE:	Timber Surround - Horizontal
						SCALE:	1:1
						SHEET:	20 OF 20



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