

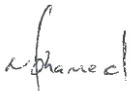
Test Report 3125376.
Smart Systems Limited
Incorporating Smart Extrusions

Introduction.

This report has been prepared by Jack Nicholls and relates to the activity detailed below:

Job/Registration Details	Client Details
Job number: 3125376 Job type: Testing Samples Submitted Start Date: 29/07/2020 Test type: Type Sample ID: 10187258 Registration: KM 81580 Scheme: BS 4873 / PAS24 Protocol: PP 519 Scheme Mgr: Lorraine Balch	Smart Systems Limited Incorporating Smart Extrusions Arnolds Way Yatton BS49 4QN United Kingdom

The report has been approved for issue by Mohamed Abukar – Subject Matter Expert

Approved For Issue	
	Issue Date: 20 November 2020

Objectives.

Type test for product certification

Product Scope.

Smart Systems Heritage aluminium windows

Report Summary.

The samples were received on 23 July 2020 and the testing was started on 29 July 2020.

The samples submitted complied with the requirements of the test work conducted.

BS4873:2016 Weather Type Test.

Product Description.

2 off tilt / turn windows next to fixed lights

(Equipment Record No: 10187258)

Date Sample Received: 23 July 2020

Summary of Results.

1. Air Permeability Test sample 1 met the requirements of the Specification, in respect of clause 6, for Test Pressure Class 4.

2. Watertightness Test sample 1 met the requirements of the Specification, in respect of clause 7, for Test Pressure Class 9A.

3. Wind Resistance Test sample 1 met the requirements of the Specification, in respect of clause 8, for Exposure Category Class BE 2400.

Classification for Wind Resistance – Exposure Category 2400Pa (BE).

4. Operation and Strength Test samples 1 met the requirements of the Specification in respect of BS6375-2.

Classification for Operational Strength.

Operating forces	Class 1
Resistance to Static torsion	Class 3
Racking	Class 3
Load bearing	N/A
Impact resistance	Class 0
Repeated opening and closing (Sample 2)	Passed 10,000 tilt mode and 5,000 turn mode

5. Basic Security Test sample 1 met the requirements of BS6375-3:2009.

Preparation and Method of Test.

The sample was prepared as required by: BS EN 1026:2016 Windows and Doors - Air Permeability; BS EN 1027:2000 Windows and Doors – Watertightness; and BS EN 12211:2016 Windows and Doors in respect of BS 6375 - 1:2015. The sample was mounted into a plywood surround for installation in the test apparatus. The joint between the sample and the plywood surround was sealed. The test sample was manufactured by the client.

1. Air permeability

The air permeability of the sample was determined by the method given in BS EN 1026:2016.

2. Watertightness

The watertightness of the sample was determined by the method given in BS EN 1027:2000.

3. Resistance to wind load (P1 and P2)

The resistance to wind load of the samples was determined by the method given in BS EN 12211:2016.

4. Repeat test

After testing for resistance to wind load test 1 (air permeability) was repeated.

5. Resistance to wind load (P3)

The resistance to wind load of the samples was determined by the method given in BS EN 12211:2016.

6. Operational strength

The operational strength characteristics were determined by the method given in BS 6375-2:2009.

7. Basic security

The basic security test method was determined by the method given in BS6375-3:2009.

8. Repeated opening and closing

The repeated opening and closing was carried out using the method given in standard BS EN 1191:2000.

Note – BS EN 1027:2000, BS6375-3:2009, BS4873:2016 and BS EN 1191: 2000 not UKAS accredited

Description of Samples 1 and 2. (Weather)

Sample type -	Tilt turn window next to fixed lights		
Material -	Aluminium		
Construction -	Mechanically jointed		
Fittings -	3 off tilt turn stays		
	A seven-point locking Sobinco Chrono Invision Safe tilt turn gearing system (seven mushroom bolts) operated by a key locking handle		
Glass -	Double glazed, 6-12-6mm toughened glass sealed units		
Glazing System -	Internal beads and gaskets		
Weathersealing -	Double-sealed plastic weather strip		
Sample Dimensions -	For information only (nominal sizes)		
	Overall Size -	Length: 1850mm	Height: 2140mm
	Sash Size -	Length: 1145mm	Height: 2040mm
Laboratory Temperature -	20.8°C		
Laboratory Humidity -	55.8%RH		
Atmospheric Pressure -	100.3kPa		

Alitherm Heritage, Tilt and Turn, Fixed Light.

Outer Frame width	1243mm 600mm	Outer Frame Material	Aluminium
Outer Frame height	2142mm 2142mm	Outer Frame Gasket	
Outer Frame Part Numbers		Gasket Type	EDPM
Top	W20110	Manufacturer	Lesser
Bottom	W20110	Product Name	Central Gasket External Gasket
Lock Side	W20110	Product Code	ACW20130 ACW20131
Hinge Side	W20110	Cill	
Outer Frame section dimensions		Manufacturer	Smarts
Width	41mm	Product name	135mm Cill
Depth	47mm	Product Code	ETC 452
Vertical Coupler		Materials	Aluminium
Manufacturer	Smarts	Outer Frame Joint Method	
Product Name	Coupler	Head	Cleat, Crimp Glue.
Product code	W20051	Foot	Cleat, Crimp Glue.
Material	Aluminium		

Leaf		Leaf Material:	Aluminium
Leaf Width:	1201mm	Leaf Gasket	
Leaf Height:	2100mm	Gasket type:	EDPM
Leaf Part Numbers:		Manufacturer:	Aliplast
Top:	W20120	Product Name:	Flipper Gasket
Bottom:	W20120	Product Code	ACVL031
Lock side:	W20120	Leaf Midrail:	NA
Hinge Side	W20120	Manufacturer:	
Leaf section size		Product name:	
Width:	55mm	Product code:	
Depth:	61mm	Material:	
Fixed Light Transom		Leaf joint method	
Manufacturer:	Smarts	Head:	Cleat, Crimp Glue.
Product Name:	Transom	Foot:	Cleat, Crimp Glue.
Product Code:	W20130		
Material:	Aluminium		
Bead			
Manufacturer:	Smarts		
Product Name:	Glazing Bead		
Product Code:	W20174		
Material:	Aluminium		
Bead Size:	15mm x 16mm		

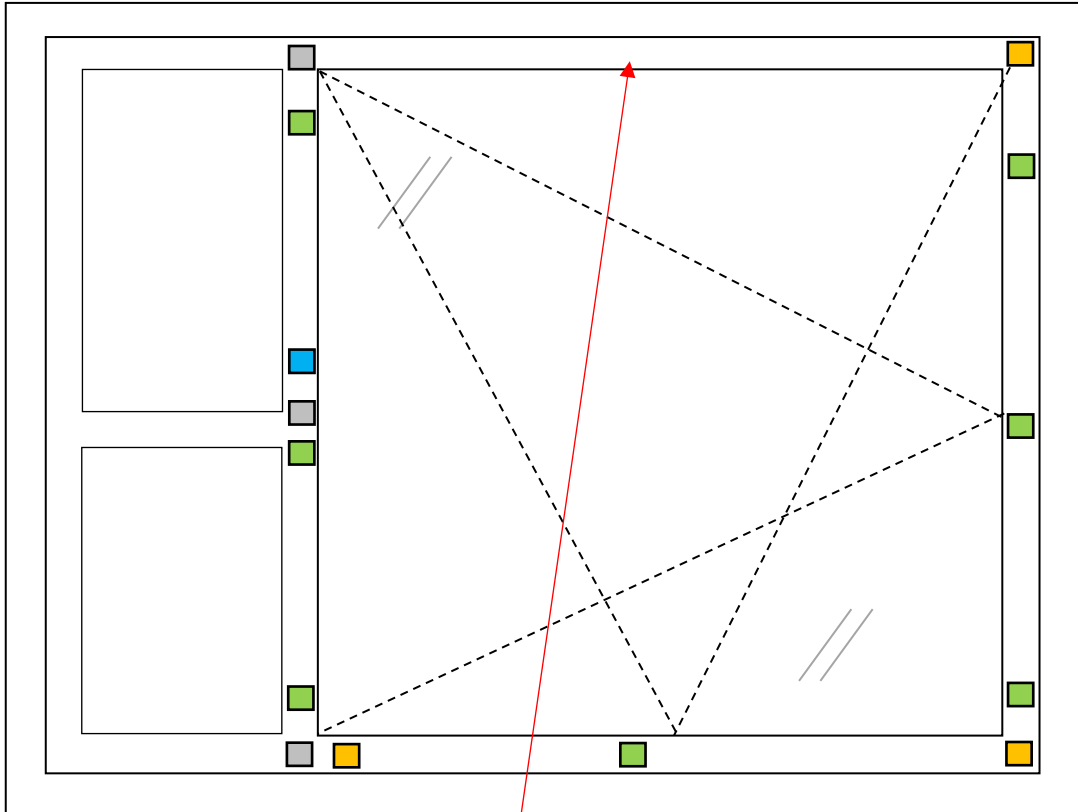
Alitherm Heritage, Tilt and Turn, Fixed Light.

Glazing Unit		Glazing Gasket	
Manufacturer:	Ashton Glass	Gasket Type:	EDPM
Inner Thickness:	6mm	Manufacturer:	Reddiplex
Spacer Material:	Aluminium	Product Name:	E Gasket Wedge Gasket
Outer Thickness:	6mm	Product Code	ACET 842 ACET 840
Unit Sizes:	1113mm x 2012mm x1 540mm x 1025mm x2	Glazing Clip	NA.
Glazing Tape Details	NA.	Manufacturer:	
Manufacturer:		Product Name:	
Product Name:		Product Code	
Product Code			

Hardware			Fixings	Quantity
Hinges:	ACSB660N	Sobinco Chrono Invision Safe Base Set.	Incorporated in Gearing.	1
Scissor Stay	ACSB765RN	Sobinco Scissor Stay	M5 Grub Screw	1
Handle Drive	ACSB605	Slides into Sash Channel.		1
Bottom Restrictor.	ACSB586	M5 Grub Screw into Frame.		1
Handle:	ACSB082	Sobinco Locking Handle	M5 Machine Allen Bolts	1
Extra Lock Points	30540-831	Sobinco		3
Extra Lock Points Keeps	30300-850	Sobinco	ACET060	3
100mm Synthetic Rod	ACSB511			2
250mm Synthetic Rod	ACSB514			2
365mm Synthetic Rod	ACSB518			2
110mm Synthetic Rod	ACSB519			2
BridgePacker	ACW20157	Smarts Glass setting block.	Clip into Sash.	10

Note – parts list supplied by client but not verified by BSI

Elevation Drawing Indicating Position of Hardware. (Samples 1 and 2)



Water Leakage Point

- Handle: ■
- Hinge: ■
- Mushroom Bolt: ■
- Transducer Placement: ■

Table of Air Permeability Before Gusting. (Sample 1)

AIR PERMEABILITY TEST RESULTS - BS EN 1026:2016 / BS EN 12207:2000

Three positive pressure pulses of 660Pa were applied prior to testing

Air Pressure [Pa]	Blank reading [m ³ /h]	Maximum total air flow [m ³ /h]	Actual rate of air leakage [m ³ /h]	Rate of air leakage per meter length of opening joint [m ³ /h.m]	Rate of air leakage relative to area of sample [m ³ /h.m ²]
50	3.1	3.2	0.1	0.01	0.02
100	5.4	5.5	0.1	0.02	0.03
150	7.3	7.5	0.2	0.02	0.05
200	9.2	9.4	0.2	0.03	0.05
250	10.9	11.1	0.2	0.03	0.05
300	12.7	12.9	0.3	0.04	0.07
450	17.8	18.1	0.3	0.03	0.07
600	26.7	28.5	1.8	0.23	0.46
-50	3.0	3.3	0.2	0.03	0.06
-100	5.0	5.3	0.3	0.04	0.08
-150	6.6	7.0	0.4	0.05	0.11
-200	8.0	8.4	0.4	0.05	0.11
-250	9.2	9.7	0.5	0.06	0.12
-300	10.3	10.8	0.5	0.07	0.13
-450	12.8	13.5	0.7	0.09	0.17
-600	14.7	15.5	0.7	0.09	0.18

Total opening perimeter = 7.98m

Overall area = 3.95m²

BS EN 12207:2000 - Joint class = 4

BS EN 12207:2000 - Area class = 4

BS EN 12207:2000 - Overall class before gusting = 4

Note – Due to the low air permeability of the test sample, the related graph has been omitted from this report as there is no data plotted on it.

Table of Average Air Permeability Before Gusting. (Sample 1)

AIR PERMEABILITY TEST RESULTS - BS 6375-1:2015 / BS EN 1026:2016

Three positive pressure pulses of 660Pa were applied prior to testing

Air Pressure [Pa]	Average rate of air leakage [m ³ /h]	Average rate of air leakage per meter length of opening joint [m ³ /h.m]	Average rate of air leakage relative to area of sample [m ³ /h.m ²]
50	0.2	0.02	0.04
100	0.2	0.03	0.06
150	0.3	0.04	0.08
200	0.3	0.04	0.08
250	0.4	0.04	0.09
300	0.4	0.05	0.10
450	0.5	0.06	0.12
600	1.3	0.16	0.32

Note: The figures in the table above give the leakage as an average of the leakage at positive pressure and the leakage at negative pressure

Total opening perimeter = 7.98m

Overall area = 3.95m²

BS 6375-1:2015 Clause 6.3 - Joint class = 4

BS 6375-1:2015 Clause 6.3 - Area class = 4

BS 6375-1:2015 Clause 6.3 - Overall class = 4

Note – Due to the low air permeability of the test sample, the related graph has been omitted from this report as there is no data plotted on it.

Watertightness Test Results – BS EN 1027:2000. (Sample 1)

Clause 7 Watertightness before resistance to wind loads

Figure 1 – Spraying method 1A (Test method BS EN 1027:2000)

Pressure (Pascals)	Point and time at which water leakage occurred
0	No leakage
50	No leakage
100	No leakage
150	No leakage
200	No leakage
250	No leakage
300	No leakage
450	No leakage
600	No leakage
750	Water leaked from sill opening joint at 35 seconds
900	-
1050	-

Wind Resistance Test Results - BS EN 12211:2016. (Sample 1)

Clause 8 Resistance to wind load

P1 Deflection Test

Three positive pressure pulses at 2640Pa were applied.

No visible failures or functional defects of the sample were observed after wind loads applied at a positive pressure of 2400Pa.

Actual deflection 6.60mm (maximum deflection allowed 11.25mm)

Deflection/span ratio 1/340 (maximum ratio allowed 1/150)

Three negative pressure pulses at 2640Pa were applied.

No visible failures or functional defects of the sample were observed after wind loads applied at a negative pressure of 2400Pa.

Actual deflection 8.20mm (maximum deflection allowed 11.25mm)

Deflection/span ratio 1/274 (maximum ratio allowed 1/150)

Wind Resistance Test Results - BS EN 12211:2016. (Continued)

P2 Repeated Pressure Test

No visible failures or functional defects of the sample were observed after 50 cycles of repeated wind loads were applied at a positive pressure of 1200Pa.

No visible failures or functional defects of the sample were observed after 50 cycles of repeated wind loads were applied at a negative pressure of 1200Pa.

Graph of Air Permeability After Gusting. (Sample 1)

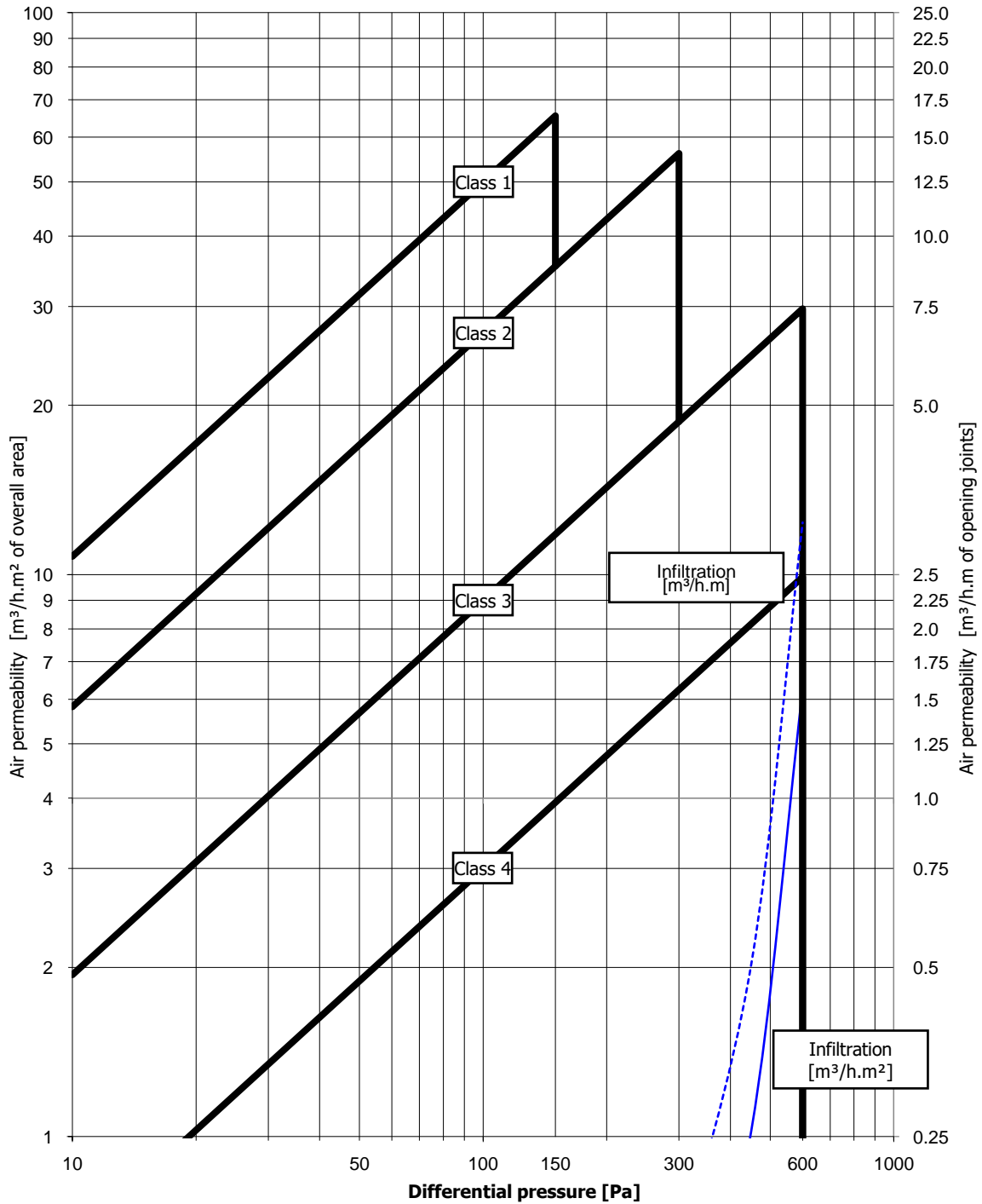


Table of Air Permeability After Gusting. (Sample 1)

AIR PERMEABILITY TEST RESULTS - BS EN 1026:2016 / BS EN 12207:2000

Three positive pressure pulses of 660Pa were applied prior to testing

Air Pressure [Pa]	Blank reading [m ³ /h]	Maximum total air flow [m ³ /h]	Actual rate of air leakage [m ³ /h]	Maximum rate of air leakage per meter length of opening joint [m ³ /h.m]	Maximum rate of air leakage relative to area of sample [m ³ /h.m ²]
50	4.5	4.5	0.0	0.00	0.00
100	7.6	7.8	0.2	0.02	0.04
150	10.4	10.7	0.3	0.04	0.08
200	13.0	13.5	0.5	0.06	0.13
250	15.5	16.3	0.8	0.10	0.20
300	17.8	19.0	1.2	0.15	0.31
450	25.4	29.5	4.0	0.51	1.02
600	32.6	57.6	24.7	3.09	6.25
-50	4.5	4.5	0.0	0.00	0.00
-100	7.4	7.4	0.0	0.00	0.00
-150	9.6	9.7	0.1	0.01	0.01
-200	11.6	11.6	0.1	0.01	0.02
-250	13.2	13.3	0.1	0.01	0.02
-300	14.6	14.8	0.1	0.02	0.04
-450	18.3	18.5	0.1	0.02	0.03
-600	20.9	20.9	0.0	0.00	0.00

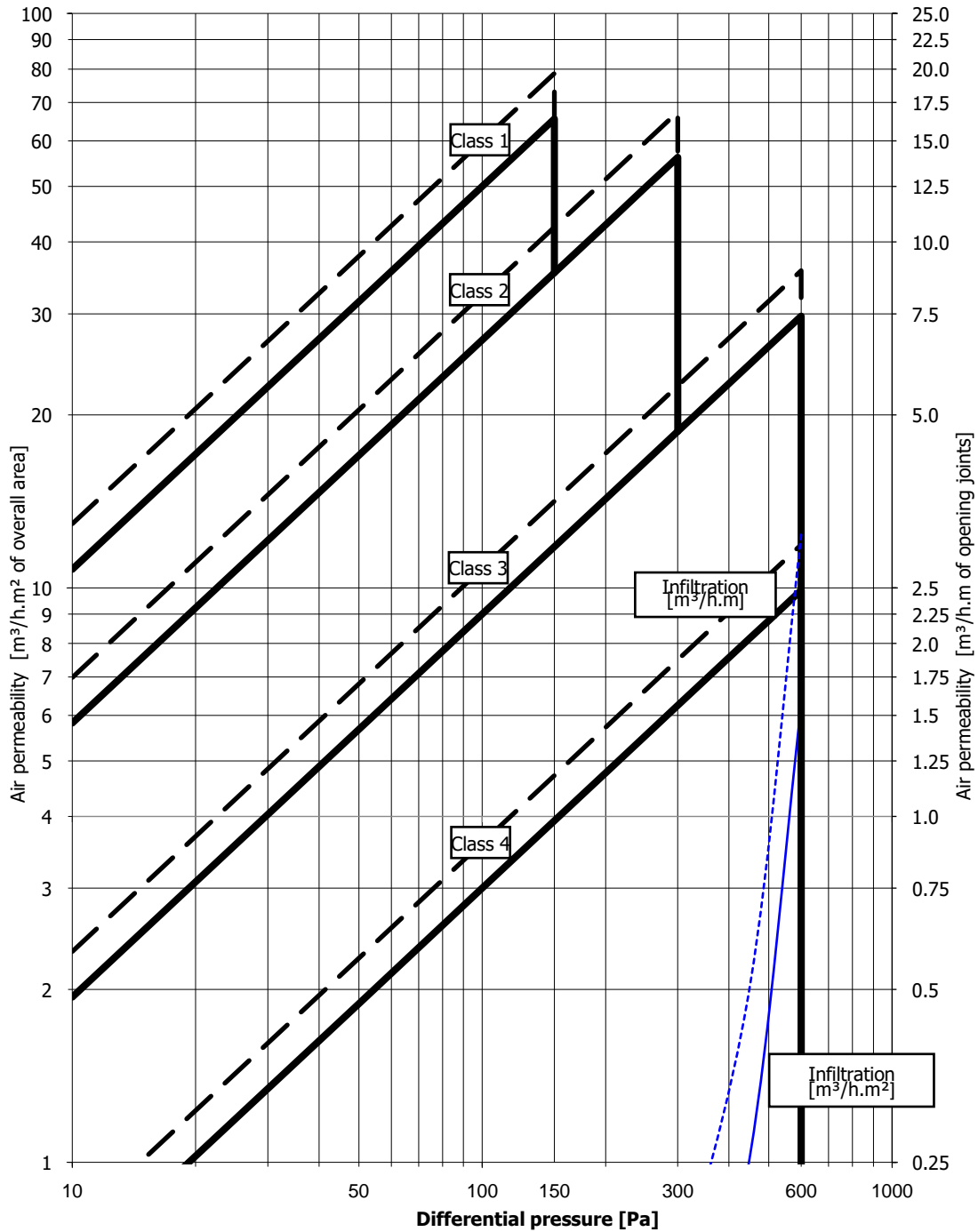
Total opening perimeter = 7.98m

Overall area = 3.95m²

For classification to BS EN 12210:2000 - Section 6.1: Resistance to wind load, the change in air permeability due to the wind pressure and repeated pressure tests HAS exceeded the achieved class (4) by more than 20%.

Graph of Air Permeability After Gusting. (Sample 1)

(including +20% lines for each class)



Graph of Average Air Permeability After Gusting. (Sample 1)

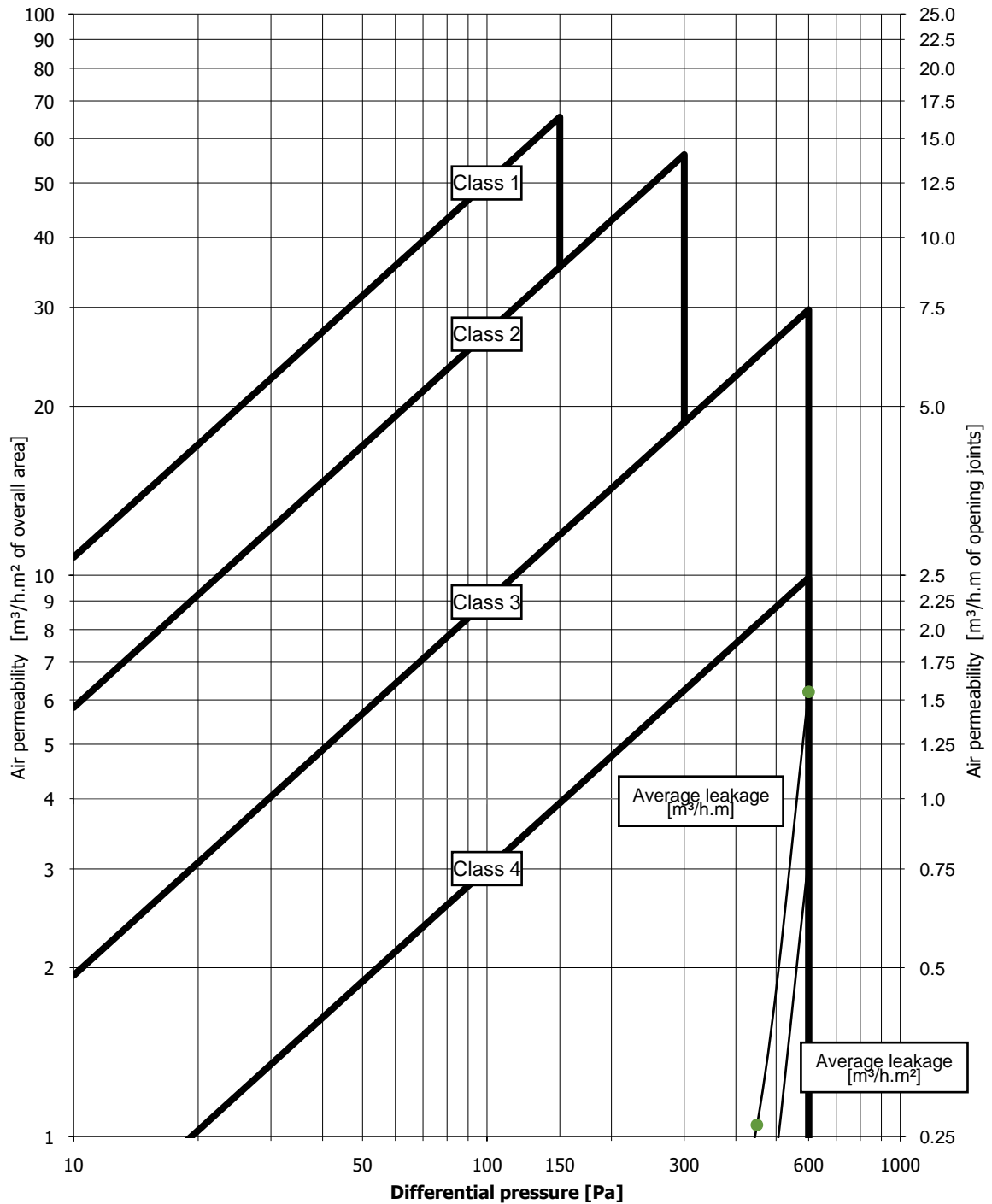


Table of Average Air Permeability After Gusting . (Sample 1)

AIR PERMEABILITY TEST RESULTS - BS 6375-1:2015 / BS EN 1026:2016

Three positive pressure pulses of 660Pa were applied prior to testing

Air Pressure [Pa]	Average rate of air leakage [m ³ /h]	Average rate of air leakage per meter length of opening joint [m ³ /h.m]	Average rate of air leakage relative to area of sample [m ³ /h.m ²]
50	0.0	0.00	0.00
100	0.1	0.01	0.02
150	0.2	0.02	0.05
200	0.3	0.04	0.07
250	0.4	0.06	0.11
300	0.7	0.09	0.17
450	2.1	0.26	0.53
600	12.4	1.55	3.13

Note: The figures in the table above give the leakage as an average of the leakage at positive pressure and the leakage at negative pressure

Total opening perimeter = 7.98m

Overall area = 3.95m²

BS 6375-1:2015 Clause 6.5 - Joint class = 4

BS 6375-1:2015 Clause 6.5 - Area class = 4

BS 6375-1:2015 Clause 6.5 - Overall class = 4

In accordance with BS 6375-1:2015 Clause 6.5, as the classification after the resistance to wind load tests is the same as the classification before the resistance to wind load tests, the resulting classification for the sample is Class 4.

Wind Resistance Test Results - BS EN 12211:2000. (Continued)

P3 Safety Test

No parts of the test sample became detached and the test sample remained closed after a wind load safety test was applied at a positive air pressure of 3600Pa.

No parts of the test sample became detached and the test sample remained closed after a wind load safety test was applied at a negative air pressure of 3600Pa.

Operation and Strength. (Sample 1)

BS 6375-2:2009

Clause 5 Performance characteristics and requirements for windows

Clause 5.1 Operating Forces: EN13115:2001 and EN12046:2003 (Class 1) Assessment

The sample was tested three times - unlocking the key, opening the handle, opening the sash, closing the sash, closing the handle and locking the key - and the average of the three results was then recorded.

Tilt Mode

Key unlock – <1.00Nm (maximum 5Nm)	Pass
Handle opening – 47.96N (maximum 100N)	Pass
Sash opening – 28.65N (maximum 100N)	Pass
Sash closing – 42.91N (maximum 100N)	Pass
Handle closing – 57.50N (maximum 100N)	Pass
Key unlock – <1.00Nm (maximum 5Nm)	Pass

Turn Mode

Key unlock – <1.00Nm (maximum 5Nm)	Pass
Handle opening – 66.80N (maximum 100N)	Pass
Sash opening – 42.08N (maximum 100N)	Pass
Sash closing – 58.06N (maximum 100N)	Pass
Handle closing – 72.01N (maximum 100N)	Pass
Key unlock – <1.00Nm (maximum 5Nm)	Pass

Operation and Strength (Sample 1, continued).

Tilt Mode

Clause 5.2.1 Resistance to Static Torsion BS EN 14609:2004 and BS EN 13115:2001 (Class 3)

The sample was opened and closed five times before the test. All loads were applied in accordance with BS EN 14609:2004 in maximum increments of 100N in intervals of one second (minimum).

The window was opened to 90° or its maximum opening position and blocked, and a pre-load of 30N was applied for 60 seconds.

300N was then applied in one second intervals (minimum), and after five minutes the maximum deformation was recorded. The load was then removed and after one-minute rest the residual deformation was recorded.

Maximum deformation – 24.20mm

Residual deformation – 0.56mm

After resistance to static torsion the operating forces were tested again.

Clause 5.2.1 Resistance to Static Torsion BS EN 14609:2004 and BS EN 13115:2001 (Class 3)

Turn mode

The sample was opened and closed five times before the test. All loads were applied in accordance with BS EN 14609:2004 in maximum increments of 100N in intervals of one second (minimum).

The window was opened to 90° or its maximum opening position and blocked, and a pre-load of 30N was applied for 60 seconds.

300N was then applied in one second intervals (minimum), and after five minutes the maximum deformation was recorded. The load was then removed and after one-minute rest the residual deformation was recorded.

Maximum deformation – 34.60mm

Residual deformation – 1.80mm

After resistance to static torsion the operating forces were tested again.

Operation and Strength (Sample 1, continued).

BS 6375-2:2009 (continued)

Clause 5 Performance characteristics and requirements for windows (continued)

Clause 5.1 Operating Forces: EN13115:2001 and EN12046:2003 (Class 1) Assessment

The sample was tested three times - unlocking the key, opening the handle, opening the sash, closing the sash, closing the handle and locking the key - and the average of the three results was then recorded.

Tilt Mode

Key unlock – <1.00Nm (maximum 5Nm)	Pass
Handle opening – 52.90N (maximum 100N)	Pass
Sash opening – 32.30N (maximum 100N)	Pass
Sash closing – 47.70N (maximum 100N)	Pass
Handle closing – 61.25N (maximum 100N)	Pass
Key unlock – <1.00Nm (maximum 5Nm)	Pass

Turn Mode

Key unlock – <1.00Nm (maximum 5Nm)	Pass
Handle opening – 70.95N (maximum 100N)	Pass
Sash opening – 48.20N (maximum 100N)	Pass
Sash closing – 61.81N (maximum 100N)	Pass
Handle closing – 74.70N (maximum 100N)	Pass
Key unlock – <1.00Nm (maximum 5Nm)	Pass

Operation and Strength (Sample 1, continued).

Clause 5.2.2 Racking BS EN 14608:2004 and BS EN 13115:2001 (Class 3)

Tilt Mode

The sample was opened and closed five times before the test. All loads were applied in accordance with BS EN 14608:2004 in maximum increments of 100N in intervals of one second (minimum).

The window was opened to 90° or its maximum opening position and blocked, and a pre-load of 60N was applied for 60 seconds.

600N was then applied in one second intervals (minimum), and after five minutes the maximum deformation was recorded. The load was then removed and after one-minute rest the residual deformation was recorded.

Maximum deformation – 13.10mm

Residual deformation – 1.10mm

After racking the operating forces were tested again.

Clause 5.2.2 Racking BS EN 14608:2004 and BS EN 13115:2001 (Class 3)

Turn Mode

The sample was opened and closed five times before the test. All loads were applied in accordance with BS EN 14608:2004 in maximum increments of 100N in intervals of one second (minimum).

The window was opened to 90° or its maximum opening position and blocked, and a pre-load of 60N was applied for 60 seconds.

600N was then applied in one second intervals (minimum), and after five minutes the maximum deformation was recorded. The load was then removed and after one-minute rest the residual deformation was recorded.

Maximum deformation – 19.20mm

Residual deformation – 1.60mm

After racking the operating forces were tested again.

Operation and Strength (Sample 1, continued).

BS 6375-2:2009 (continued)

Clause 5 Performance characteristics and requirements for windows (continued)

Clause 5.1 Operating Forces: EN13115:2001 and EN12046:2003 (Class 1) Assessment

The sample was tested three times - unlocking the key, opening the handle, opening the sash, closing the sash, closing the handle and locking the key - and the average of the three results was then recorded.

Tilt Mode

Key unlock – <1.00Nm (maximum 5Nm)	Pass
Handle opening – 56.61N (maximum 100N)	Pass
Sash opening – 35.10N (maximum 100N)	Pass
Sash closing – 50.48N (maximum 100N)	Pass
Handle closing – 65.40N (maximum 100N)	Pass
Key unlock – <1.00Nm (maximum 5Nm)	Pass

Turn Mode

Key unlock – <1.00Nm (maximum 5Nm)	Pass
Handle opening – 73.55N (maximum 100N)	Pass
Sash opening – 50.46N (maximum 100N)	Pass
Sash closing – 65.86N (maximum 100N)	Pass
Handle closing – 76.96N (maximum 100N)	Pass
Key unlock – <1.00Nm (maximum 5Nm)	Pass

Operation and Strength (Sample 1, continued).

BS 6375-2:2009 (continued)

Assessment

Clause 5.4 Impact resistance BS EN 13049:2003 and BS EN 13115:2001 (Class 0)

Drop height for Class 0 is 0mm – no impact performed

Basic Security (Annex A). (Sample 1)

BS 6375-3:2009+A1:2013 – Performance of windows

The objective of this test is to establish if, from the outside, entry can be gained by defeating the glazing or locking system.

The force used did not result in permanent set or plastic deformation of any tool.

Damaged tools shall be replaced. The test did not exceed the maximum three-minute time period.

The screwdriver was used to no effect.

No entry gained within the time allowed.

Pass

BS EN 1191:2000. (Sample 2, Tilt Mode)

Clause 5 Performance characteristics and requirements for windows

Clause 5.5 Repeated Opening and Closing

Assessment

The sample was opened and closed five times before testing started

Key rotation of key to unlock: 180 degrees

Tested for 10,000 cycles

Clause 5.1 Operating Forces: EN13115:2001 and EN12046:2003 (Pre-test operation)

The sample was tested three times - unlocking the key, opening the handle, opening the sash, closing the sash, closing the handle and locking the key - and the average of the three results were then recorded.

Key unlock – <1.00Nm (maximum 5Nm)	Pass
Handle opening – 45.08N (maximum 100N)	Pass
Sash opening – 32.35N (maximum 100N)	Pass
Sash closing – 46.86N (maximum 100N)	Pass
Handle closing – 55.38N (maximum 100N)	Pass
Key unlock – <1.00Nm (maximum 5Nm)	Pass

At 100% of the complete cycles the operating forces were measured again

Key unlock – <1.00Nm (maximum 5Nm)	Pass
Handle opening – 46.88N (maximum 100N)	Pass
Sash opening – 33.38N (maximum 100N)	Pass
Sash closing – 48.28N (maximum 100N)	Pass
Handle closing – 56.31N (maximum 100N)	Pass
Key unlock – <1.00Nm (maximum 5Nm)	Pass

The sample met the requirements of the standard and remained within the forces for 10,000 cycles

BS EN 1191:2000. (Sample 2, Turn Mode)

Clause 5 Performance characteristics and requirements for windows

Clause 5.5 Repeated Opening and Closing

Assessment

The sample was opened and closed five times before testing started

Key rotation of key to unlock: 180 degrees

Tested for 5,000 cycles

Clause 5.1 Operating Forces: EN13115:2001 and EN12046:2003 (Pre-test operation)

The sample was tested three times - unlocking the key, opening the handle, opening the sash, closing the sash, closing the handle and locking the key - and the average of the three results were then recorded.

Key unlock – <1.00Nm (maximum 5Nm)	Pass
Handle opening – 66.95N (maximum 100N)	Pass
Sash opening – 44.58N (maximum 100N)	Pass
Sash closing – 53.38N (maximum 100N)	Pass
Handle closing – 72.75N (maximum 100N)	Pass
Key unlock – <1.00Nm (maximum 5Nm)	Pass

At 100% of the complete cycles the operating forces were measured again

Key unlock – <1.00Nm (maximum 5Nm)	Pass
Handle opening – 68.61N (maximum 100N)	Pass
Sash opening – 46.18N (maximum 100N)	Pass
Sash closing – 56.93N (maximum 100N)	Pass
Handle closing – 76.38N (maximum 100N)	Pass
Key unlock – <1.00Nm (maximum 5Nm)	Pass

The sample met the requirements of the standard and remained within the forces for 5,000 cycles

PAS24:2016 Type Test.

Product Description.

1 off tilt / turn window next to fixed lights

(Equipment Record No: 10187258)

Date Sample Received: 23 July 2020

Test Results.

- | | |
|-----------------------|--|
| 1. Manipulation | The test sample met the requirements of the Specification in respect of Clause 4.3 |
| 2. Glazing Removal | The test sample met the requirements of the Specification in respect of Clause 4.4 |
| 3. Mechanical Loading | The test sample met the requirements of the Specification in respect of Clause 4.5 |
| 4. Manual Check Test | The test sample met the requirements of the Specification in respect of Clause 4.6 |

Clause 2 Sample Selection.

The sample submitted for tests was selected by the Client on behalf of BSI.

Assessment.

The assessment of the test sample followed the sequence detailed in Scheme Document PCP519.

Clause 3 Test Apparatus and Sample Mounting.

The test apparatus used for the manual and mechanical tests is shown in figure 2 of this report. This apparatus meets the requirements of the Specification.

The test sample was submitted for test mounted in a 50 x 100mm timber subframe in accordance with the manufacturer's installation requirements. The test sample was manufactured by the client.

The results within this test report are valid only for the conditions under which the testing was carried out, and for the specified products only.

Description of Sample. (Security)

Sample type -	Tilt turn window next to fixed lights		
Material -	Aluminium		
Construction -	Mechanically jointed		
Fittings -	3 off tilt turn stays		
	A seven-point locking Sobinco Chrono Invision Safe tilt turn gearing system (seven mushroom bolts) operated by a key locking handle		
Classification –	W		
Glass -	Double glazed, 6-12-6mm toughened glass sealed unit		
Glazing System -	Internal beads and gaskets		
Weathersealing -	Double-sealed plastic weather strip		
Sample Dimensions -	For information only (nominal sizes)		
	Overall Size -	Length: 1850mm	Height: 2140mm
	Sash Size -	Length: 1145mm	Height: 2040mm

Test Results.

Performance Requirements

Assessment

Clause 4.3 Manipulation Test A

The sample was mounted vertically in the test rig as described in Clause 3.

The test was carried out in accordance with the given objectives of this Clause using the tools specified in A.2.1

The sample was closed and locked and the key removed. Although there is a 15 minute overall time limit no one technique was used for more than three minutes.

No tools effective.

No entry gained within the time allowed.

Pass

Date of test – 29 July 2020

Test engineer(s) – Kevin Huscroft & David Vinyard

Laboratory temperature – 18.6°C

Clause 4.4 Infill Medium Removal Test

Clause 4.4.2 Manual Test

The sample was mounted vertically in the test rig as described in Clause 3.

The sample was assessed using the tools specified in A.2.1 Group A and A.2.2 Group B.

A craft knife was used to cut the glazing gaskets.

No entry gained within the time allowed.

Pass

Date of test – 29 July 2020

Test engineer(s) – Kevin Huscroft & David Vinyard

Laboratory temperature – 18.6°C

Test Results. (continued)

Performance Requirements (continued)

Assessment

Clause 4.4.3 Mechanical Test

The sample was mounted vertically in the test rig as described in Clause 3.

A perpendicular-to-plane load of 2.0kN was applied to each corner of the glazing in turn as specified in Clause 4.4.3.

No evidence of bead failure. No entry gained.

Pass

Date of test – 29 July 2020

Test engineer(s) – Kevin Huscroft & David Vinyard

Laboratory temperature – 18.6°C

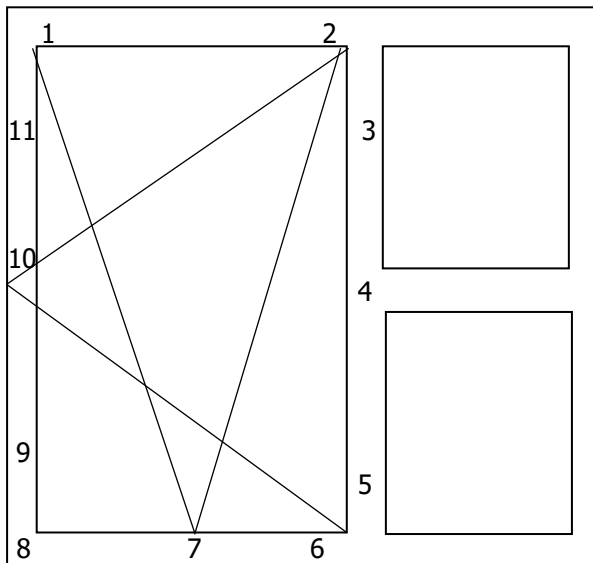
Test Results (Continued).

Clause 4.5 Mechanical Loading Test

The sample was mounted vertically in the test rig as described in Clause 3.

The test was carried out in accordance with the procedures detailed in Clause 4.5.2 using the apparatus detailed in Clause 3.

Diagram of load points



C.4.5.2 Loading Procedure

First Sequence

Point of application of load

1 - Corner (left head)

Standard loading case used: 5

Load applied in plane: 1.0kN along the edge in the direction to disengage the nearest locking point
 Load applied perpendicular to plane: 3.0kN applied for ten seconds

Load applied in plane: 1.0kN at right angles to the edge and towards the opposite edge
 Load applied perpendicular to plane: 3.0kN applied for ten seconds

Test Results (Continued).

C.4.5.2 Loading Procedure (Continued)

First Sequence (Continued)

2 - Corner (right head)

Standard loading case used: 5

Load applied in plane: 1.0kN along the edge in the direction to disengage the nearest locking point
Load applied perpendicular to plane: 3.0kN applied for ten seconds

Load applied in plane: 1.0kN at right angles to the edge and towards the opposite edge
Load applied perpendicular to plane: 3.0kN applied for ten seconds

3 - Mushroom Bolt (upper mullion)

Standard loading case used: 7

Load applied in plane: 1.0kN along the edge in the direction to disengage the bolt
Load applied perpendicular to plane: 3.0kN applied for ten seconds

Load applied in plane: 1.0kN at right angles to the edge and towards the opposite edge
1.0kN at the mullion to oppose the above load

Load applied perpendicular to plane: 3.0kN applied for ten seconds

4 - Mushroom Bolt (centre mullion)

Standard loading case used: 7

Load applied in plane: 1.0kN along the edge in the direction to disengage the bolt
Load applied perpendicular to plane: 3.0kN applied for ten seconds

Load applied in plane: 1.0kN at right angles to the edge and towards the opposite edge
1.0kN at the mullion to oppose the above load

Load applied perpendicular to plane: 3.0kN applied for ten seconds

5 - Mushroom Bolt (lower mullion)

Standard loading case used: 7

Load applied in plane: 1.0kN along the edge in the direction to disengage the bolt
Load applied perpendicular to plane: 3.0kN applied for ten seconds

Load applied in plane: 1.0kN at right angles to the edge and towards the opposite edge
1.0kN at the mullion to oppose the above load

Load applied perpendicular to plane: 3.0kN applied for ten seconds

Test Results (Continued).

C.4.5.2 Loading Procedure (Continued)

First Sequence (Continued)

6 - Corner (right sill)

Standard loading case used: 5

Load applied in plane: 1.0kN along the edge in the direction to disengage the nearest locking point
Load applied perpendicular to plane: 3.0kN applied for ten seconds

Load applied in plane: 1.0kN at right angles to the edge and towards the opposite edge
Load applied perpendicular to plane: 3.0kN applied for ten seconds

7 - Mushroom Bolt (centre sill)

Standard loading case used: 6

Load applied in plane: 1.0kN along the edge in the direction to disengage the bolt
Load applied perpendicular to plane: 3.0kN applied for ten seconds

Load applied in plane: 1.0kN at right angles to the edge and towards the opposite edge
Load applied perpendicular to plane: 3.0kN applied for ten seconds

8 - Corner (left sill)

Standard loading case used: 5

Load applied in plane: 1.0kN along the edge in the direction to disengage the nearest locking point
Load applied perpendicular to plane: 3.0kN applied for ten seconds

Load applied in plane: 1.0kN at right angles to the edge and towards the opposite edge
Load applied perpendicular to plane: 3.0kN applied for ten seconds

9 - Mushroom Bolt (lower left jamb)

Standard loading case used: 6

Load applied in plane: 1.0kN along the edge in the direction to disengage the bolt
Load applied perpendicular to plane: 3.0kN applied for ten seconds

Load applied in plane: 1.0kN at right angles to the edge and towards the opposite edge
Load applied perpendicular to plane: 3.0kN applied for ten seconds

Test Results (Continued).

C.4.5.2 Loading Procedure (Continued)

Assessment

First Sequence (Continued)

10 - Mushroom Bolt (centre left jamb)

Standard loading case used: 6

Load applied in plane: 1.0kN along the edge in the direction to disengage the bolt
Load applied perpendicular to plane: 3.0kN applied for ten seconds

Load applied in plane: 1.0kN at right angles to the edge and towards the opposite edge
Load applied perpendicular to plane: 3.0kN applied for ten seconds

11 - Mushroom Bolt (upper left jamb)

Standard loading case used: 6

Load applied in plane: 1.0kN along the edge in the direction to disengage the bolt
Load applied perpendicular to plane: 3.0kN applied for ten seconds

Load applied in plane: 1.0kN at right angles to the edge and towards the opposite edge
Load applied perpendicular to plane: 3.0kN applied for ten seconds

No entry gained

Pass

Date of test – 29 July 2020

Test engineer(s) – Kevin Huscroft & David Vinyard

Laboratory temperature – 18.6°C

C.4.3 Manipulation Test B

No fixings were exposed during mechanical loading.

Pass

Date of test – 29 July 2020

Test engineer(s) – Kevin Huscroft & David Vinyard

Laboratory temperature – 18.6°C

Test Results. (continued)

Performance Requirements (continued)

Assessment

Clause 4.6 Manual Check Test

The sample was mounted vertically in the test rig as described in Clause 3.

The test was carried out using the tools described in B.4.6.2 in accordance with the procedures detailed in C.4.6.2.

Two nail bars were used to no effect.

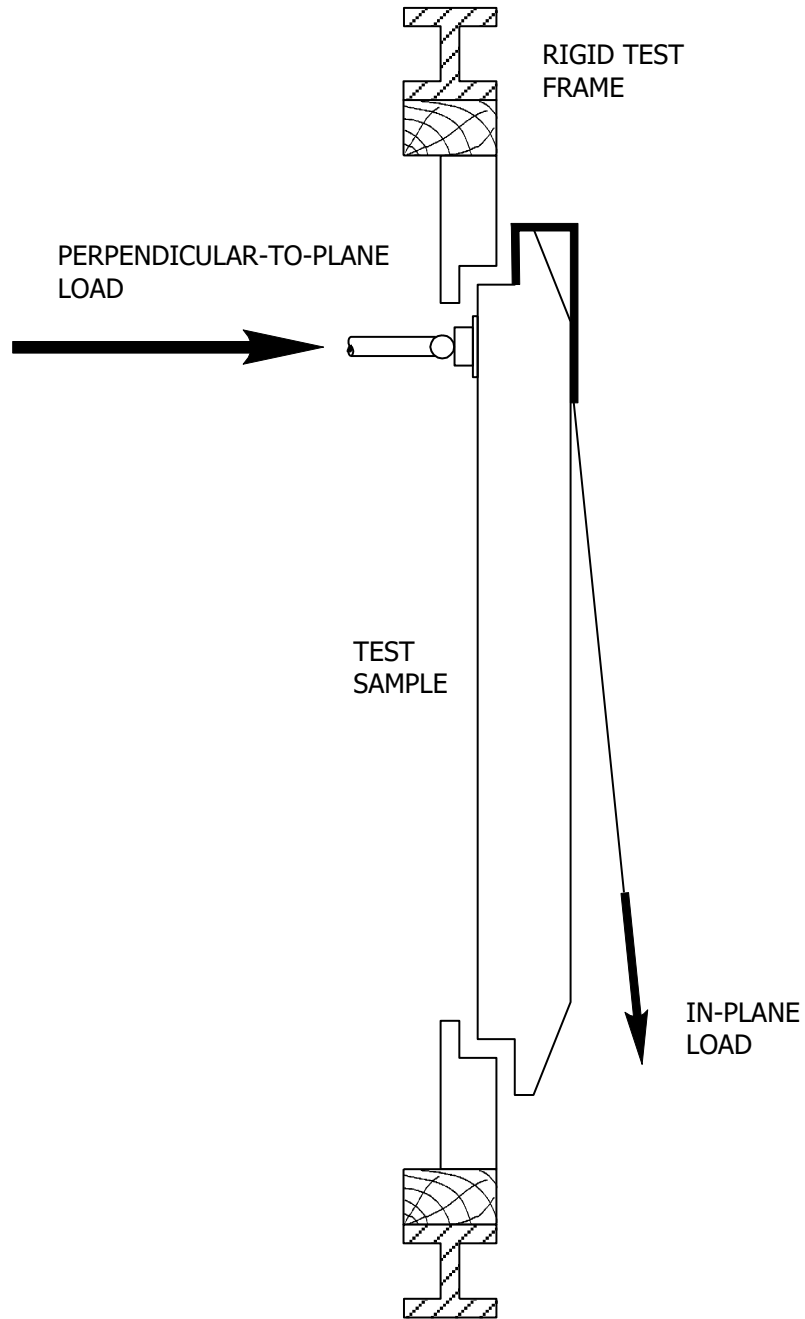
No alternative method of entry could be found.

Date of test – 29 July 2020

Test engineer(s) – Kevin Huscroft & David Vinyard

Laboratory temperature – 18.6°C

Figure 2.



Test Samples.

Sample Id	ER Number	Description
1	10187258	Aluminium windows

Description of Test Samples.

Sample Description
3 off tilt / turn windows next to fixed lights

Test Requirements.

BS4873/PAS24 window type test

Clause	Requirements
Results table	<i>BS4873/PAS24 window type test</i>

Glossary of Terms.

PASS: Complies. Tested by BSI engineers at BSI laboratories.

PASS1: Complies. Witnessed by BSI engineers in manufacturers laboratory.

PASS2: Complies. Tests carried out by third party lab; results accepted by BSI.

PASS*: Report resulted in uncertainty and states that Compliance is more probable than non-compliance.

FAIL: Non compliance – Product does not meet the requirements of this clause.

FAIL*: Report resulted in uncertainty and states that Non-compliance is more probable than compliance.

N/A: Not applicable to design under consideration.

N/T: Not tested due to similarity to previously tested item; reference earlier test report.

Conditions of Issue.

This Test Report is issued subject to the conditions stated in current issue of 'BSI Terms of Service'. The results contained herein apply only to the particular sample(s) tested and to the specific tests carried out, as detailed in this Test Report. The issuing of this Test Report does not indicate any measure of Approval, Certification, Supervision, Control or Surveillance by BSI of any product. No extract, abridgement or abstraction from a Test Report may be published or used to advertise a product without the written consent of BSI, who reserve the absolute right to agree or reject all or any of the details of any items or publicity for which consent may be sought.

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*** End of Report ***