



Test Report: W14345-2

**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: 3 Pane Opening In Bifolding door
Stayfix Viso Fold

Client Stayfix Ltd

Address 53 Park Royal Road
London
NW10 7LQ

Date 10 - 03 - 2015

Build Check Ltd

Montrose House
Lancaster Road
Cressex Business Park
High Wycombe
Bucks
HP12 3PY

Tel: 01494 452713
Fax: 08702 101013

Web: www.buildcheck.co.uk
Email: info@buildcheck.co.uk



4044

This document is confidential and remains the property of Build Check Ltd

Software issue ref: April 2013

Summary

The weathertightness classification tests were commissioned by Kiran Budhia, Stayfix Ltd, 53 Park Royal Road, London, NW10 7LQ, , 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 |
| 1200 | 2 | 300 Pa | 3A | 150 Pa | A3 | 1200 | 600 | 1800 |



Gorden Stewart - Test Engineer



Richard Bate – Technical Director

Issue Date: 10 - 03 - 2015

| Contents | Page No. |
|-------------------------------|-----------------|
| Test Specimen | 4 |
| Results and Analysis | 6 |
| Conclusion | 7 |
| Appendix 1 - Test data | 8 |
| Appendix 2 - Product drawings | 15 |
| Appendix 3 - Test procedure | 17 |
| Appendix 4 - Equipment used | 19 |

Test Specimen

The test specimen was received on .

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 and was conditioned for a minimum of 4 hours.

The specimen had no vents and therefore did not require sealing.

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

Description of test specimen

Type of specimen: 3 Pane Opening In Bifolding door

Brand/ range name Stayfix Viso Fold

Door frame construction

Material / profile: F1101 – Outer Frame
Size (w x h x t) in mm: 3000 x 2400 x 71mm
Joints F1027 Corner fixing. Fixed in with general purpose silicone
Seals PG014 - Foam Bubble
Thermal insert Polyamide 20mm

Sash frame construction

Material / profile: F1104 - Opening In stile; F1103 – Fold Stile
Size (w x h x t) in mm): 1 x 984 x 2306mm; 2 x 967 x 2306mm
Joint: F1004 – 12mm leaf cleat. Joined with general purpose silicone
Thermal insert: 32mm Polyamide
Seals: PG014 - Foam Bubble [rebate]; FG001 – Fold gasket Type 1 [fold style]
Other information: F1043 – toe and heal device

Glazing

Size (w x h x t) in mm: 872 x 2211mm
Unit: 4-20-4 - 28mm toughened glass
Manufacturer: Kingsbury Windows
Beads: F1109 Fold Bead
Gasket: WG034T – 3/4mm Wedge gasket
Other information:

Hardware

Outer hinge – F1010; Fold hinge – F1007
 Top Roller/Bottom Wheel – F1023
 Top Roller/Bottom Wheel – F1023
 Fold stile Foam 23 x 55mm – FO11
 Lever/Lever handle – 641
 Cylinder 45/45- 45/45
 3 Point door Lock – 621
 Shootbolt Gearbox – F1032

PVC Lock adaptor – F1014
 Stainless steal track – F1009
 Shootbolt – F1018
 Shootbolt guide – F1016

Specimen photograph



Test Procedure

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:

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

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_{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 (VA and VL) against air pressure 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 2 |
| 1st test, negative pressure: | Class 2 |
| 2nd test, positive pressure: | Class 2 |
| 2nd test, negative pressure: | Class 2 |

Classes in relation to length of opening joint:

| | |
|------------------------------|---------|
| 1st test, positive pressure: | Class 2 |
| 1st test, negative pressure: | Class 2 |
| 2nd test, positive pressure: | Class 2 |
| 2nd test, negative pressure: | Class 2 |

Giving an overall air permeability class of: **Class 2**

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 1. It also 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 of: **Class 3A**

Wind Resistance tests

Deflection test

The recorded deflections - both the deflections during the wind gust and the residual deflections have been tabulated in Appendix 1. 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 of: **Class A3**

The maximum test pressure (P1) was: 1200 Pa

Repeated pressure test

The results and any damage or functioning defects were recorded - See Appendix 1.

Safety tests

Any occurring damage was recorded - See Appendix 1.

Conclusion

Based on the above the specimen tested can be awarded the following classes with regard to weather-tightness 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 |
| 1200 | 2 | 300 Pa | 3A | 150 Pa | A3 | 1200 | 600 | 1800 |

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

Appendix 1 - Test data

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 | 10.08 | 14.45 | 4.30 | 0.60 | 0.29 |
| 100 | 15.54 | 21.8 | 6.15 | 0.85 | 0.42 |
| 150 | 19.84 | 28.3 | 8.32 | 1.16 | 0.56 |
| 200 | 24.18 | 33.5 | 9.16 | 1.27 | 0.62 |
| 250 | 28.16 | 38.71 | 10.37 | 1.44 | 0.70 |
| 300 | 32.48 | 44.42 | 11.74 | 1.63 | 0.80 |

| 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 | 10.26 | 13.18 | 2.87 | 0.40 | 0.19 |
| 100 | 16.6 | 21.15 | 4.47 | 0.62 | 0.30 |
| 150 | 21.45 | 28.55 | 6.98 | 0.97 | 0.47 |
| 200 | 27.31 | 32.24 | 4.85 | 0.67 | 0.33 |
| 250 | 30.52 | 32.42 | 1.87 | 0.26 | 0.13 |
| 300 | 33.74 | 39.51 | 5.67 | 0.79 | 0.38 |

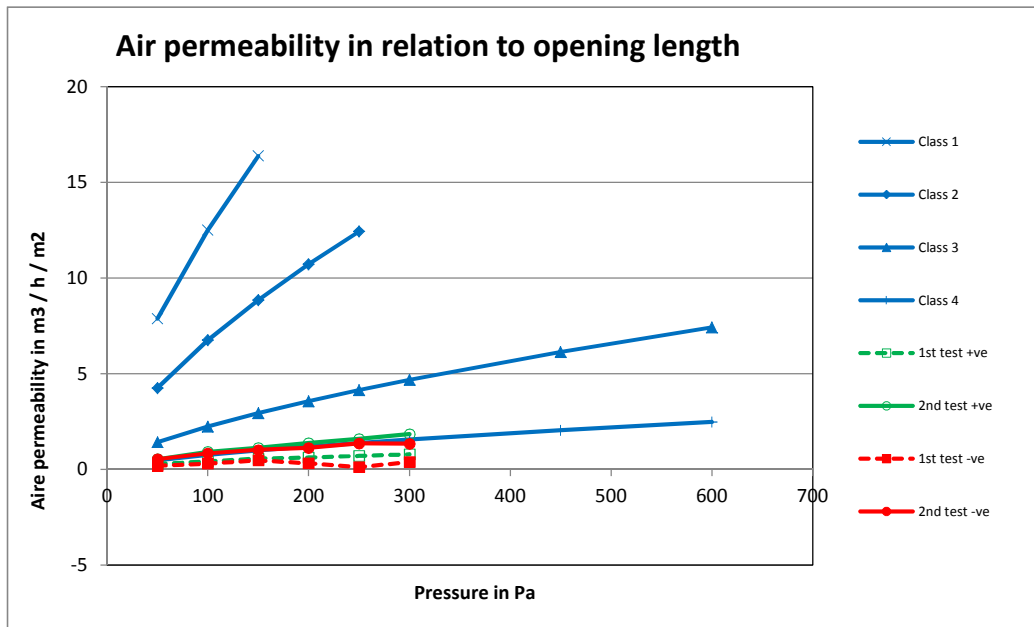
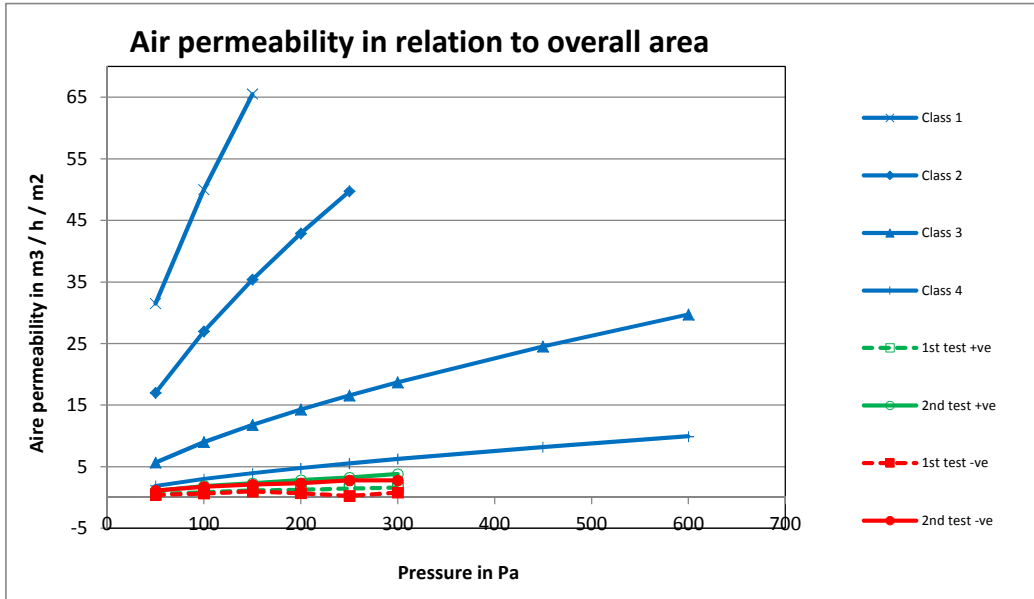
| Average between positive and negative pressure -1st test | | | | | | |
|--|--|---------------------------------------|--|---------------------------------------|-------------------------|-----------------------|
| Air pressure | Positive pressure | | Negative pressure | | Mean | |
| | Net Permeability 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 | 0.60 | 0.29 | 0.40 | 0.19 | 0.50 | 0.24 |
| 100 | 0.85 | 0.42 | 0.62 | 0.30 | 0.74 | 0.36 |
| 150 | 1.16 | 0.56 | 0.97 | 0.47 | 1.06 | 0.52 |
| 200 | 1.27 | 0.62 | 0.67 | 0.33 | 0.97 | 0.47 |
| 250 | 1.44 | 0.70 | 0.26 | 0.13 | 0.85 | 0.41 |
| 300 | 1.63 | 0.80 | 0.79 | 0.38 | 1.21 | 0.59 |

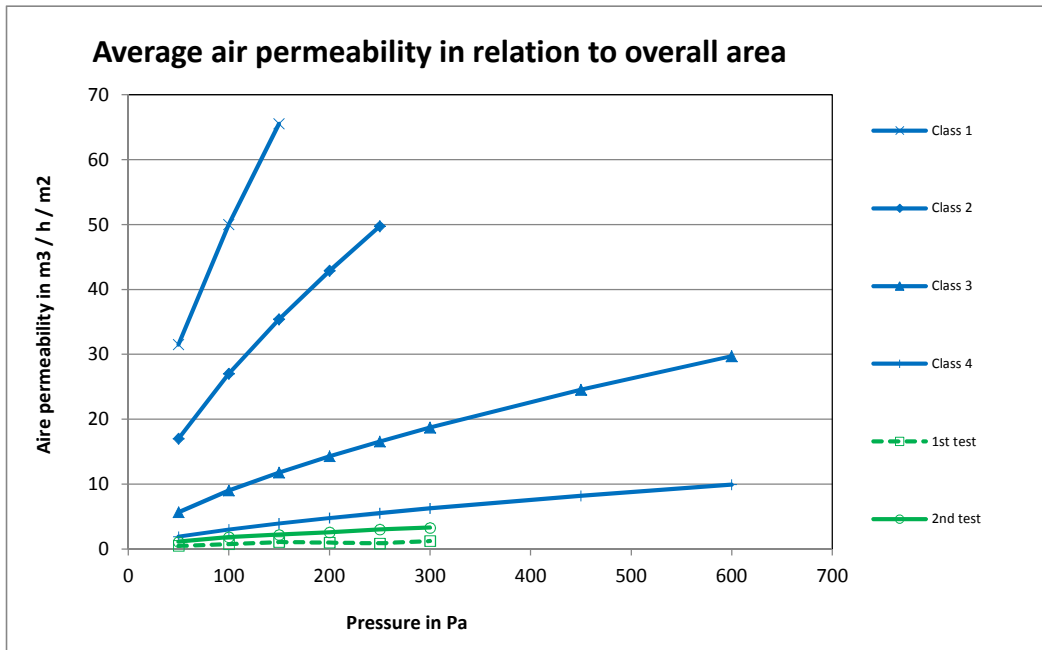
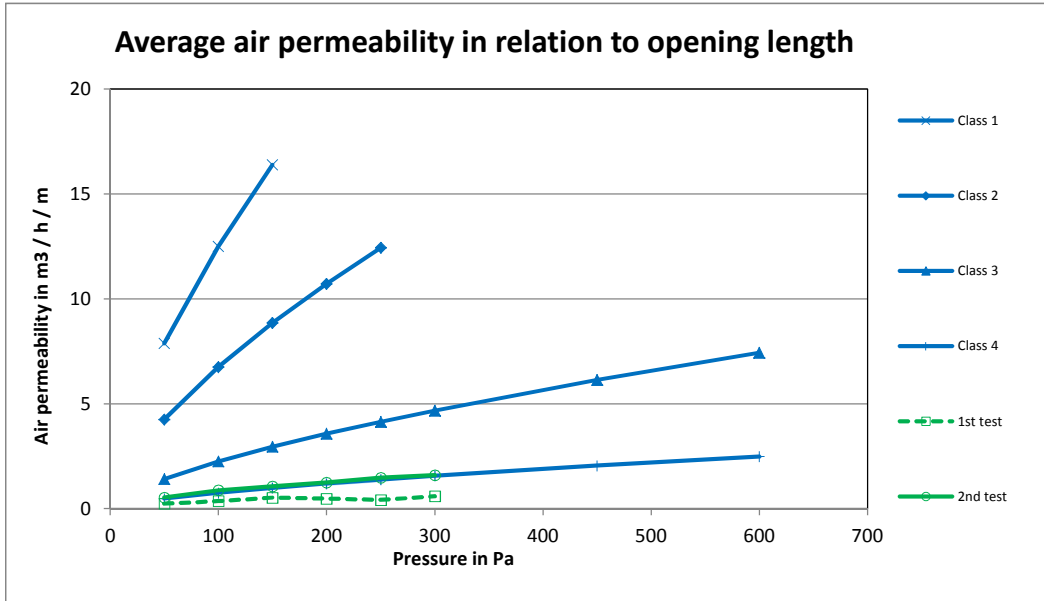
| 2nd test - positive pressure | | | | | |
|------------------------------|----------------------|---------------------|-----------------------------------|--|---------------------------------------|
| Pressure | Chamber permeability | Total Permeability | Net perm, adjusted for conditions | Net permeability 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 | 11.63 | 19.65 | 7.88 | 1.09 | 0.53 |
| 100 | 17.3 | 31.13 | 13.60 | 1.89 | 0.92 |
| 150 | 22.13 | 38.93 | 16.51 | 2.29 | 1.12 |
| 200 | 26.6 | 47.21 | 20.26 | 2.81 | 1.37 |
| 250 | 31.7 | 55.5 | 23.40 | 3.25 | 1.59 |
| 300 | 36.32 | 64.05 | 27.26 | 3.79 | 1.85 |

| 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 | 11.17 | 19.23 | 7.92 | 1.10 | 0.54 |
| 100 | 16.8 | 29.51 | 12.49 | 1.74 | 0.85 |
| 150 | 21.7 | 36.94 | 14.98 | 2.08 | 1.01 |
| 200 | 26.61 | 43.42 | 16.52 | 2.30 | 1.12 |
| 250 | 30.72 | 51.11 | 20.04 | 2.78 | 1.36 |
| 300 | 34.63 | 54.8 | 19.83 | 2.75 | 1.34 |

| 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 | 1.09 | 0.53 | 1.10 | 0.54 | 1.10 | 0.54 |
| 100 | 1.89 | 0.92 | 1.74 | 0.85 | 1.81 | 0.88 |
| 150 | 2.29 | 1.12 | 2.08 | 1.01 | 2.19 | 1.07 |
| 200 | 2.81 | 1.37 | 2.30 | 1.12 | 2.55 | 1.25 |
| 250 | 3.25 | 1.59 | 2.78 | 1.36 | 3.02 | 1.47 |
| 300 | 3.79 | 1.85 | 2.75 | 1.34 | 3.27 | 1.60 |

Air permeability graphs





Watertightness data

| Air pressure (Pa) | Spray Duration (minutes) | Any penetration? | Position of penetration 1) | Time of occurrence (min:sec) |
|-------------------|--------------------------|------------------|------------------------------------|------------------------------|
| 0 | 15 +1/-0 | Nil | --- | --- |
| 50 ±3 | 5 +1/-0 | Nil | --- | --- |
| 100 ±5 | 5 +1/-0 | Nil | --- | --- |
| 150 ±8 | 5 +1/-0 | Nil | --- | --- |
| 200 ±10 | 5 +1/-0 | Yes | Bottom right door/threshold corner | @ 1 min 15 sec |
| 250 ±13 | 5 +1/-0 | | | |
| 300 ±18 | 5 +1/-0 | | | |
| 450 ±23 | 5 +1/-0 | | | |
| 600 ±30 | 5 +1/-0 | | | |

Drawing with water penetration point: ■



Leakage 1 min 15 sec @ 200Pa

Wind deflection data

Deflection Test: P1= 1200 Pa

| Positive pressure : | | | | | | |
|--------------------------------------|---------------------------|----------------|-----------|----------------|--------|---------------------|
| Member measured on drawing) (mark | Dial Gauge readings in mm | | | | Length | Relative deflection |
| | Left end | Centre | Right End | Net deflection | | |
| 3 pre-gusts of | 0 | Pa carried out | | | | |
| Dial Gauge ID | WT07 | WT06 | WT05 | 8.835 | 2250 | 1/ 255 |
| Pre-test reading | 24.42 | 25.86 | 21.42 | | | |
| Max reading | 27.91 | 38.49 | 25.52 | | | |
| Net gust reading | 3.49 | 12.63 | 4.1 | | | |
| Residual reading | 24.89 | 25.88 | 21.81 | | | |

| Negative pressure : | | | | | | |
|--------------------------------------|---------------------------|----------------|-----------|----------------|--------|---------------------|
| Member measured on drawing) (mark | Dial Gauge readings in mm | | | | Length | Relative deflection |
| | Left End | Centre | Right End | Net deflection | | |
| 3 pre-gusts of | 0 | Pa carried out | | | | |
| Dial Gauge ID | WT07 | WT06 | WT05 | 7.545 | 2250 | 1/ 298 |
| Pre-test reading | 22.51 | 23.9 | 19.98 | | | |
| Max reading | 17.43 | 11.43 | 15.21 | | | |
| Net gust reading | 5.08 | 12.47 | 4.77 | | | |
| Residual reading | 22.42 | 23.63 | 19.81 | | | |

Worst case when considering both positive and negative pressure: 1/ 255

Minimum requirement: 1/ 150

=> PASS

Location of deflection reading points ✦



Cyclic wind and wind safety data

Cyclic test (repeated pressure):

P2 = Pa

| | | |
|---------------------------------|-----|----------------|
| 50 cycles at | 600 | Pa carried out |
| Any damage or function defects? | | |
| NO DEFECTS | | |

Passed? (yes/no)

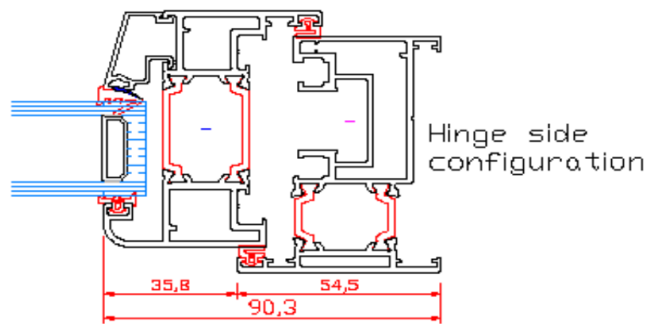
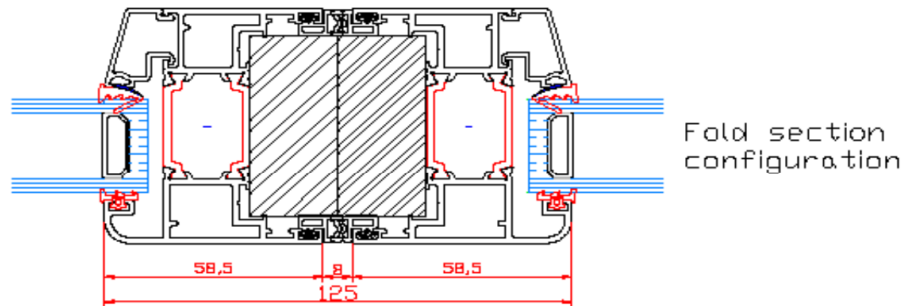
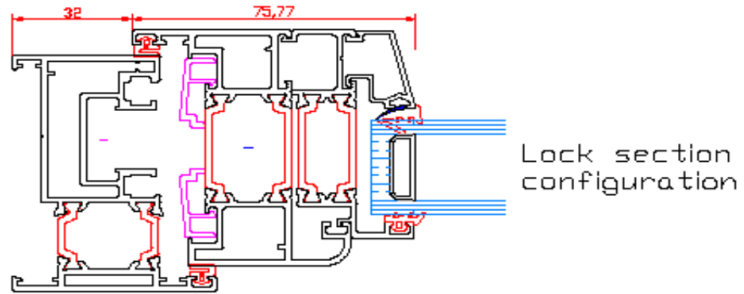
Safety test:

P3 = Pa

| | | |
|---|------|----------------|
| 1 positive and 1 negative gust of | 1800 | Pa carried out |
| Did the specimen remain closed and / or did any part become detached? | | |
| NO DEFECTS | | |

Passed? (yes/no)

Appendix 2 - Product drawings



Appendix 3 - Test Procedure

General

The tests were carried out on 25 - 02 - 2015.

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

| | |
|-----------------------|----------|
| Temperature: | 18 °C |
| Relative Humidity: | 45 % RH |
| Atmospheric pressure: | 98.9 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 Deflection and cyclic wind resistance tests in accordance with BS EN 12211:2000
- 5 Second air permeability test in accordance with BS EN 1026:2000
- 6 Safety test in accordance with BS EN 12211:2000

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 as shown in the photograph in the Appendices.

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 330 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 2 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 +1/-0 minutes at each step.

Throughout the process the specimen was inspected and any occurring penetrations were recorded - see table and drawing in the Appendices.

Wind Resistance tests

Deflection test

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

3 gusts of 1320 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 1200 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 600 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 Appendices.

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 Appendices.

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 \pm 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 Appendices.

Appendix 4 - Equipment Used

Build Check 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