



## PERFORMANCE TEST REPORT

Air Permeability, Watertightness an Resistance to Wind Load

Test Report No: 010.016.1 / 2010



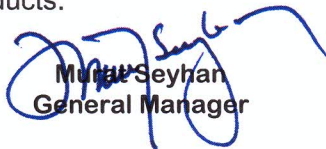
Rendered to	: Burak Aluminium San. ve Tic. A.Ş.	Norms Applied	: EN 12153
			: EN 12155
			: EN 12179
Product	: Curtain Walling ALS50		:
		Classification Norms	: EN 12152
			: EN 12154
			: EN 13116
Sample Size	: 2400 mm x 7700 mm		:
Sample Description	: Top Hang Window (2 pieces)		:
	: 6 / 16 / 6 Double Glass		:
	:	Test Comp. Date	: 22.12.2010
Test Performed	: Air Permeability - Static	Report Date	: 25.12.2010
	: Watertightness - Static	Record Retention Date	: 25.12.2013
	: Wind Load - Static	Number of Pages	: 10
		Number of Annex Pages:	: 10

**Test Results** : The Test sample performed in accordance of to following classifications

Air Penetration	: EN 12152 - Class A4 (600 Pa)
Water Tightness	: EN 12154 - Class R7 (600 Pa) *** (see to section 6 in the report)
Wind Resistance	: EN 13116 - OK (1100 Pa)

\* Calibration of the test equipments certified by CEBTP / France referenced to report BEB1-9-2024-1/2

\*\*This Test Report includes spesific test data, results, photographic documention and build drawings of the sample submitted for testing only and thus does not prejudice other related products.

  
Murat Seyhan  
General Manager

  
Oktay Usta  
Testing Manager



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## 1. PREFACE

This report comprises of tests which were performed by FTI Façade Testing Institute at the address Çakıl Village Bağlar Region, Çatalca - İstanbul. Tests were carried out in December 2010 for the determination of the air infiltration, water penetration (static pressure) and resistance to wind loading of curtain walling systems.

The above mentioned tests have been carried out as per the test methods provided in project specifications and classified on the standards indicated below.

EN 13830	* Curtain Walling - Product Standard
EN 12153	* Curtain Walling - Air Tightness - Test Method
EN 12152	* Curtain Walling - Air Tightness - Performance Requirements and Class.
EN 12155	* Curtain Walling - WaterTightness - Laboratory Tests Under Static Pressure
EN 12154	* Curtain Walling - Water Tightness - Performance Requirements and Class.
EN 12179	* Curtain Walling - Resistance to Wind Load - Test Method
EN 13116	* Curtain Walling - Resistance to Wind Load - Performance Requirements

Test sample comprises of a part of façade system which have been constructed for the ...by Burak Aluminium.

Test sample was prepared by the company's own facilities and has been sent to FTI Façade Testing Institute's testing laboratories on 13 / 12 / 2010.

## 2. TEST PARTICIPANTS

Tests were conducted on 22 / 12 / 2010 with the following participants.

Mr. Oktay USTA	FTI	Testing Manager
Mr. Oner ARSLAN	FTI	Testing Engineer
Mr. M. Serhat ÇOLAK	FTI	Testing Engineer

and partially by

Mr. Şükrü BOZOKLUOĞLU	Burak Al.
Mr. Ali ÇOLAK	Burak Al.
Mr. Enes ASLANTÜRK	Bsm Al.
Mr. Saim Bey	Bsm Al.
Mr. Salih SEKBAN	CWG Danışmanlık
Mr. Murat GÜVENİR	Bayındırlık ve İskan B.lığı
Mr. Davut YAŞÇI	Bayındırlık ve İskan B.lığı

### 3. DESCRIPTION OF TEST SAMPLE

* Type of Sample	<b>Curtain Walling</b>
* System	<b>Burak Al. ALS50 System</b>
* Dimensions of Sample (LxH)	<b>2400 mm x 7700 mm</b>
* Surface area of Sample	<b>16,08 m<sup>2</sup></b>
* Fixed Panel Length	<b>69,20 m</b>
* Opening type	<b>Top Hang Window</b>
* Openable window	<b>1200 mm x 1000 mm</b>
* Surface area of wings	<b>8,80 m<sup>2</sup></b>
* Glass Type	<b>6 / 16 / 6 Insulated Glass</b>

#### System Components

* ALS 05	Aluminium Profile
* ALS 06	Aluminium Profile
* ALS 13	Aluminium Profile
* AG-726	Aluminium Profile
* AG-740	Aluminium Profile (Cover)
* 5327-14	Aluminium Profile
* 5371-00	Aluminium Profile
* -	Aluminium Profile (Case)
* GF 150	Epdm Gasket
* GF 15	Epdm Gasket
* 4031	Epdm Gasket
* GF 21	Epdm Gasket
* SY 02	Epdm Gasket
* GF 3	Epdm Gasket
* SY 04	Epdm Gasket
* PVC04 – PVC06	PVC
* Screws	
* Aluminium Sheet	
* Special Anchor	
* Steel Anchorage	

Please refer to the drawings in annex 7.1.



#### 4. TEST RESULTS

##### 4.1 Test Conditions

Local Temperature	:	14	°C
Atmospheric Pressure	:	1021	mbar
Ambient Humidity	:	78	%
Test Stand	:	Stand	2
$\phi 1$ : Flow Calculation while $\phi < 9.5 \text{ m}^3/\text{h}$	:	$14,781 \times \phi + 0,85 / 10,644 \times \phi + 1,16$	
$\phi 2$ : Flow Calculation while $\phi > 9.5 \text{ m}^3/\text{h}$	:	$62,828 \times \phi - 6,93 / 90,686 \times \phi - 39,82$	

##### 4.2 Pressure Sequence

STEPS		POSITIVE PRESSURE (Pa)	NEGATIVE PRESSURE (Pa)
1	P1= 25%PN	150	150
2	P2= PN	600	600
3	P3= 50%PN	300	300
4	PE = 150%PN	900	900

PN: Pressure Normative  
PE: Pressure Extreme

##### 4.3 Air Permeability

Before starting the test, 3 pulses at 660 Pa is applied to the sample.

During the tests, the pressure at the following values is applied for 10 secs.

##### Air permeability measurements based on overall area ;

POSITIVE PRESSURE			
$\phi 1 / \phi 2$	Test Pressure (Pa)	Air Leakage ( $\text{m}^3/\text{h}$ )	Air Leakage ( $\text{m}^3/\text{h}/\text{m}^2$ )
$\phi 1$	50	1,54	0,10
$\phi 1$	100	3,00	0,19
$\phi 1$	150	4,21	0,26
$\phi 1$	200	4,94	0,31
$\phi 1$	250	5,64	0,35
$\phi 1$	300	6,15	0,38
$\phi 1$	450	7,52	0,47
$\phi 1$	600	8,90	<b>0,55</b>

Test No : 2010.092.16

NEGATIVE PRESSURE			
$\phi 1 / \phi 2$	Test Pressure (Pa)	Air Leakage ( $\text{m}^3/\text{h}$ )	Air Leakage ( $\text{m}^3/\text{h}/\text{m}^2$ )
$\phi 1$	50	2,34	0,15
$\phi 1$	100	3,51	0,22
$\phi 1$	150	4,68	0,29
$\phi 1$	200	5,51	0,34
$\phi 1$	250	6,22	0,39
$\phi 1$	300	6,75	0,42
$\phi 1$	450	8,09	0,50
$\phi 1$	600	8,49	<b>0,53</b>

Test No : 2010.092.17



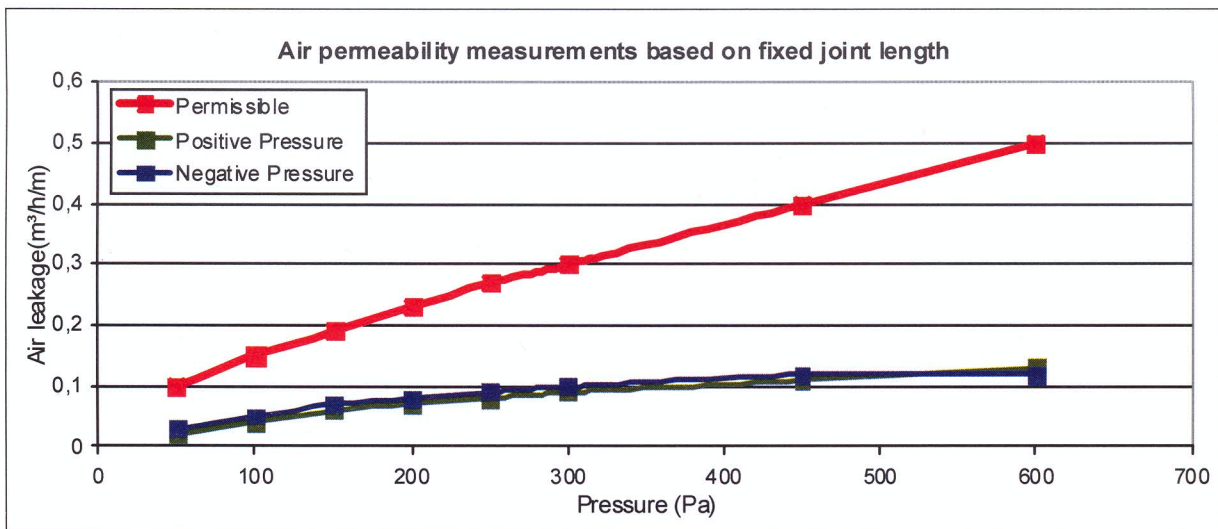
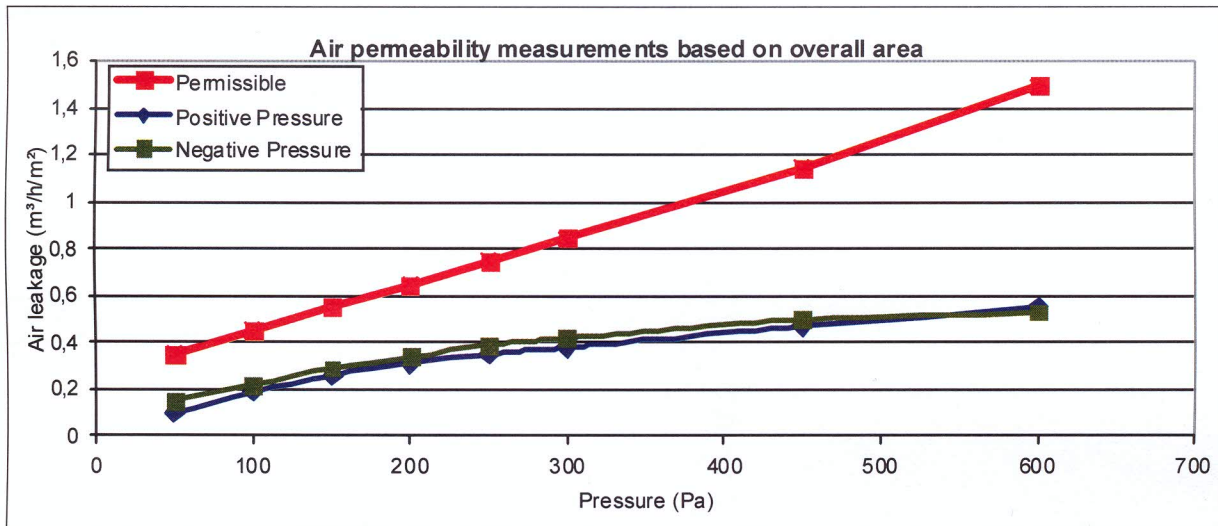
**Air permeability measurements based on fixed joint length;**

POSITIVE PRESSURE			
$\phi 1 / \phi 2$	Test Pressure (Pa)	Air Leakage ( $m^3/h$ )	Air Leakage ( $m^3/h/m$ )
$\phi 1$	50	1,54	0,02
$\phi 1$	100	3,00	0,04
$\phi 1$	150	4,21	0,06
$\phi 1$	200	4,94	0,07
$\phi 1$	250	5,64	0,08
$\phi 1$	300	6,15	0,09
$\phi 1$	450	7,52	0,11
$\phi 1$	600	8,90	0,13

Test No : 2010.092.16

NEGATIVE PRESSURE			
$\phi 1 / \phi 2$	Test Pressure (Pa)	Air Leakage ( $m^3/h$ )	Air Leakage ( $m^3/h/m$ )
$\phi 1$	50	2,34	0,03
$\phi 1$	100	3,51	0,05
$\phi 1$	150	4,68	0,07
$\phi 1$	200	5,51	0,08
$\phi 1$	250	6,22	0,09
$\phi 1$	300	6,75	0,10
$\phi 1$	450	8,09	0,12
$\phi 1$	600	8,49	0,12

Test No : 2010.092.17



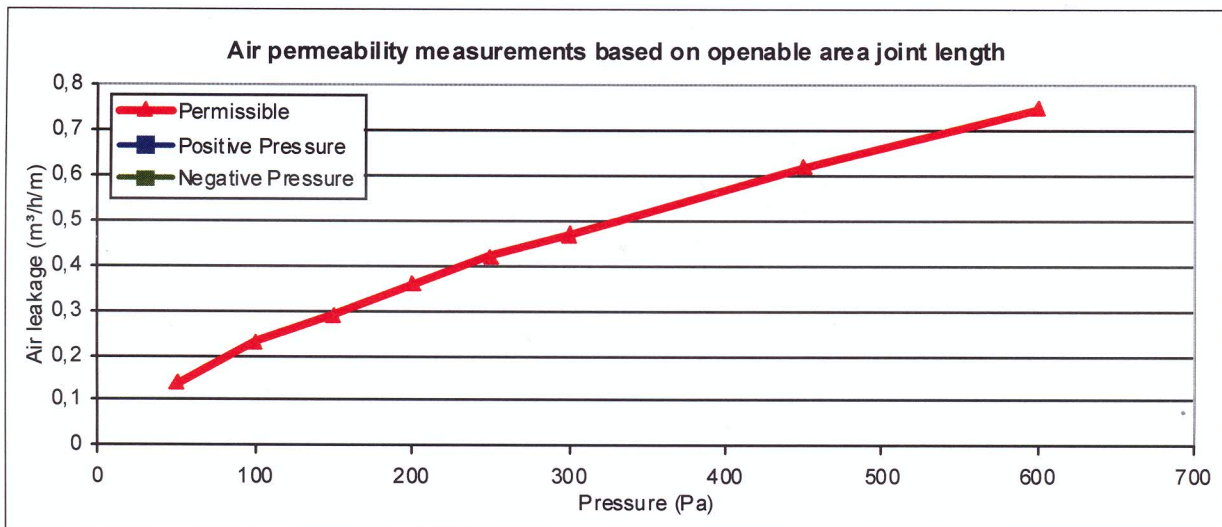
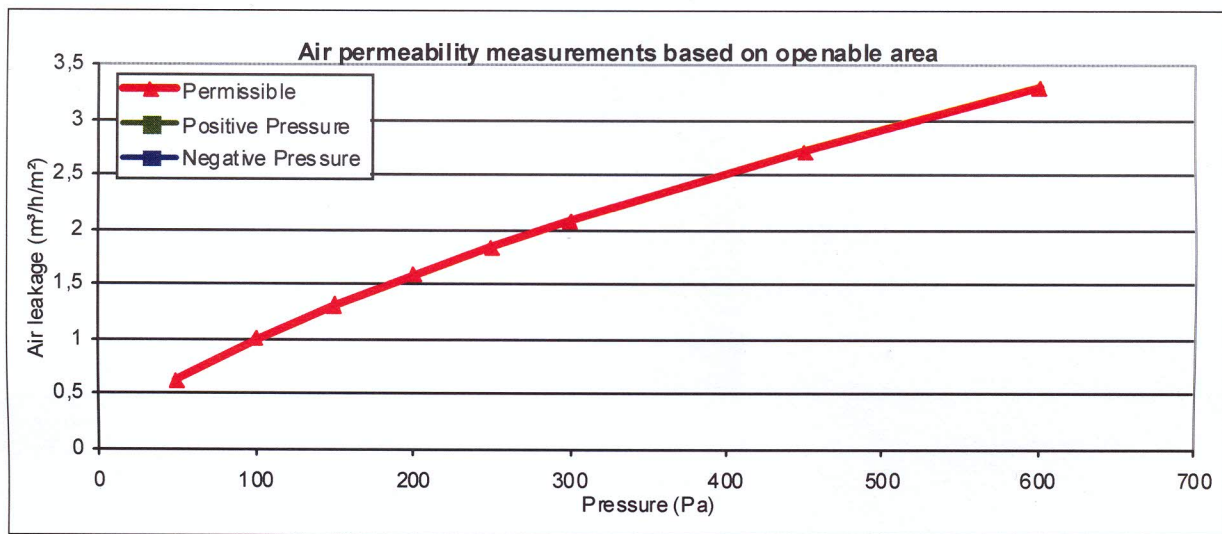
**Air permeability measurements based on the openable area ; (Could not be measured)**

POSITIVE PRESSURE				
$\phi 1 / \phi 2$	Test Pressure (Pa)	Air Leakage (m <sup>3</sup> /h)	Air Leakage (m <sup>3</sup> /h/m <sup>2</sup> )	Air Leakage (m <sup>3</sup> /h/m)
$\phi 1$	50			
$\phi 1$	100			
$\phi 1$	150			
$\phi 1$	200			
$\phi 1$	250			
$\phi 1$	300			
$\phi 1$	450			
$\phi 1$	600			

NEGATIVE PRESSURE				
$\phi 1 / \phi 2$	Test Pressure (Pa)	Air Leakage (m <sup>3</sup> /h)	Air Leakage (m <sup>3</sup> /h/m <sup>2</sup> )	Air Leakage (m <sup>3</sup> /h/m)
$\phi 1$	50			
$\phi 1$	100			
$\phi 1$	150			
$\phi 1$	200			
$\phi 1$	250			
$\phi 1$	300			
$\phi 1$	450			
$\phi 1$	600			

Test No : 2010.092.XX

Test No : 2010.092.XX





#### 4.4 Watertightness Under Static Pressure

Before starting the test, 3 pulses at 660 Pa are applied to the sample.

Time lapse between each pulse is 3 seconds.

Water spray nozzles are arranged in 4 rows, such that the first nozzle is apart 400 mm. from the side and the distance between the nozzle rows is 1400 mm.

The number of nozzles at each row is 6 pieces.

The amount of water applied to the façade = ( 2 l/min x 6 ) x 4 = 48 l/min. = 2880 l/h  
 = 2,98 lt/min/m<sup>2</sup>

#### Observations

Pressure Value (Pa)	Time Period (min)	Observations
0	15	No water leakage was observed.
50	5	No water leakage was observed.
100	5	No water leakage was observed.
150	5	No water leakage was observed.
200	5	No water leakage was observed.
300	5	No water leakage was observed.
450	5	No water leakage was observed.
600	5	No water leakage was observed.

**Test No : 2010.092.18**

#### 4.5 Resistance to Wind Load

Before starting the test, 3 pulses at 550 Pa are applied to the sample.

Time lapse between each pulse is 3 seconds.

During the tests, the pressure values described in the table at page 9 are applied for 10 seconds.

Acceptable proportion at resistance to wind load:

Position: Vertical distance for mullion at middle axis

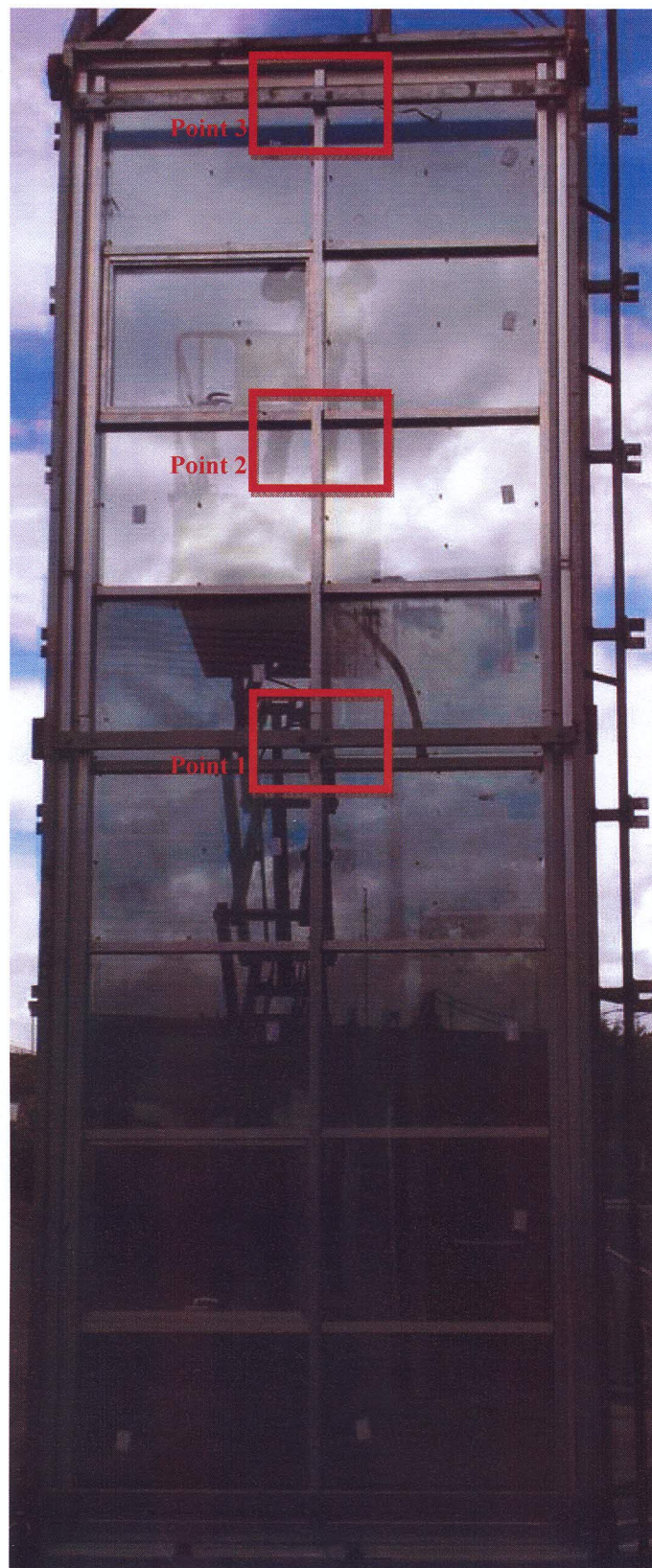
Scale: **Vertical 4000 mm**

The measured frontal deflection between points of the structural support should not exceed the minimum of **1/200** of the framing member's span or 15 mm, under the positive and negative design loads:

**Vertical 4000 / 200 = 20,00 mm or 15,00 mm**



**Positions of the transducers on which deflection measurements have been carried out on Test Samples**



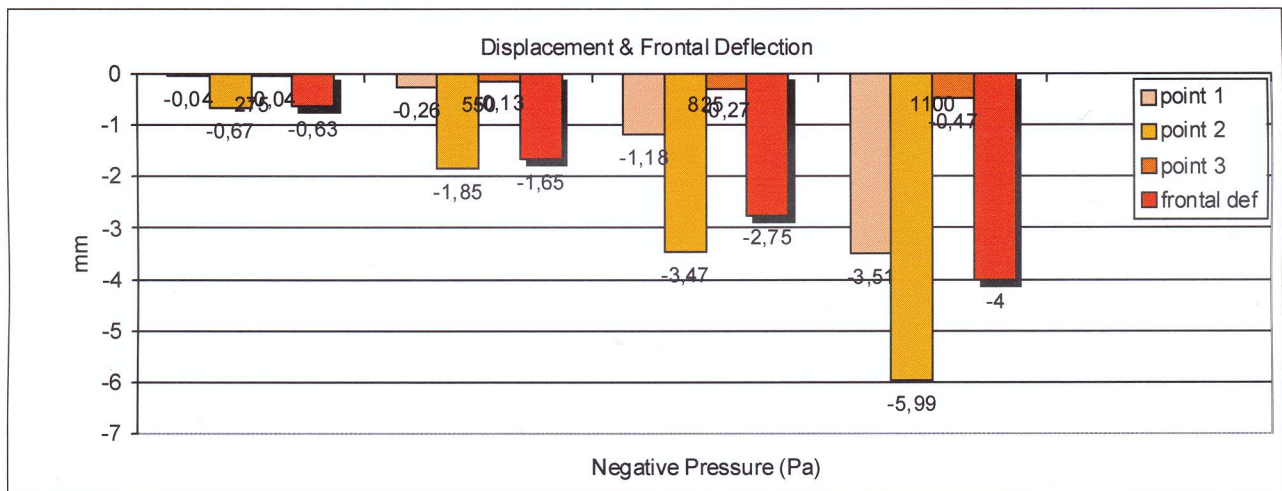
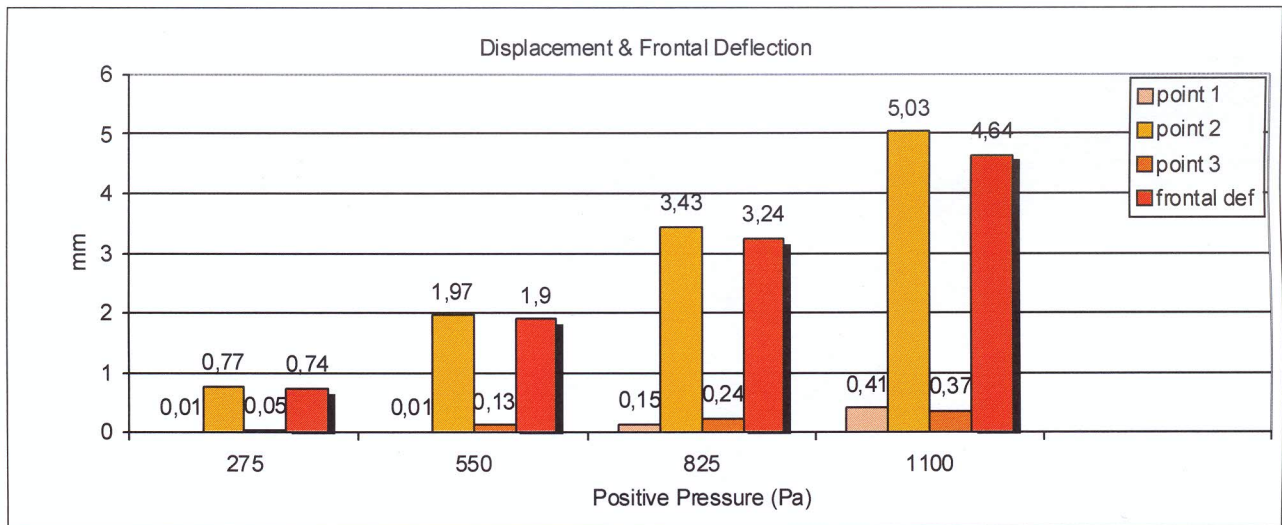
**Frontal deflection measurement results on the vertical mullion;**

Positive Pressure (Pa)	Point 1	Point 2	Point 3	Frontal Deflection
0	0,00	0,00	0,00	0,00
275	0,01	0,77	0,05	0,74
550	0,01	1,97	0,13	1,90
825	0,15	3,43	0,24	3,24
1100	0,41	5,03	0,37	4,64
0	0,36	0,45	0,04	0,25

Negative Pressure (Pa)	Point 1	Point 2	Point 3	Frontal Deflection
0	0,00	0,00	0,00	0,00
275	0,04	0,67	0,04	0,63
550	0,26	1,85	0,13	1,65
825	1,18	3,47	0,27	2,75
1100	3,51	5,99	0,47	4,00
0	2,70	1,63	0,12	0,22

Test No : 2010.092.19

Test No : 2010.092.20





**4.6 Increased Load Test( Safety Test - Secure Load ) (Could not be measured)**

Safety load increased to 1,5 times the design load is applied to the sample.

Test Pressure	Observations
PE = + 1650 Pa	Could not be measured.
PE = - 1650 Pa	Could not be measured.

**5. REVISIONS MADE ACCORDING TO TEST RESULTS**

- Condensate silicon channel that should be scrubbed.
- Termal barrier cavity in the horizontal profile of the wing adapter filled with silicone.
- Slat profile in the horizontal profiles in front of the wing adapter filled with silicone.
- Waterspout assembled vertical profile per 8 meters.
- Alufix tape bonded under the cover profiles.

**6. RESULT**

**6.1. Results and classification**

	CONDITIONS	RESULTS		CLASSIFICATION
<b>AIR PERMEABILITY EN 12152</b>	at 600 Pa $\phi < 1,5 \text{ m}^3/\text{h},\text{m}^2$	Positive Pressure	0,55	<b>A4</b>
	at 600 Pa $\phi < 0,5 \text{ m}^3/\text{h},\text{m}$		0,13	
	at 600 Pa $\phi < 1,5 \text{ m}^3/\text{h},\text{m}^2$	Negative Pressure	0,53	<b>A4</b>
	at 600 Pa $\phi < 0,5 \text{ m}^3/\text{h},\text{m}$		0,12	
<b>WATER-TIGHTNESS (Static Pressure) EN 12154</b>	There will be no water leakage at 600 Pa	No water leakage was observed at 600 Pa.		<b>R7</b>
<b>RESISTANCE TO WIND LOAD EN 13116</b>	Deflection < 4,64 mm at 1100 Pa	OK (max. 4,64 mm) (max. -4,00 mm)		<b>OK</b>
	There will be no damage at secure load	(Could not be measured)		

\*\*\* All tests have been completed according to the procedure. Then the extra watertightness test, water penetration was observed on the sample at 300 Pa.