



Test Report: W10179-2

**Classification of Weathertightness in accordance with BS
6375-1:2009**

**Incorporating Air Permeability test in accordance with BS EN
1026:2000**

**Watertightness test in accordance with BS EN 1027:2000 and
Resistance to wind load in accordance with BS EN 12211:2000**

Specimen type: Window - vertical slider
Rehau Heritage S719

Client Rehau Ltd

Address Hill Court
Walford
Ross-on-Wye
Herefordshire
HR9 5QN

Date 12th July 2010

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Summary

The weathertightness classification tests were commissioned by , Rehau Ltd, Hill Court, Walford, Ross-on-Wye, Herefordshire,HR9 5QN and were performed in accordance with the following standards:

- Air permeability tests in accordance with BS EN 1026:2000
- Watertightness test in accordance with BS EN 1027:2000
- Wind resistance tests in accordance with BS EN 12211:2000
- Exposure category classification in accordance with BS 6375-1:2009 (clauses 6, 7 and 8)

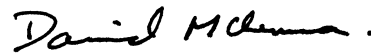
This report records the test data and documents all of the calculations in accordance with the equations contained within the above standards.

The following classification was achieved:

UK exposure category	Air permeability		Watertightness		Resistance to wind load			
	Class	Maximum test pressure	Class	Maximum test pressure	Class	P1	P2	P3
2000	3	600 Pa	7A	600 Pa	A5	2000	1000	3000



Richard Bate – Technical Director



David McKenna – Managing Director

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Test Specimen

The test specimen was received on 15/06/10.

The specimen type and size to be tested was determined by the client, who selected and delivered the specimen to Build Check's Laboratory.

The specimen was kept in the laboratory from the date it was received until the date it was tested.

The specimen had no vents, however because it was a vertically sliding window it was sealed all round.

Listed below is a description of the test specimen including size and materials used - for further information see drawings in Appendix 8 and photographs in Appendix 9.

Type of specimen: Window - vertical slider
Brand/ range name Rehau Heritage S719

Outer frame construction

Material / profile: PVC Outerframe Art 559500
Size (w x h x t) in mm: 1230 x 1480 x 137
Seals Nylon brushpile
Thermal insert None
Other information Frame groove cover - Article 219180

Top sash construction

Material / profile: PVC-u - Article 559510
Size (w x h x t) in mm: 1123 x 696 x 57
Beads 24mm sculptured bead - Article 559590
Thermal insert None
Reinforcement Slim sash reinforcement - Article 219000
Seals Nylon brushpile
Other information Frame groove cover - Article 219180
Foamasil Universal Gasket - Article 235203
24mm Square gasket edged bead aluminium - Article 219140

Bottom sash construction

Material / profile: (top of bottom sash) PVC-u - Article 559520
Material / profile: (deep bottom rail) PVC-u - Article 559540
Size (w x h x t) in mm: 1143 x 732 x 57
Beads 24mm sculptured beads - Article 559590
Thermal insert None
Other information Reinforcement aluminium Article 219040
Intermediate slim sash interlock - Article 559550
Reinforcement intermediate sash - Article 219010
Foamasil universal gasket - Article 235203
Deep bottom rail front gasket - Article 219350
Deep bottom rail back gasket - Article 219360

Glazing

Top sash Size (w x h x t) mm	1061 x 632 x 24
Bottom sash Size (w x h x t) mm	1061 x 632 x 24
Beads	Article - 559590
Gasket	Article - 235203

Hardware

Torso balance	2No. Torso balances
Pivot shoes	2No. Pivot shoes - UK133
Pivot bar carriers	2No. Pivot bar carriers - UK526
Pivot bars	2No. Slide in pivot bars - UK 507
Sash lock keeps	2No. Top mounted sash lock keeps - 30459DG
Sash locks	2No. Sash locks - KL800DG
Sash hooks	2No. Sash hooks (bottom sash fitment) - UK616DG
Sash rings	2No. Sash rings (top sash fitment) - UK624DG
Sash horn	2No. Sash horn slim sash - Article 219100
Joint blocks	2No. Intermediate sash joint blocks - Article 219270
Sliding latches	2No. Sliding latches (left and right) - Article 219070

Test Procedure

General

The tests began on 30/06/10.

On the day of testing the laboratory conditions were as follows:

Temperature:	26.7 °C
Relative Humidity:	36 % RH
Atmospheric pressure:	100 kPa

The tests were carried out in the following sequence as described in BS 6375-1:2009:

- 1 Air permeability of test chamber in accordance with BS EN 1026:2000
- 2 First air permeability test in accordance with BS EN 1026:2000
- 3 Water resistance test in accordance with BS EN 1027:2000
- 4 Wind resistance tests in accordance with BS EN 12211:2000
- 5 Second air permeability test in accordance with BS EN 1026:2000

Installation

At the request of Build Check the Client delivered the test specimen with a 50mm wide x 100mm deep sub-frame made of timber. The sub-frame was clamped to the front of the test chamber at the positions shown in Appendix 9.

Air permeability tests:

Initially all opening joints / vents on the specimen was sealed in order to establish the chamber air permeability after which the process was repeated with the opening joints / vent being unsealed to establish the total air permeability.

As required in BS 6375-1:2009 the air permeability tests were carried out for both positive and negative pressure as follows:

With the chamber closed 3 pre-gusts of 660 Pa was applied.

The static air pressure on the specimen was then raised in steps of 50Pa until a pressure of 300Pa was reached, then in steps of 150 Pa until the maximum air pressure was reached. At each step the required airflow to maintain the pressure was recorded - see Appendix 1.

Watertightness tests:

The spray nozzles were set-up in the pattern described as spray method "A" in the standard and the spray rate for each nozzle was 6 l/min.

All opening parts was opened and closed at least once before securing in closed position.
Initially the specimen was sprayed for 15 minutes with no added air pressure.

The air pressure on the specimen was then raised in steps of 50Pa until a pressure of 300Pa was reached, then in steps of 150 Pa until the maximum air pressure was reached. The pressure was maintained for 5 minutes $\pm$ 0 minutes at each step.

Throughout the process the specimen was inspected and any occurring penetrations were recorded
- see table in Appendix 3 and the positions marked on drawing in Appendix 4.

Wind Resistance tests**Deflection test**

Dial gauges were set-up to measure deflection at the points indicated on drawing in Appendix 6.

3 pressure gusts of 2200 Pa was applied. The time to reach the pressure was a minimum of 1 second and it was sustained for at least 3 seconds.

Following this all dial gauges were zeroed.

The test pressure (P1) of 2000 Pa was then applied at a rate not exceeding 100 Pa per second.
This pressure was maintained for 30 seconds and the deflection was read and recorded, see Appendix 5.

The pressure was then reduced to 0 Pa at a rate not exceeding 100 Pa per second and the residual deflection was recorded after 60 seconds $\pm$ 5 seconds.

Repeated pressure test

The specimen was subjected to 50 cycles of one negative pressure gust and then one positive pressure gust. The variation from negative to positive took 7 ± 3 seconds.

The pressure at each gust was 1000 Pa.

After completion of the 50 cycles, the moving parts of the specimen was opened and closed and any damage or functioning defects were recorded - See Appendix 7.

Prior to the safety test being carried out, a repeat air permeability test in accordance with BS EN 1026:2000 was carried out on the specimen to establish if the wind resistance tests have had an impact on the performance - see Appendix 1.

Safety tests

The specimen was subjected to one cycle of one negative pressure gust and then one positive pressure gust. The variation from negative to positive took 7 ± 3 seconds and the pressure was maintained for 7 seconds ± 3 seconds.

Following the safety test it was checked whether the test specimen remained closed and if any parts of the test specimen became detached this was recorded - See Appendix 7.

Results and analysis

Air permeability tests:

Individual readings of airflows for each pressure step (positive and negative) for both the chamber air permeability test and the total air permeability tests are tabulated in Appendix 1. The net air permeability was calculated as the difference between total and chamber air permeability and this was adjusted for Laboratory temperature and atmospheric pressure on the day of testing using the following equation:

$$V_{\text{net,ad}} = V_{\text{net}} \times \frac{293}{273 + T_x} \times \frac{P_x}{101.3}$$

where

T_x = Temperature of the laboratory in °C

P_x = Atmospheric pressure in the laboratory in kPa

V_{net} = Net air permeability, adjusted for Laboratory conditions

$V_{\text{net,ad}}$ = Net air permeability, defined as total air permeability minus chamber air permeability

The adjusted air permeability was then divided with the overall specimen area to establish the air permeability in relation to area (V_A) and with the total joint length to give air permeability in relation to opening length (V_L). All recorded and calculated values can be found in Appendix 1.

Graphs of the air permeabilities (V_A and V_L) against air pressure can be found in Appendix 2. These graphs also indicate the performance criteria for classes 1 to 4 as defined in BS 6375-1:2009 and from them it can be seen that the following air permeability classes can be awarded:

Classes in relation to overall area:

1st test, positive pressure: Class 3

1st test, negative pressure: Class 4

2nd test, positive pressure: Class 3

2nd test, negative pressure: Class 4

Classes in relation to length of opening joint:

1st test, positive pressure:	Class 3
1st test, negative pressure:	Class 4
2nd test, positive pressure:	Class 3
2nd test, negative pressure:	Class 4

Giving an overall air permeability class of:

Class 3

Watertightness tests:

Any water penetrations occurring during the test (including the pressure and the time at which it occurred) were recorded and has been tabulated in Appendix 3. Appendix 4 contains a drawing with marked positions of the penetration(s).

Based on the requirements in BS EN 12208, the specimen can be awarded the following watertightness class:

Class 7A

Wind Resistance tests

Deflection test

The recorded deflections - both the deflections during the wind gust and the residual deflections have been tabulated in Appendix 5. The deflections were expressed relative to the deflection length.

Based on the requirements in BS EN 12210, the specimen can be awarded the following wind deflection class:

Class A5

The maximum test pressure (P1) was: 2000 Pa

Repeated pressure test

Any damage or functioning defects were recorded - See Appendix 7.

Safety tests

Any occurring damage was recorded - See Appendix 7.

Conclusion

Based on the above the specimen tested can be awarded the following classes with regard to weathertightness in accordance with BS 6375-1:2009:

UK exposure category	Air permeability		Watertightness		Resistance to wind load			
	Class	Maximum test pressure	Class	Maximum test pressure	Class	P1	P2	P3
2000	3	600 Pa	7A	600 Pa	A5	2000	1000	3000

The classes obtained are specific to the type and size of specimen tested.

Appendix 1 - Air permeability data

1st test - positive pressure					
Pressure	Chamber permeability	Total Permeability	Net perm, adjusted for conditions	Net permeability per m ² area	Net permeability per m opening length
(Pa)	(m ³ /h)	(m ³ /h)	(m ³ /h)	(m ³ /h m ²)	(m ³ /h m)
50	3.08	4.66	1.52	0.84	0.25
100	5.07	8.06	2.89	1.59	0.47
150	6.76	11.28	4.36	2.40	0.71
200	8.36	14.55	5.97	3.28	0.97
250	9.94	18.02	7.80	4.28	1.27
300	11.36	21.32	9.61	5.28	1.57
450	15.62	33.31	17.07	9.38	2.79
600	19.94	46.85	25.97	14.27	4.24

1st test - negative pressure					
Pressure	Chamber permeability	Total Permeability	Net perm, adjusted for conditions	Net permeability per m ² area	Net permeability per m opening length
(Pa)	(m ³ /h)	(m ³ /h)	(m ³ /h)	(m ³ /h m ²)	(m ³ /h m)
50	2.52	3.94	1.37	0.75	0.22
100	4.20	6.77	2.48	1.36	0.40
150	5.48	8.99	3.39	1.86	0.55
200	6.76	11.13	4.22	2.32	0.69
250	7.87	13.20	5.14	2.83	0.84
300	8.92	15.22	6.08	3.34	0.99
450	11.79	20.56	8.46	4.65	1.38
600	14.34	25.52	10.79	5.93	1.76

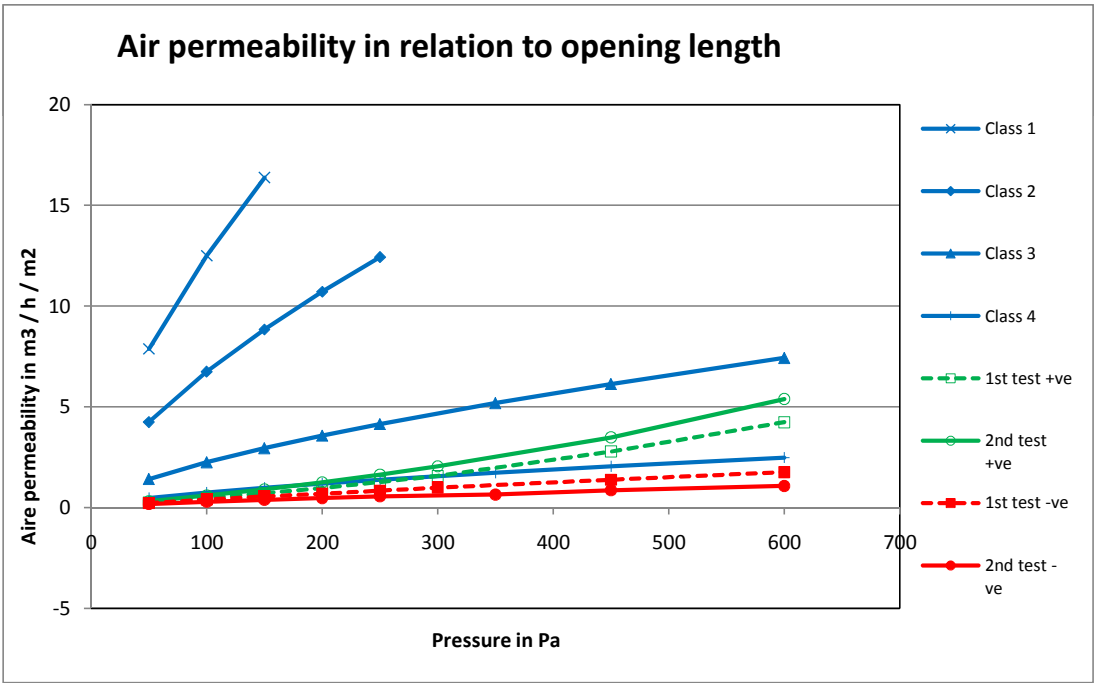
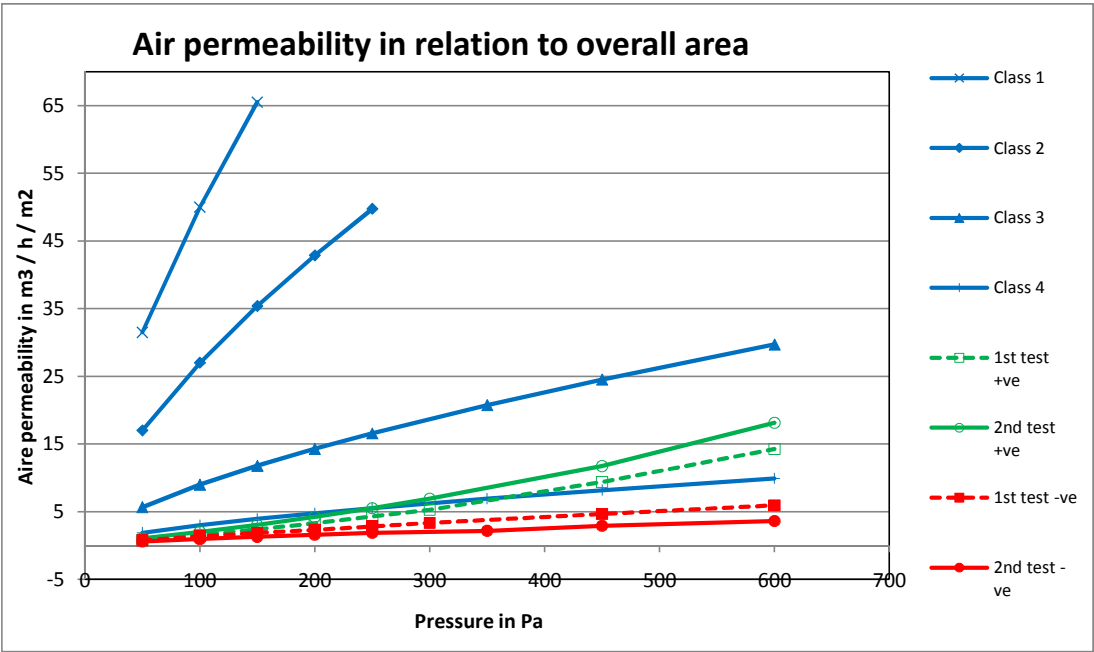
Average between positive and negative pressure -1st test						
Air pressure	Positive pressure		Negative pressure		Mean	
	Net Permeability per m ² area	Net Permeability per m opening length	Net Permeability per m ² area	Net Permeability per m opening length	Per m ² area	Per m opening length
(Pa)	(m ³ /h m ²)	(m ³ /h m)	(m ³ /h m ²)	(m ³ /h m)	(m ³ /h m)	(m ³ /h m)
50	0.84	0.25	0.75	0.22	0.80	0.24
100	1.59	0.47	1.36	0.40	1.47	0.44
150	2.40	0.71	1.86	0.55	2.13	0.63
200	3.28	0.97	2.32	0.69	2.80	0.83
250	4.28	1.27	2.83	0.84	3.55	1.06
300	5.28	1.57	3.34	0.99	4.31	1.28
450	9.38	2.79	4.65	1.38	7.01	2.08
600	14.27	4.24	5.93	1.76	10.10	3.00

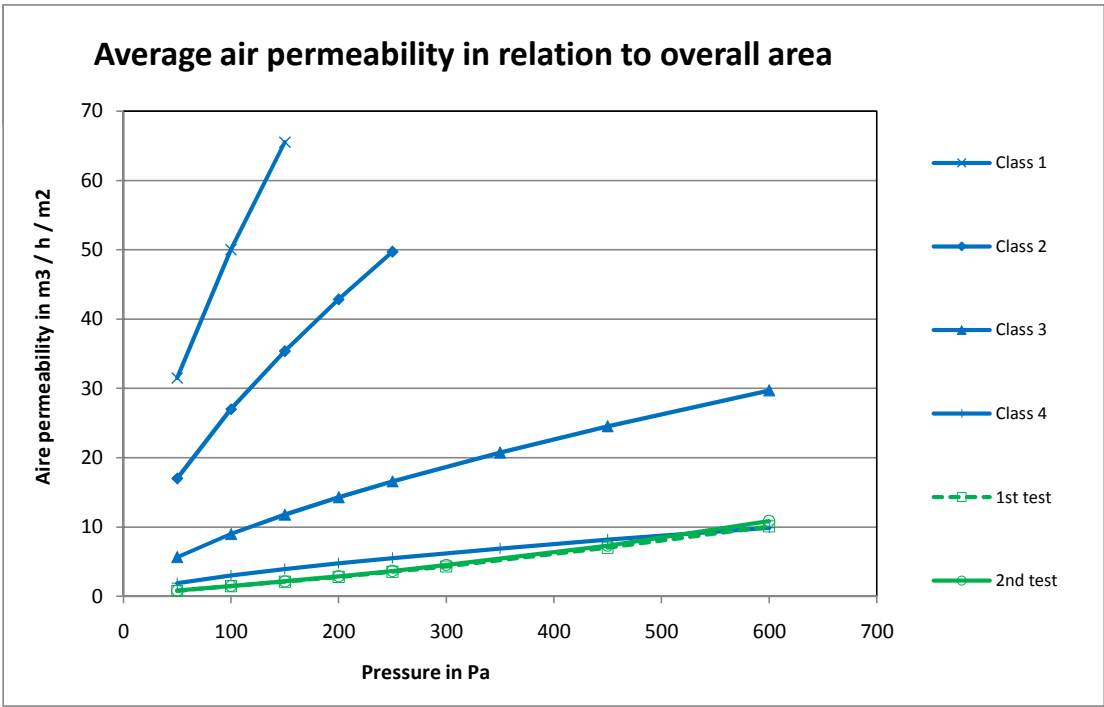
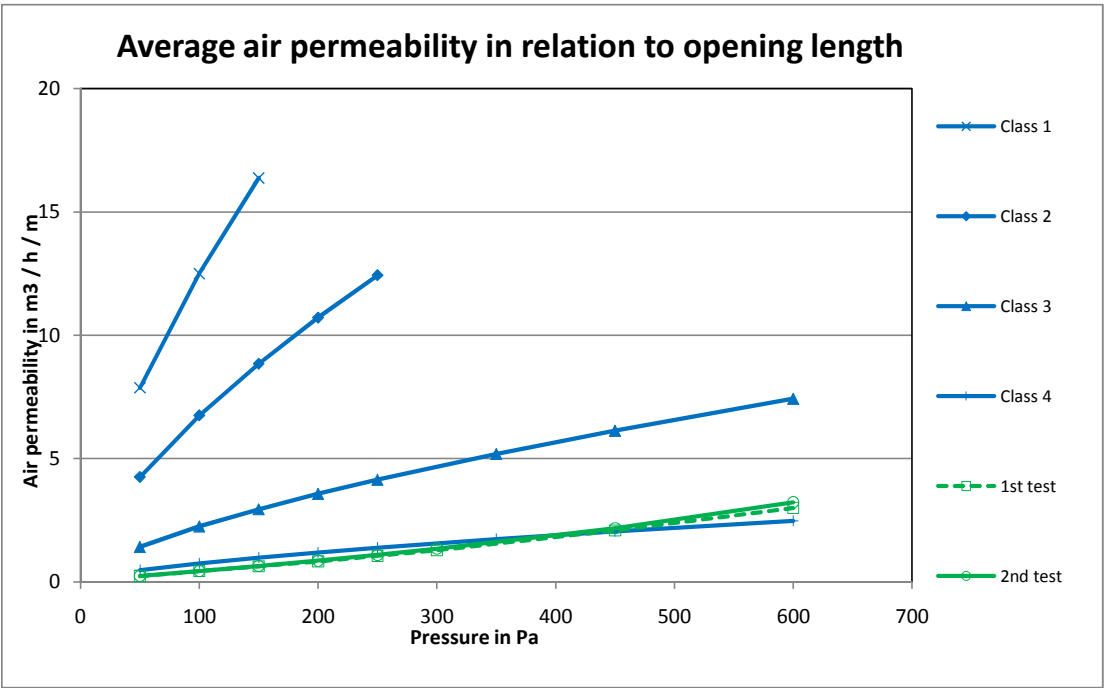
2nd test - positive pressure					
Pressure	Chamber permeability	Total Permeability	Net perm, adjusted for conditions	Net permeability per m ² area	Net permeability per m opening length
(Pa)	(m ³ /h)	(m ³ /h)	(m ³ /h)	(m ³ /h m ²)	(m ³ /h m)
50	2.49	4.50	1.94	1.07	0.32
100	4.17	8.00	3.70	2.03	0.60
150	5.66	11.43	5.57	3.06	0.91
200	7.00	14.94	7.66	4.21	1.25
250	8.23	18.61	10.02	5.50	1.63
300	9.50	22.53	12.58	6.91	2.05
450	12.92	35.05	21.36	11.73	3.48
600	14.08	48.30	33.03	18.14	5.39

2nd test - negative pressure					
Pressure	Chamber permeability	Total Permeability	Net perm, adjusted for conditions	Net permeability per m ² area	Net permeability per m opening length
(Pa)	(m ³ /h)	(m ³ /h)	(m ³ /h)	(m ³ /h m ²)	(m ³ /h m)
50	2.13	3.24	1.07	0.59	0.17
100	3.47	5.28	1.75	0.96	0.29
150	4.60	7.02	2.34	1.28	0.38
200	5.66	8.66	2.90	1.59	0.47
250	6.58	10.10	3.40	1.87	0.55
300	7.48	11.58	3.96	2.17	0.65
450	9.99	15.48	5.30	2.91	0.86
600	12.3	19.14	6.60	3.63	1.08

Average between positive and negative pressure - 2nd test						
Pressure	Positive pressure		Negative pressure		Mean	
	Net Permeability per m ² area	Net Permeability per m opening length	Net Permeability per m ² area	Net Permeability per m opening length	Per m ² area	Per m opening length
(Pa)	(m ³ /h m ²)	(m ³ /h m)	(m ³ /h m ²)	(m ³ /h m)	(m ³ /h m)	(m ³ /h m)
50	1.07	0.32	0.59	0.17	0.83	0.25
100	2.03	0.60	0.96	0.29	1.50	0.44
150	3.06	0.91	1.28	0.38	2.17	0.64
200	4.21	1.25	1.59	0.47	2.90	0.86
250	5.50	1.63	1.87	0.55	3.68	1.09
300	6.91	2.05	2.17	0.65	4.54	1.35
450	11.73	3.48	2.91	0.86	7.32	2.17
600	18.14	5.39	3.63	1.08	10.88	3.23

Appendix 2 - Air permeability graphs



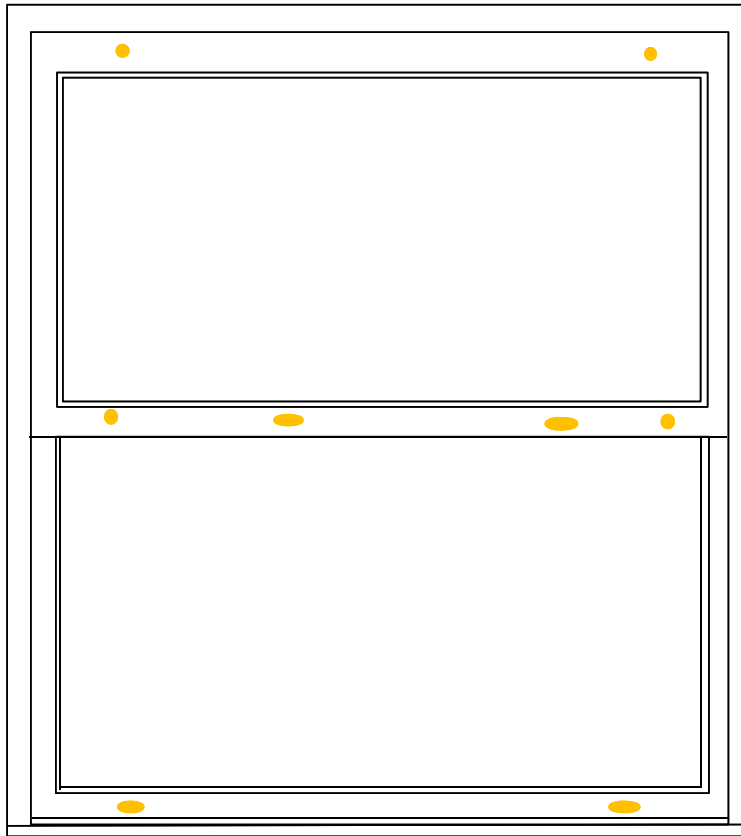


Appendix 3 - Watertightness data

Air pressure (Pa)	Spray Duration (minutes)	Any penetration?	Position of penetration 1)	Time of occurrence (min:sec)
0	15 +1/-0	No		
50 ±3	5 +1/-0	No		
100 ±5	5 +1/-0	No		
150 ±8	5 +1/-0	No		
200 ±10	5 +1/-0	No		
250 ±13	5 +1/-0	No		
300 ±18	5 +1/-0	No		
450 ±23	5 +1/-0	No		
600 ±30	5 +1/-0	No		

1) - see positions on drawing in Appendix 4

Appendix 4 - Drawing with water penetration points



No water penetration points to report

Appendix 5 - Wind deflection data

Deflection Test:
P1= Pa

Positive pressure :							
Member measured (mark on drawing)		Dial Gauge readings in mm				Length	Relative deflection
		Left end	Centre	Right End	Net deflection		
3 pre-gusts of 2200		Pa carried out					
	Dial Gauge ID	WT-05	WT-06	WT-07		1140	
	Pre-test reading	15.66	13.27	12			
	Max reading	19.06	18.84	15.5			
	Net gust reading	3.4	5.57	3.5	2.12		1/ 538
	Residual reading	15.73	13.38	12.1			
	Net residual read	0.07	0.11	0.1	0.025		1/ 45600

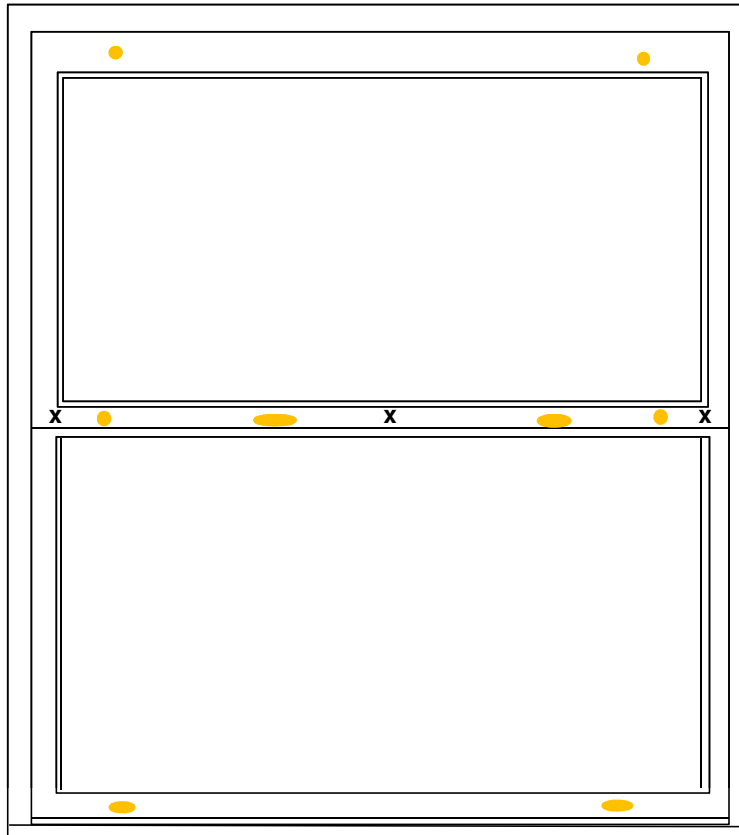
Negative pressure :							
Member measured (mark on drawing)		Dial Gauge readings in mm				Length	Relative deflection
		Left End	Centre	Right End	Net deflection		
3 pre-gusts of 2200		Pa carried out					
	Dial Gauge ID	WT-05	WT-06	WT-07		1140	
	Pre-test reading	-14.18	-11.94	-10.88			
	Max reading	-12.08	-7.67	-7.02			
	Net gust reading	2.10	4.27	3.86	1.29		1/ 884
	Residual reading	-14.12	-11.88	-10.82			
	Net residual read	0.06	5.00	0.06	4.94		1/ 231

Worst case when considering both positive and negative pressure:

Minimum requirement:

=>

Appendix 6 - Drawing with deflection reading points



X location of dial gauge to measure deflection
 window fittings

Appendix 7 - Cyclic wind and wind safety data

Cyclic test (repeated pressure):

P2 = Pa

50 cycles at	1000	Pa carried out
Any damage or function defects?		
Record any damage or function defects: No damage or defects occurred.		

Passed? (yes/no)

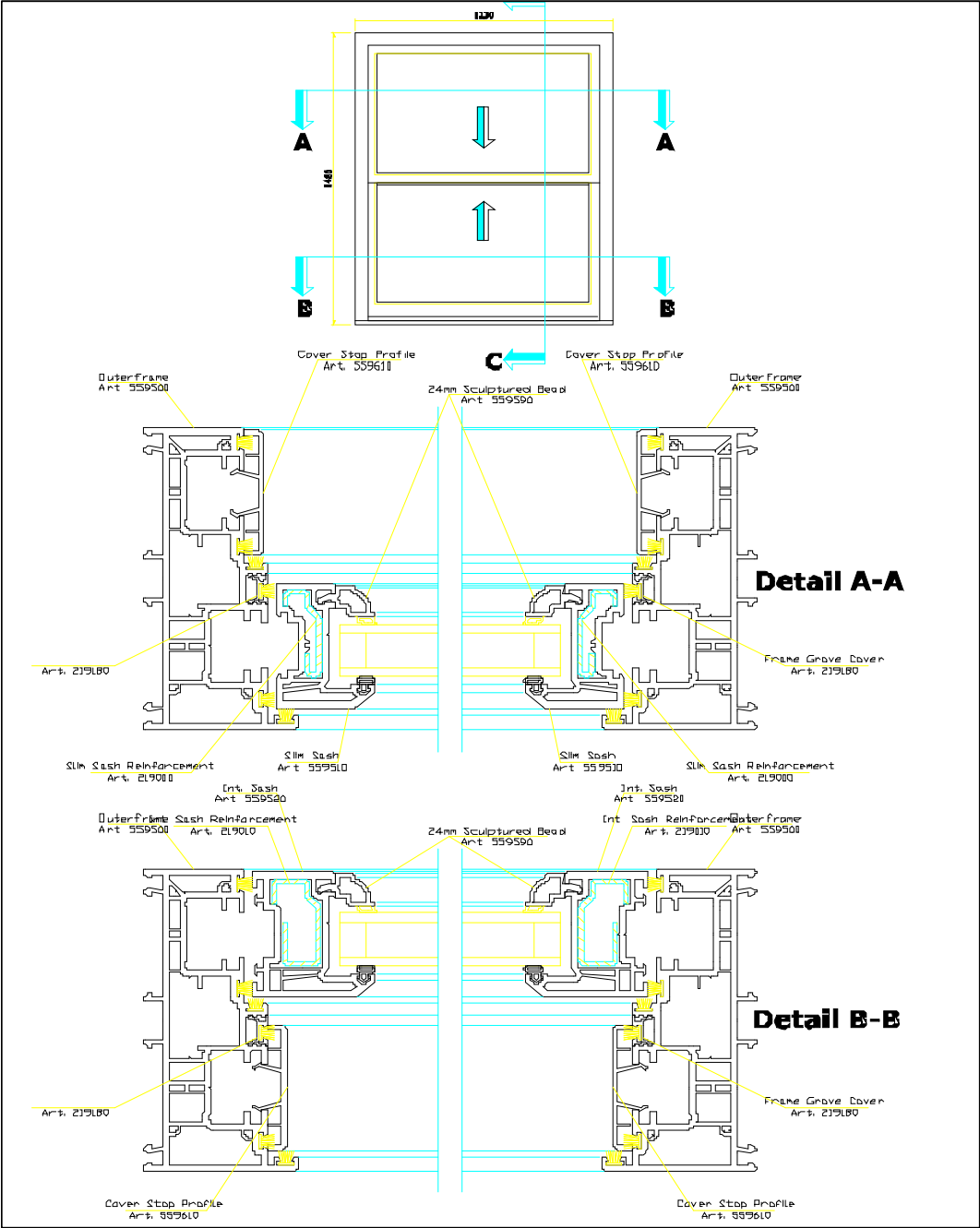
Safety test:

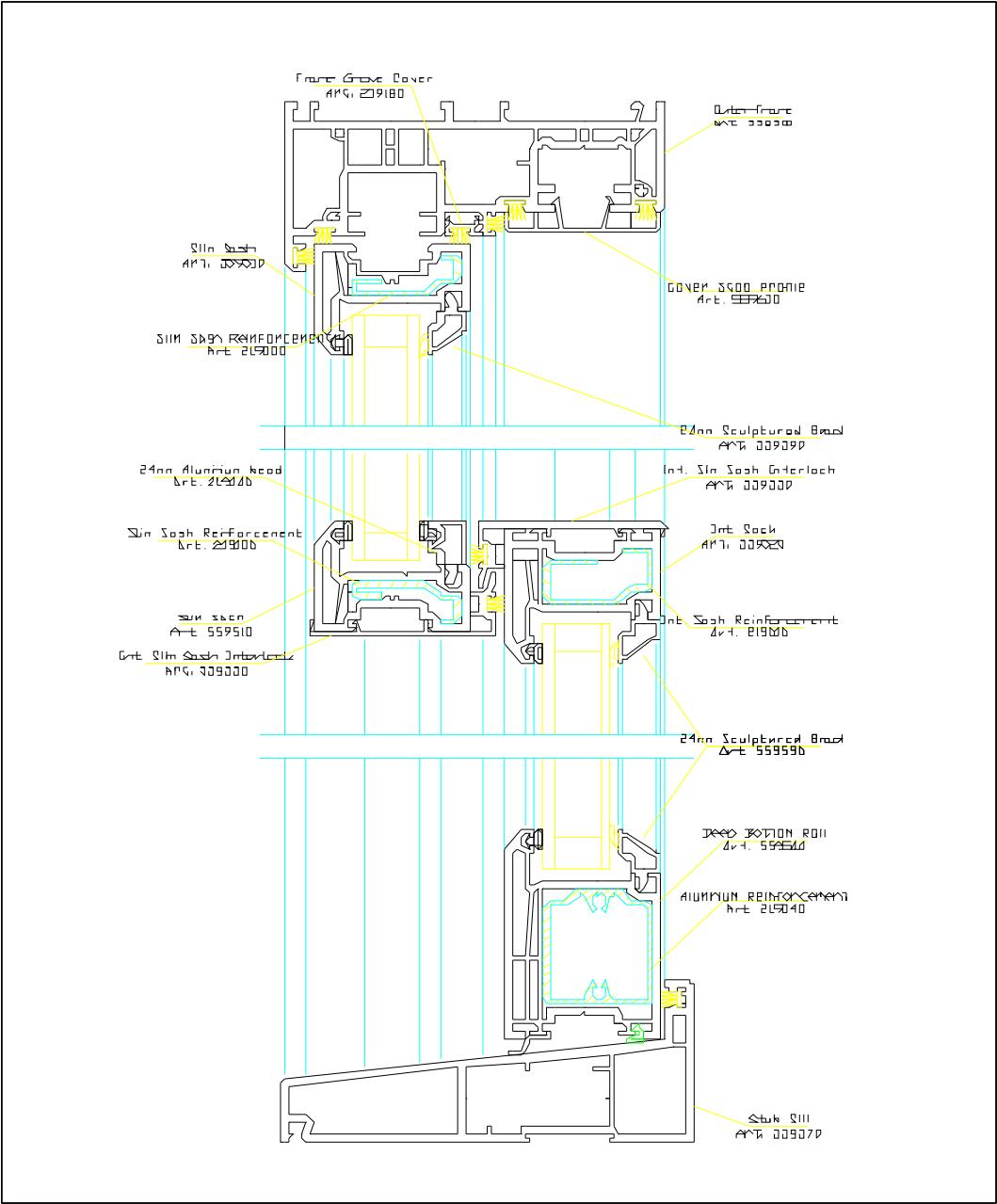
P3 = Pa

1 positive and 1 negative gust of	3000	Pa carried out
Did the specimen remain closed and / or did any part become detached?		
Record if the specimen remains closed and describe any part which have become attached: The specimen remained closed and no parts became detached.		

Passed? (yes/no)

Appendix 8 - Drawings





Appendix 9 - Photographs



Appendix 10 - Equipment Used

Weather rig
Weather station AL-07
Manometer WT-01
Air Flow Meter WT-04
Tape measure WT-03
Water Flow Meter WT-15
Nozzle Angle Check Stick WT-12
Set Square WT-14
Dial gauge WT-05
Dial gauge WT-06
Dial gauge WT-07