

600/600/2400

bre

**Weathertightness test to
BS 6375: Part 1: 2009 on
a Smart Systems Ltd
Alitherm inward opening
glazed door**

Prepared for: Mr. D. Northam

Smart Systems Ltd

21 April 2009

Test report number 252 145



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Date 15 April 2009

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1 Introduction

At the request of Mr. D. Northam of Smart Systems Ltd, Arnolds Way, Yatton, North Somerset, BS49 4QN, BRE issued proposal number 124402 on 04 March 2009. The proposal was accepted on 14 April 2009 and BRE tested a specimen door on 15 April 2009.

The tests to methods in BS 6375: Part 1: 2009, BS EN 1026¹, 1027² and 12211³ measure the weathertightness of the specimen in terms of air permeability, watertightness and resistance to wind load respectively. Classification of the results is based on BS 6375: Part 1: 2009⁴ and BS EN 12207⁵, 12208⁶, 12210⁷.

The tests on the specimen were carried out under the BRE Standard Terms and Conditions of Business and to the UKAS BRE Specific Procedures Series F, as BRE Job number 252145 in project number CV2937.

The tests were witnessed by:

Mr. M. Walford Smart Systems Ltd

Mr. D. White Smart Systems Ltd

2 Details of tests carried out

The weathertightness test was carried out to the requirements of BS 6375: Part 1: 2009, BS EN's 1026, 1027 and 12211 for air permeability, watertightness and resistance to wind load.

BS 6375: Part 1: 2009 specifies that the air permeability test is performed under both positive and negative test pressures and that the average of the values defines the results. It also specifies that water tightness test method A is used and that deflections measured during the resistance to wind load test do not exceed 1/150 of the span. The weathertightness test comprised of three parts in the sequence:

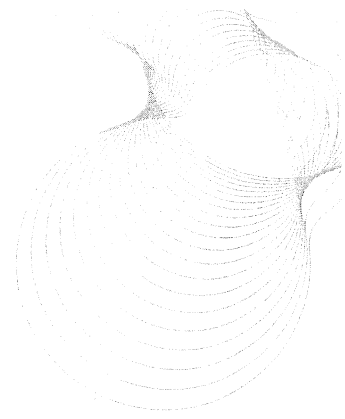
1. Air permeability to BS EN 1026: 2000; by application of a series of test air pressure differentials across the specimen with measurement of the air permeability of it at each pressure step. The maximum positive and negative pressure differential was 600 Pa reached in pressure steps of 50, 100, 150, 200, 250, 300, 450 and 600 Pascals.
2. Watertightness to BS EN 1027: 2000; by applying specified amounts of water spray to the outside face of the specimen while incrementally increasing the air pressure differential across it. The test pressure, time and position of any water penetration are recorded. The maximum positive air pressure differential was 600 Pa. Pressure (Pa)/time (min) steps were 0/15, 50/5, 100/5, 150/5, 200/5, 250/5, 300/5, 450/5 and 600/5.
3. Resistance to wind load to BS EN 12211: 2000; by application of a series of positive and negative test air pressures. Measurements and inspections are made to assess relative frontal deflection and resistance to damage from wind loads.

The resistance to wind load test includes a deflection test, a repeated pressure test and operational test, an air permeability test and finally a safety test. For the purpose of the resistance to wind load test three test pressures are defined:

- P1 applied to measure the deflections of parts of the test specimen.
- P2 50 cycles of pulsating pressure to assess performance under repeated wind loads.
- P3 applied to assess the safety of the test specimen under extreme conditions.

The values of P1, P2 and P3 are related as follows: $P2 = 0.5P1$, $P3 = 1.5P1$.
For these tests the values are: $P1 = 2400$ Pa, $P2 = 1200$ Pa and $P3 = 3600$ Pa.

Note: The repeat air permeability test is an integral part of the resistance to wind load test and its significance is as an indicator of damage that may occur during that test.



3 Classification of results

The classifications from BS 6375: Part 1: 2009 for doors at a UK exposure category of 2000+ (2400 Pa) has air permeability at Class 2/300 Pa or to Classes 3 or 4 at 600 Pa, watertightness at Class 7A/300 Pa and resistance to wind load at Class AE2400, P1 2400 Pa, P2 1200 Pa and P3 2400 Pa. BS ENs 12207, 12208 and 12210 also classify the weathertightness performance of completely assembled windows and doors of any material after testing to the methods referred to earlier.

The relevant product standard BS EN 14351-1:2006⁸ and BS 6375: Part 1: 2009 state that the classification of air permeability is based on the averages of the positive and negative air leakage values at each pressure step.

The BS EN classifications are explained below:

Air permeability BS EN 12207: 1999. The classification is based on a comparison of the air permeability of the test specimen related to both overall area and length of opening joint. There are four classes; class 4 is applicable to the most airtight specimens while class 1 describes those with most air leakage. To meet any class the measured air permeability of the specimen must not exceed the upper limit at any test pressure step in that class.

Watertightness BS EN 12208: 2000. The classification is based on a comparison of the watertightness of the test specimen related to test pressures and duration of the test. There are nine classes; 1A/1B up to 9A for test pressures from 0 Pa to 600 Pa. For specimens that remain watertight over 600 Pa for 5 minutes a class Exxx is used. The xxx is the maximum test pressure e.g. 750 Pa. To meet any class the specimen must remain watertight for 5 minutes up to and at the test pressure set for that class.

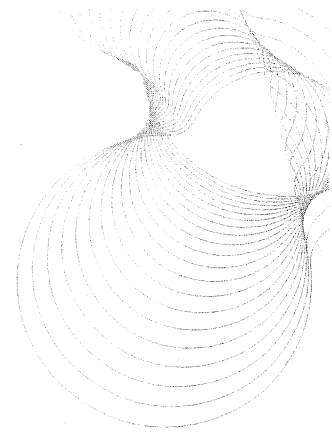
Resistance to wind load BS EN 12210: 1999. The classification is based on a comparison of the resistance to wind loads of the test specimen when subjected to test pressures P1, P2 and P3. There are five classes; 1 up to 5 for P1 test pressures from 400 Pa to 2000 Pa. For specimens that are tested to P1 pressures exceeding 2000 Pa a class Exxxx is used. The xxxx is the actual test pressure P1 used e.g. 2400 Pa. To achieve any class the resistance of the specimen to wind load must meet all the requirements for that class.

Note: This report has results for air permeability under positive and negative test pressures and displays on a graph the average air permeability for them at each pressure step.

4 Test specimen

The general details about the test specimen supplied by Smart Systems Ltd for these tests are given below and in drawings in the Annex of this report

- Type:** Aluminium door frame members with left hand hung, open inward, glazed door leaf.
Reference: Smart Systems Ltd, 2100 mm x 951 mm Alitherm door with weather moulding on the leaf above the bottom joint.
- Glazing:** The door leaf has one insulating glass unit with 4 mm thick toughened glass and a 20 mm air gap. The leaf is glazed from indoors and has snap-in aluminium beads that retain the glazing seals and the glazing.
- Seals:** On the door leaf there is a compression type Neoprene seal, continuous at the corners, with a single butt joint midway across the bottom of the leaf. On the door-frame there is a compression type Neoprene seal, continuous at the corners and butt jointed at the centre of the threshold. The glazing seals are neoprene with bonded corner joints. The glazing beads are bedded in sealant.
EPDM Sealant is applied to corner joints of the seals and other sealant is applied to the joints between glazing beads.
- Hardware:** A single lockable handle operates two espagnolette bolts, two claws, a central locking bolt and shoot bolts top and bottom on the door leaf handle side stile. There are three hinges on the left hand side of the door leaf.
- Fixings:** For these tests the specimen was fixed and sealed into a wood surround frame with screws at the top, bottom and sides.
- Detail:** The threshold of the door-frame has two drain holes with hoods on the outdoor face. The door leaf has two drainage holes with hoods in the outdoor face of the bottom rail. In the threshold channel toward the outdoor edge there are four drainage slots. Also in the threshold there are two cut-away sections connecting the rear channel to the front one. A weather moulding is fixed to the bottom of the door leaf above the opening joint.
- Dimensions:** 2100 mm high x 951 mm wide (overall). Area: 2.00 m²
Length of opening joint = 5.83 m



5 Test rig and preparatory procedures

The test specimen was conditioned for at least 4 hours within temperature and humidity ranges specified in the test standards of 10°C to 30°C and 25% to 75% RH respectively.

The water temperature in the watertightness test was within the specified range of 4°C to 30°C.

The door was mounted in the BRE test rig 'G', to form one wall of a pressure box, with the outdoor face of the door enclosed in the box.

A single spray bar with two full circular cone nozzles was mounted in the pressure box to apply water to the outside face of the specimen at the rate of 2 L/min per nozzle in accordance with BS EN 1027 spraying method 1A.

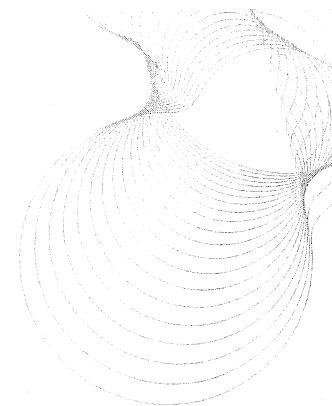
Transducers were mounted on independent supports to measure deflections of a frame member retaining an insulating glass unit. Deflections were measured on the span at the positions indicated in Figure A3.

6 Summary of test results

The test results are summarised in Table 1 below for a UK exposure category of 2000+. Figures show detail of the door and detailed results are given in Annex A.

BS or BS EN	Air permeability		Watertightness		Resistance to wind loads	
	Requirements	Results	Requirement	Results	Requirements	Results
BS 6375	Class 3 or 4 to 600 Pa	Met the requirements of Class 4 based on the averages of readings under positive and negative tests	Class 7A at 300 Pa	Met & exceeded the require – ments. Class 9A at 600 Pa	Class AE2400 P1 = 2400 Pa P2 = 1200 Pa P3 = 3600 Pa	All met. Class AE2400

Table 1. Summary of weathertightness test results



7 Conclusions

When the specimen Smart Systems Ltd 2100 mm x 951 mm Alitherm inward opening, glazed door with weather moulding on the leaf was tested to the standards described herein it was found to be:

- Sufficiently airtight to attain Class 4 when the averages of the readings under positive and negative test pressures were considered, thus **meeting** the BS 6375: Part 1: 2009 requirements.
- Resistant to water penetration using method 1A to Class 9A up to and at 600 Pa thus **meeting and exceeding** the BS 6375: Part 1: 2009 requirements.
- Resistant to wind loads of ± 2400 Pa causing deflections less than 1/150 of the span of a door leaf stile. Resistant to repeated pressure cycles of ± 1200 Pa and able to sustain the corresponding safety test pressure of ± 3600 Pa. The overall classification for resistance to wind load is Class AE2400. **Meets** the requirements of BS 6375: Part 1: 2009.

8 References

1. BS EN 1026: 2000. Windows and doors – Air permeability – Test method. British Standards Institution, London.
2. BS EN 1027: 2000. Windows and doors – Watertightness – Test method. British Standards Institution, London.
3. BS EN 12211: 2000. Windows and doors – Resistance to wind load – Test method. British Standards Institution, London.
4. BS 6375: Part 1: 2009. Performance of windows and doors – Classification for weathertightness and guidance on selection and specification
5. BS EN 12207: 2000. Windows and doors – Air permeability - Classification. British Standards Institution, London.
6. BS EN 12208: 2000. Windows and doors – Watertightness - Classification. British Standards Institution, London.
7. BS EN 12210: 2000. Windows and doors – Resistance to wind load - Classification. British Standards Institution, London.
8. BS EN 14351-1:2006 Windows and doors – Product standard. British Standards Institution, London

ANNEX 1. Weathertightness test results

Pressure differential Pa	Air flow through the specimen m ³ /h	Air flow per unit area of the specimen m ³ /h.m ²	Air flow per metre of opening joint m ³ /h.m
50	1.62	0.81	0.28
100	3.24	1.62	0.56
150	4.13	2.07	0.71
200	5.61	2.81	0.96
250	6.89	3.45	1.18
300	7.61	3.81	1.31
450	8.53	4.27	1.46
600	7.65	3.83	1.31

Table A1. Air permeability under positive air pressure; test results

Pressure differential Pa	Air flow through the specimen m ³ /h	Air flow per unit area of the specimen m ³ /h.m ²	Air flow per metre of opening joint m ³ /h.m
50	1.28	0.64	0.22
100	3.11	1.55	0.53
150	2.94	1.47	0.50
200	5.20	2.61	0.89
250	6.08	3.04	1.04
300	6.62	3.31	1.13
450	6.23	3.12	1.07
600	5.62	2.82	0.96

Table A2. Air permeability under negative air pressure; test results

Pressure differential Pa	Average air flow per unit area of the specimen m ³ /h.m ²	Average air flow per metre of opening joint m ³ /h.m
50	0.73	0.25
100	1.59	0.55
150	1.77	0.61
200	2.71	0.93
250	3.25	1.11
300	3.56	1.22
450	3.70	1.27
600	3.33	1.14

Table A3. Averages of air permeabilities under positive and negative air pressures; test results

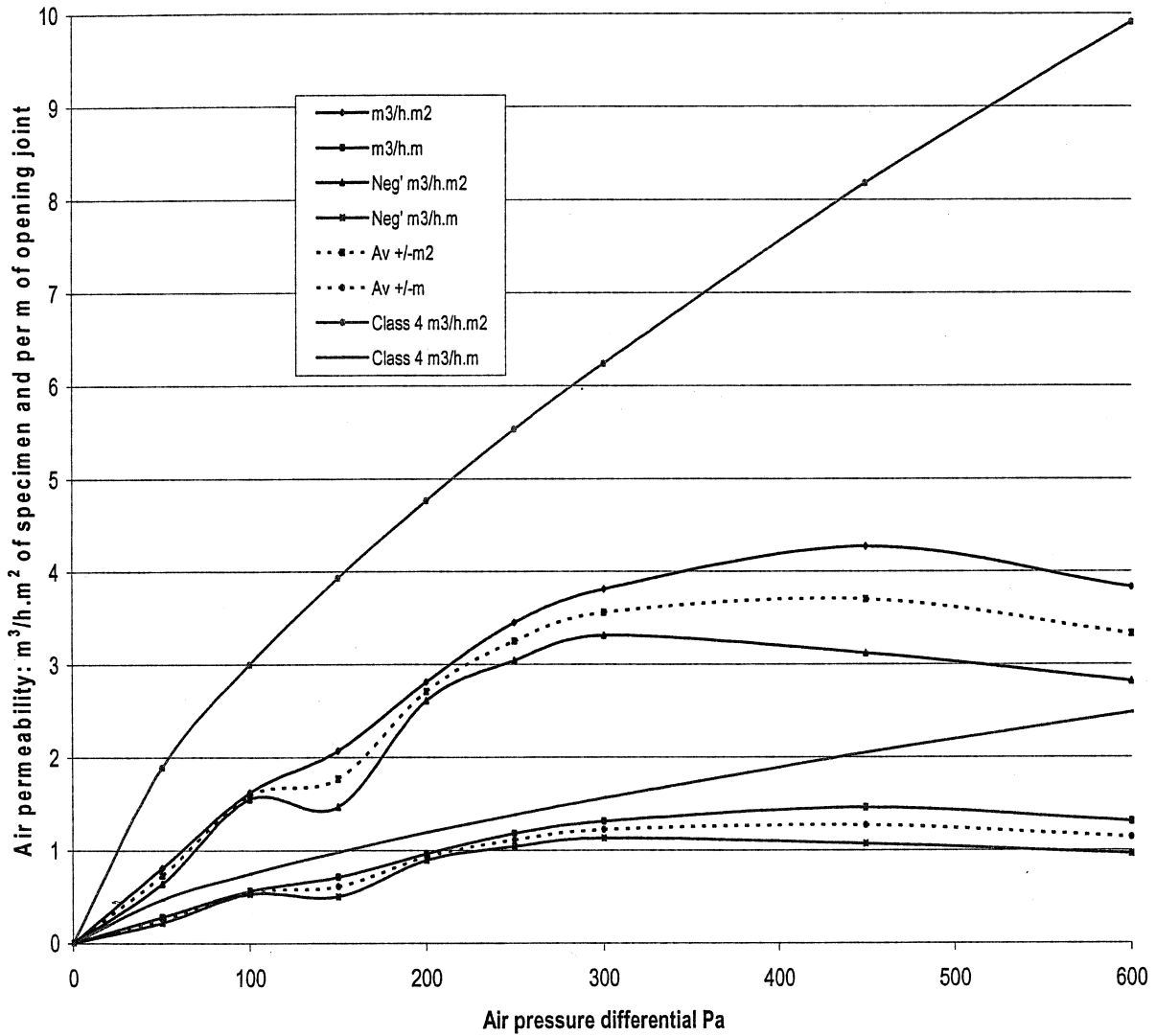
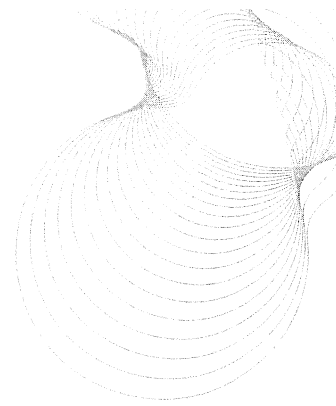


Figure A1. Air permeability under positive and negative air pressure; test results

Watertightness test

Pressure differential Pa	Duration Minutes	Water leaks
0	15	Nil
50	5	Nil
100	5	Nil
150	5	Nil
200	5	Nil
250	5	Nil
300	5	Nil
450	5	Nil
600	5	Nil

Test laboratory conditions: Air pressure 997 mb. Relative humidity 52.7% at 17.9°C
Air temperature 17.9°C. Test chamber air temperature 17.6°C. Water temperature 16.8°C

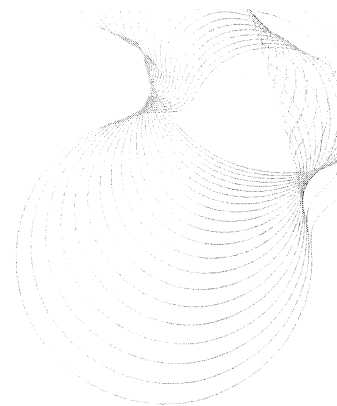
Table A4. Watertightness test results

Resistance to wind load – Deflection test at ± 2400 Pa

Position deflection measured	Positive pressure P1 to +2400 Pa		Negative pressure P1 to - 2400 Pa	
	Deflection		Deflection	
	mm	defl./span	mm	defl./span
Mid height of left hand side door leaf stile	1.53	1/1327	1.09	1/1862

Note: The deflection at the mid-point of a member is measured relative to its ends, e.g. with reference to Figure A3: Deflection at the mid-point = deflection at the mid-point – average of deflections at the two ends of the same member.

Table A5. Deflections measured on a door leaf stile in the resistance to wind load test at ±2400Pa.



Resistance to wind load – Repeated pressure test including the second air permeability test

Repeated pressure	Damage or functional defects
50 cycles to P2 at ± 1200 Pa	None

Table A6. Damage or functional defects after repeated pressures to P2 at ± 1200 Pa

Second air permeability test under positive air pressures (part of resistance to wind load test)

Pressure differential Pa	Air flow through the specimen m ³ /h	Comparison to the air permeability measured previously
50	1.63	After the test pressures P1 and P2 were applied the amounts of air flowing through the test specimen were not significantly different to those measured previously. This confirms that the air permeability of the specimen still meets the class attained in the first air permeability test.(see Table A1)
100	3.26	
150	4.15	
200	5.67	
250	6.93	
300	7.77	
450	8.67	
600	7.73	

Table A7. Second air permeability test results under positive air pressures

Second air permeability test under negative air pressures (part of resistance to wind load test)

Pressure differential Pa	Air flow through the specimen m ³ /h	Comparison to the air permeability measured previously
50	1.32	After the test pressures P1 and P2 were applied the amounts of air flowing through the test specimen were not significantly different to those measured previously. This confirms that the air permeability of the specimen still meets the class attained in the first air permeability test. (see Table A2)
100	3.15	
150	3.01	
200	5.28	
250	6.15	
300	6.68	
450	6.29	
600	5.76	

Table A8. Second air permeability test results under negative air pressures

Resistance to wind load - Safety test

Safety test	Condition after test
One pressure pulse to pressure: P3 at – then + 3600 Pa	No parts became detached and the test specimen remained closed

Table A9. Condition of the specimen after the safety test to P3 at ± 3600 Pa

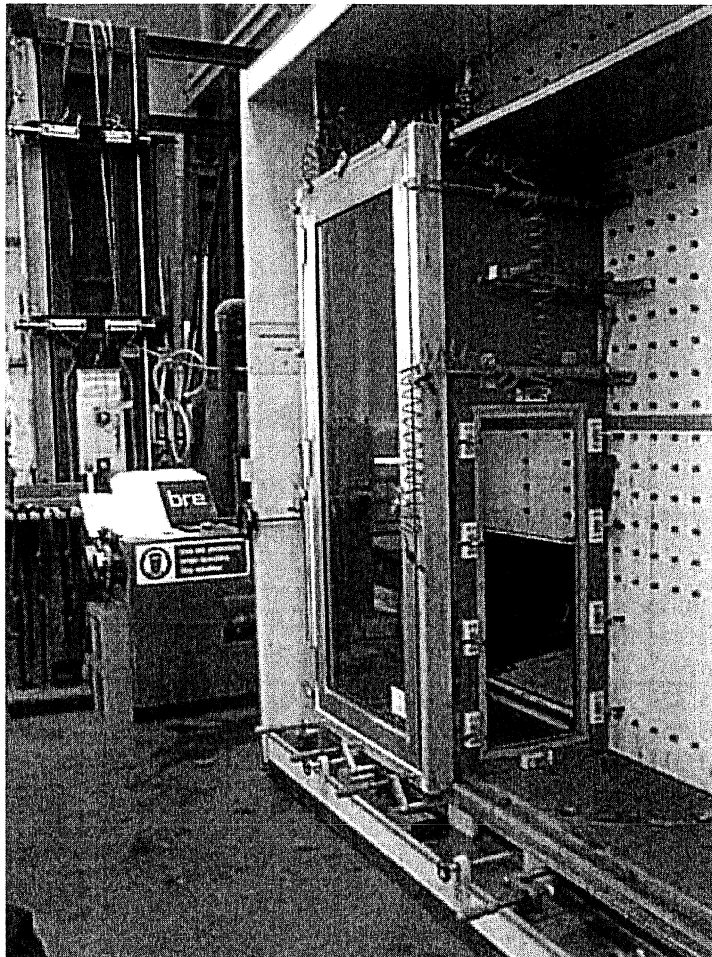


Figure A2. The Smart System 'Alitherm' door mounted in the BRE test rig

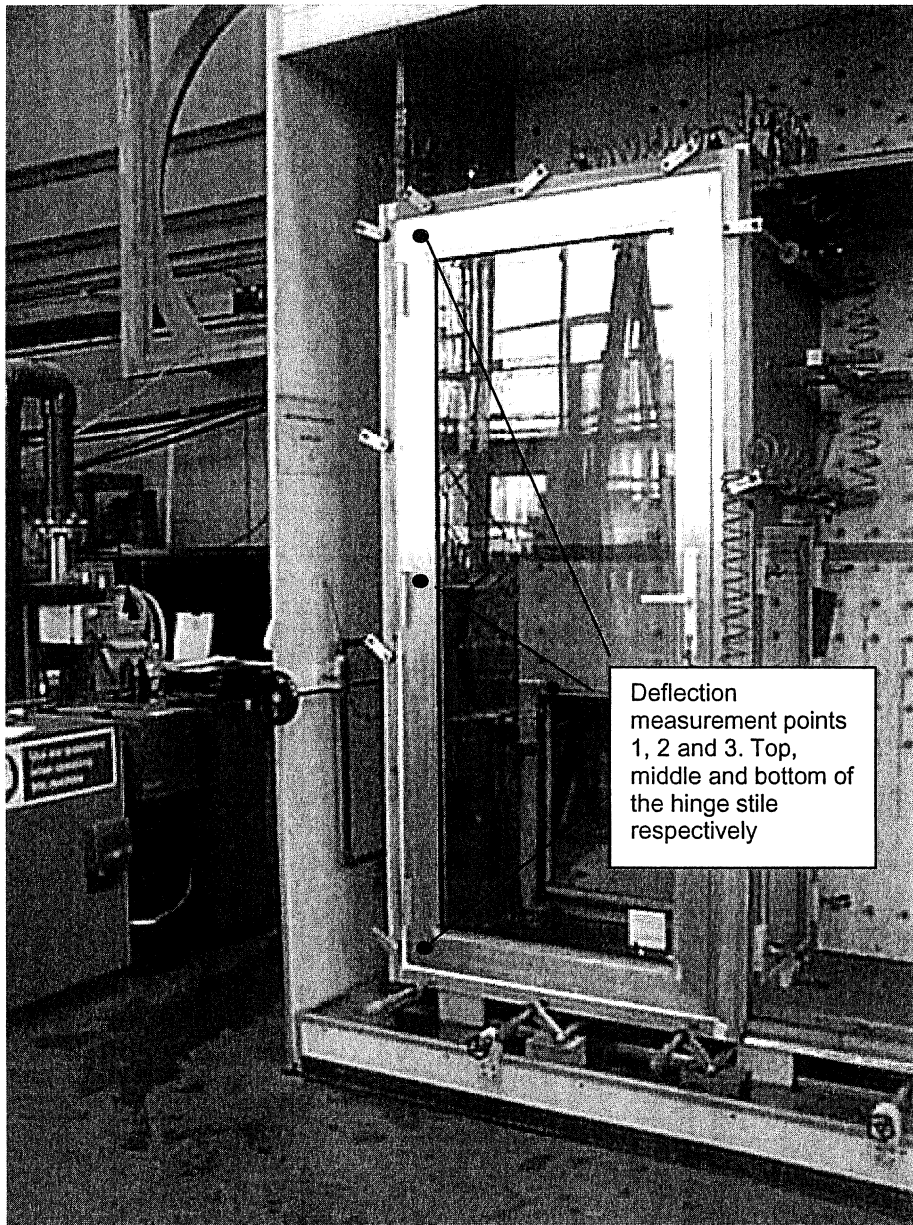
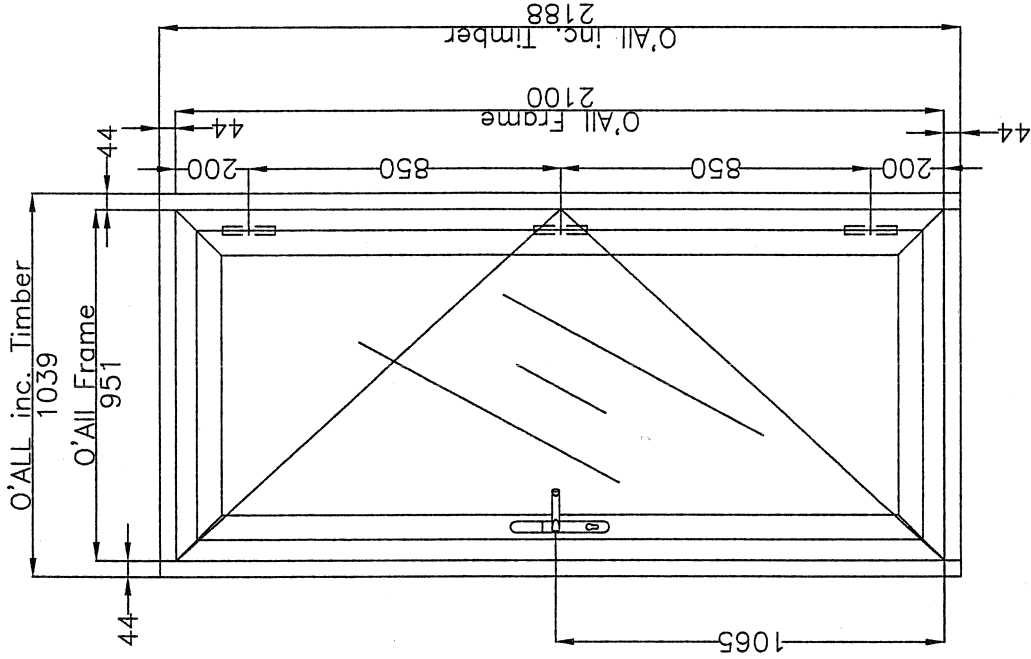


Figure A3. The 'Alitherm' door specimen showing points where deflection measuring transducers were positioned.

=====REPORT ENDS=====

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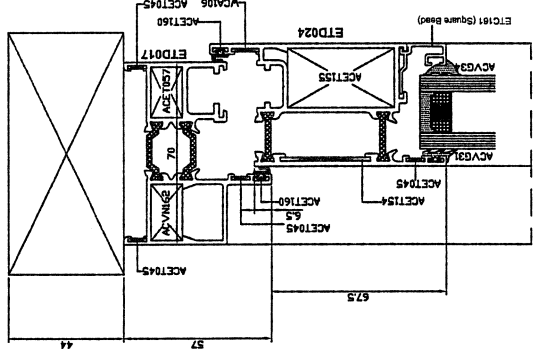


DESCRIPTION

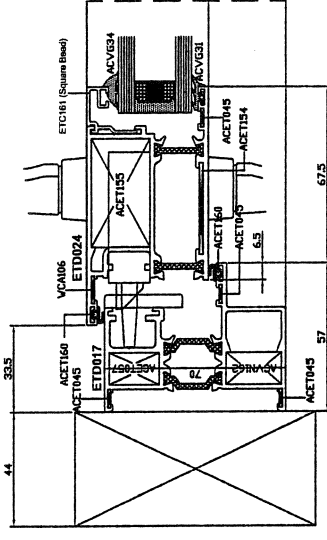
Sections: ETD017 outer frame with ETD095 drainage tray, ETD024 sash, EC161 bead, VL72 weather bar.
 Fittings: 3No. ACET174 hinges, ACET18* multi-point lock with shootbolts, RUA090 handle, ACET160 flipper gasket, ACVG31 retaining gasket, ACVG34 wedge gasket.
 Glass: 4/20/4 clear toughened double glazed unit

TECHNICAL INFORMATION

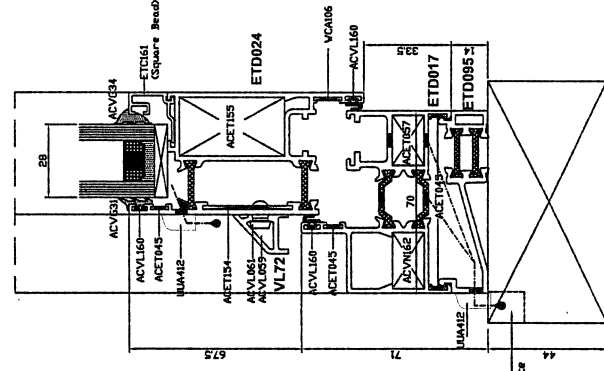
SCALE 1:2
Locking Jamb



SCALE 1:2
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SCALE 1:2
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