PERFORMANCE TEST REPORT

Air Permeability, Watertightness and Resistance to Wind Load

Test Report No: 010.059.1 / 2012

Rendered to	: **Burak Alüminyum San. ve Tic. Ltd. Şti.**	Norms Applied	: **EN 12153**
			: **EN 12155**
			: **EN 12179**
Product	: **AG 50**		:
		Classification Norms	: **EN 12152**
Sample Size	: **4050 mm x 5600 mm**		: **EN 12154**
			: **EN 13116**
Sample Description	: **Curtain Wall**		:
	: **6 / 21 / 4 + 0,76 + 4 Insulated Glass**		
	: **Four Sided**	Test Comp. Date	: **10.01.2012**
Test Performed	: **Air Permeability - Static**	Report Date	: **13.01.2012**
	: **Watertightness - Static**	Record Retention Date	: **13.01.2017**
	: **Wind Resistance - Static**	Number of Pages	: **10**
		Number of Annex Pages:	**6**

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

Air Penetration	: **EN 12152 - Class A4 (600 Pa)**
Water Tightness	: **EN 12154 - R5 (300 Pa)**
Wind Resistance	: **EN 13116 - FAIL (23,79 mm > 15 mm, -21,02 mm > 15 mm)**
Wind Resistance	: **EN 13116 - OK (Extreme Load)**

* Calibration of the test equipments certified by CEBTP / France referenced to report BEB1-B.2013-1 and BEB1-B.2013-2

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

Oktay Usta
Testing Manager

M.Serhat Çolak
Testing Engineer

F.T.I. Fasad Teknoloji Merkezi Ltd.Şti.
Rüzgarlıbahçe Mah. Toyota K Plaza Kat.5 34805 Kavacık / İstanbul / TÜRKİYE
Tel : +90 216 425 03 25 Fax : +90 216 425 03 20
www.fti-europe.com

CONTENTS

1. PREFACE

This report comprises of tests which were performed by FTI Facade Testing Institute at the address Çakıl Village Bağlar Region, Çatalca - Istanbul. Tests were carried out in January 2012 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 Classification
EN 12155	* Curtain Walling - Water Tightness - Laboratory Tests Under Static Pressure
EN 12154	* Curtain Walling - Water Tightness - Performance Requirements and Classification
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 Autoport Project by Burak Aluminyum San. Ve Tic. Ltd. Şti.

Test sample was prepared by the company's own facilities and has been sent to FTI Façade Testing Institute's testing laboratories on 02 / 12 / 2012.

2. TEST PARTICIPANTS

Tests were conducted on 10 / 01 / 2012 with the following participants.

Mr. Oktay USTA	FTI	Testing Manager
Mr. Öner ARSLAN	FTI	Testing Engineer
Mr. M.Serhat ÇOLAK	FTI	Testing Engineer
and partially by		
Ali ÇOLAK	Burak Aluminyum	

3. DESCRIPTION OF TEST SAMPLE

* Type of Sample	**Curtain Wall**
* System	**AG 50**
* Dimensions of Sample (LxH)	**4050 mm x 5600 mm**
* Surface area of Sample	**22,68 m²**
* Fixed Panel Length	**52,35 m**
* Opening type	**None**
* Openable window	**-**
* Surface area of wings	**- m^2**
* Glass Type	**6 / 21 / 4 + 0,76 + 4 Insulated Glass**

System Components

*	AG 753	Vertical Aluminium Profile
*	AG 701	Horizontal Aluminium Profile
*	Steel Reinforcement	
*	Gasket	
*	Silicone	

Please refer to the drawings in annexes.

4. TEST RESULTS

4.1 Test Conditions

Local Temperature	:	11,8	ºC
Atmospheric Pressure	:	1011	mbar
Ambient Humidity	:	61	%
Test Stand	:	Stand	2
ϕ1 : Flow Calculation for positive pressure	:	0,422 x ϕ + 0,09 , while ϕ < 22 m³/h	
		1,525 x ϕ - 23,45, while ϕ > 22 m³/h	
ϕ2 : Flow Calculation for negative pressure	:	0,196 x ϕ – 0,79, while ϕ < 25 m³/h	
		1,883 x ϕ – 42,42 while ϕ > 25 m³/h	

4.2 Pressure Sequence

STEPS		POSITIVE PRESSURE (Pa)	NEGATIVE PRESSURE (Pa)
1	P1= PN	600	600
2	P2=PD	600	600
3	P3=PE	900	900

PN: Pressure Normative
PD: Pressure Design
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 seconds.

Air permeability measurements based on overall area ;

POSITIVE PRESSURE			
ϕ1 / ϕ2	Test Pressure (Pa)	Air Leakage (m³/h)	Air Leakage (m³/h/m²)
ϕ1	50	0,52	0,02
ϕ1	100	1,95	0,09
ϕ1	150	4,27	0,19
ϕ1	200	4,88	0,22
ϕ1	250	7,11	0,31
ϕ1	300	12,16	0,54
ϕ1	450	15,93	0,70
ϕ1	600	29,61	**1,31**

Test No : 2011.131.07

NEGATIVE PRESSURE			
ϕ1 / ϕ2	Test Pressure (Pa)	Air Leakage (m³/h)	Air Leakage (m³/h/m²)
ϕ1	50	0,36	0,02
ϕ1	100	1,02	0,04
ϕ1	150	1,77	0,08
ϕ1	200	2,20	0,10
ϕ1	250	2,26	0,10
ϕ1	300	2,53	0,11
ϕ1	450	12,81	0,56
ϕ1	600	18,02	**0,79**

Test No : 2011.131.08

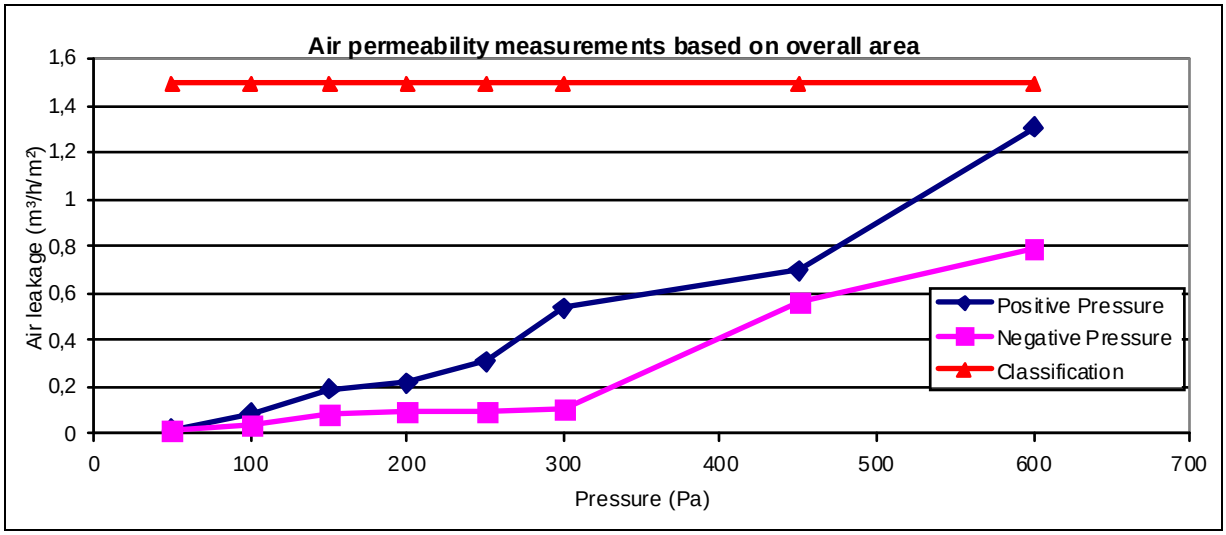
Air permeability measurements based on fixed joint length;

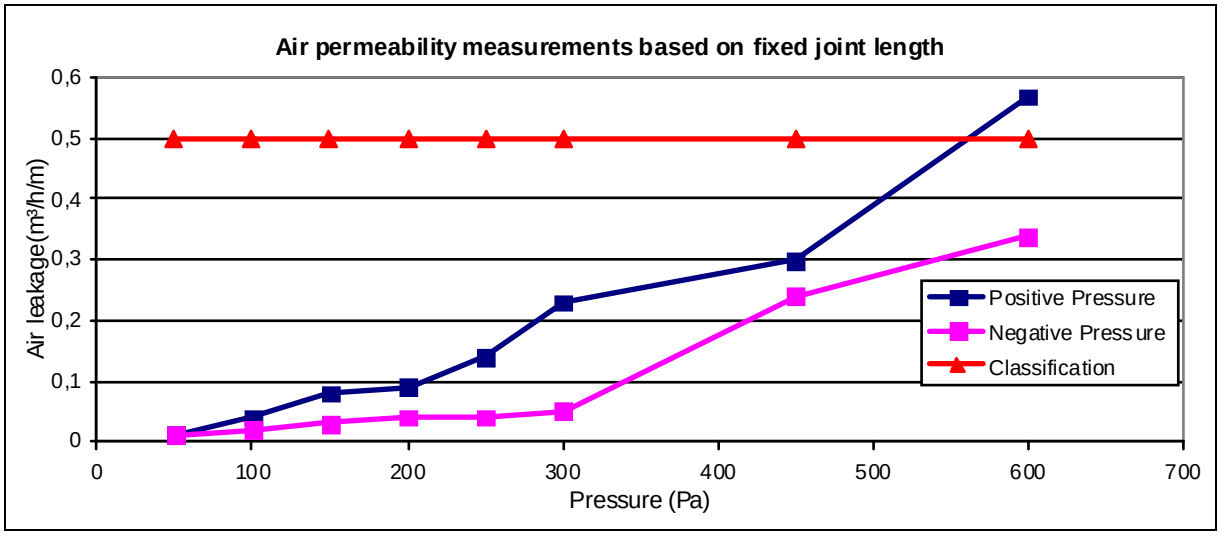
POSITIVE PRESSURE			
ϕ1 / ϕ2	Test Pressure (Pa)	Air Leakage (m³/h)	Air Leakage (m³/h/m)
ϕ1	50	0,52	0,01
ϕ1	100	1,95	0,04
ϕ1	150	4,27	0,08
ϕ1	200	4,88	0,09
ϕ1	250	7,11	0,14
ϕ1	300	12,16	0,23
ϕ1	450	15,93	0,30
ϕ1	600	29,61	**0,57**

Test No : 2011.131.07

NEGATIVE PRESSURE			
ϕ1 / ϕ2	Test Pressure (Pa)	Air Leakage (m³/h)	Air Leakage (m³/h/m)
ϕ1	50	0,36	0,01
ϕ1	100	1,02	0,02
ϕ1	150	1,77	0,03
ϕ1	200	2,20	0,04
ϕ1	250	2,26	0,04
ϕ1	300	2,53	0,05
ϕ1	450	12,81	0,24
ϕ1	600	18,02	**0,34**

Test No : 2011.131.08





4.4 Watertightness Under Static Pressure

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

Waiting duration between each impacts 3 seconds.

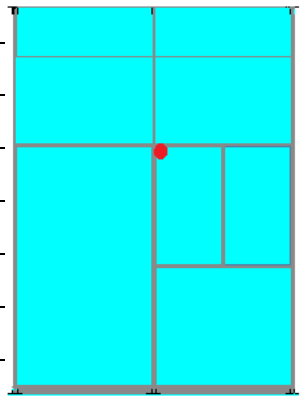
Water spray nozzles are arranged in 4 rows, such that the first nozzle is apart 250 mm. from the side and the distance between the nozzle rows are 1500 mm.

The number of nozzles at each row is 9 pieces.

The amount of water applied to the façade = (2 l/min x 9) x 4 = 72 l/min. = 4320 l/h

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	Water leakage was observed.*
600	5	Water leakage was observed.*



Test No : 2011.131.09

***** Middle transom and mullion junction point.

4.5 Resistance to Wind Load

Before starting the test, 3 pulses at 600 / -600 Pa are applied to the sample.

Waiting duration between each impacts 3 seconds.

During the tests, the pressure values are applied for 10 seconds.

Acceptable proportion at resistance to wind load:

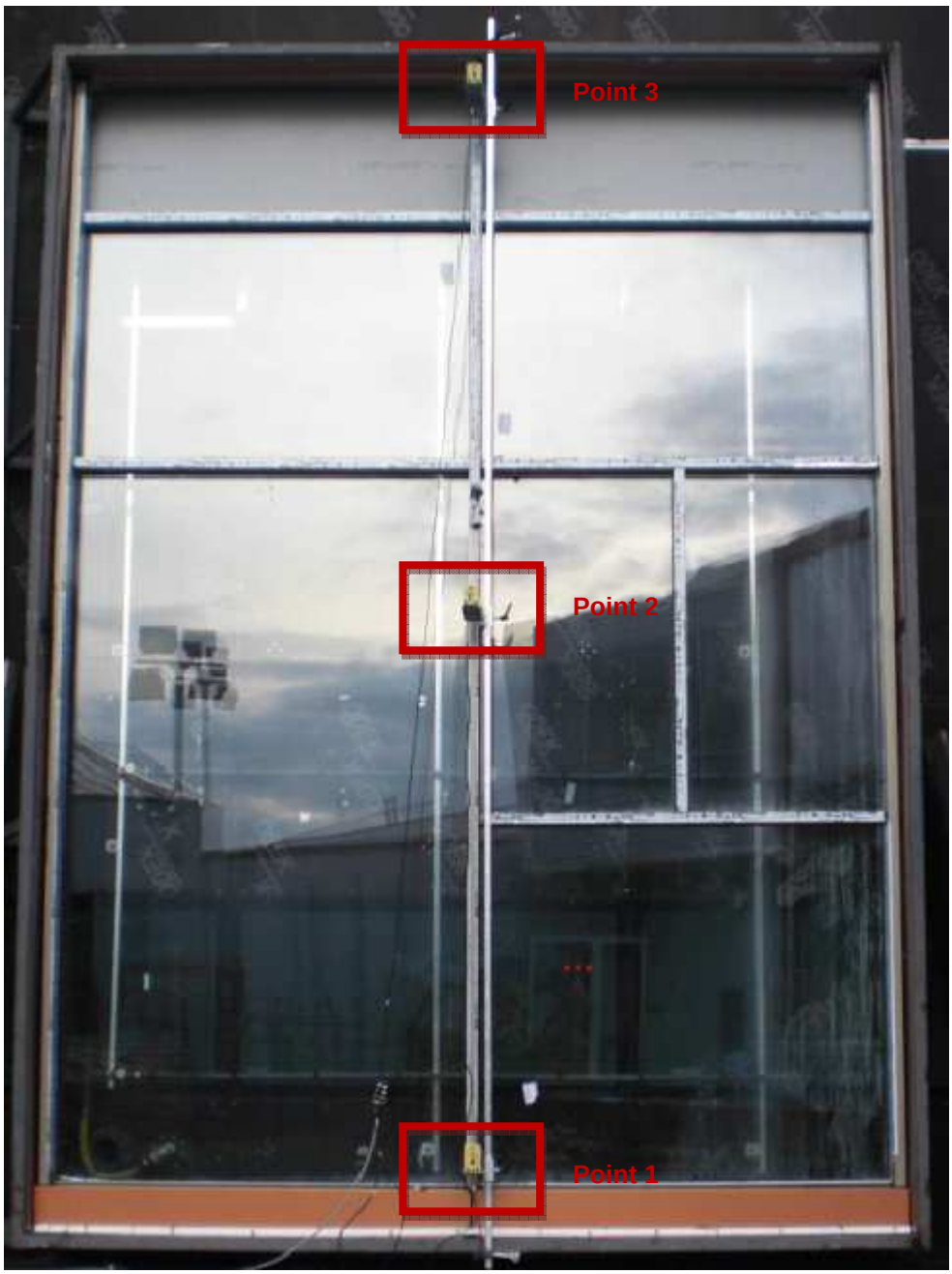
Position: Vertical distance for mullion at middle axis

Scale: **Vertical 5600 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, which is smaller, under the positive and negative design loads:

Vertical 5600 / 200 = 28,00 mm or 15,00 mm

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



Specimen dimensions and sensor replacement coordinates;

	X coordinates (mm)	Y coordinates (mm)
External Dimensions	4050	5600
Sensor 3 Replacement	2025	5400
Sensor 2 Replacement	2025	2800
Sensor 1 Replacement	2025	200

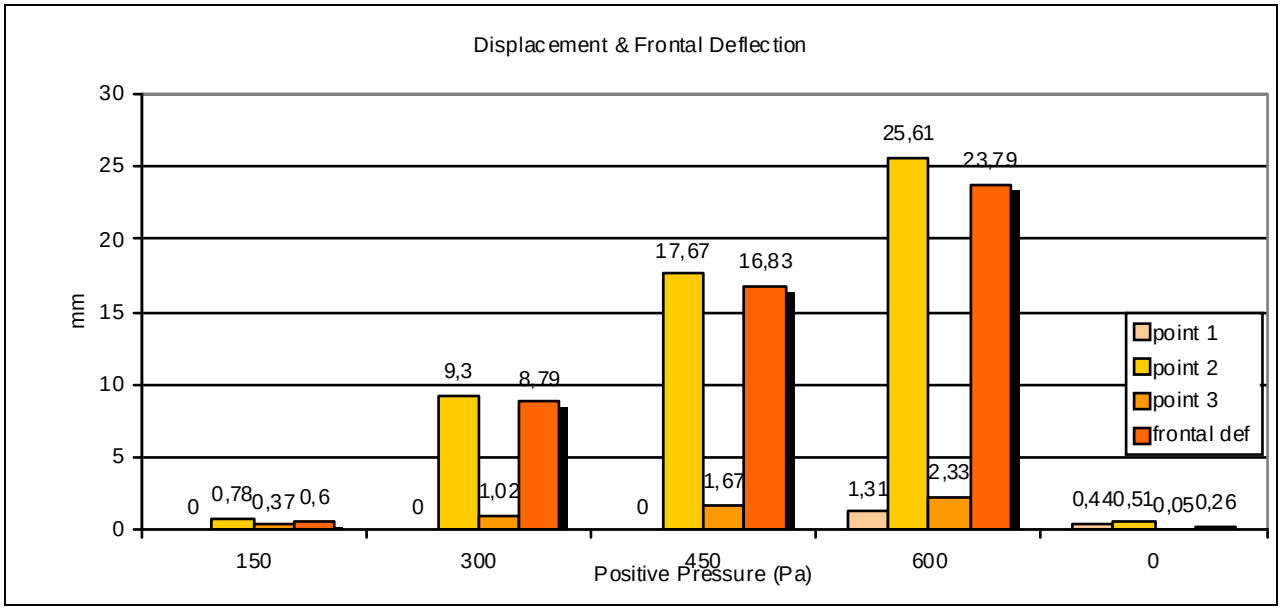
Frontal deflection measurement results on the vertical mullion;

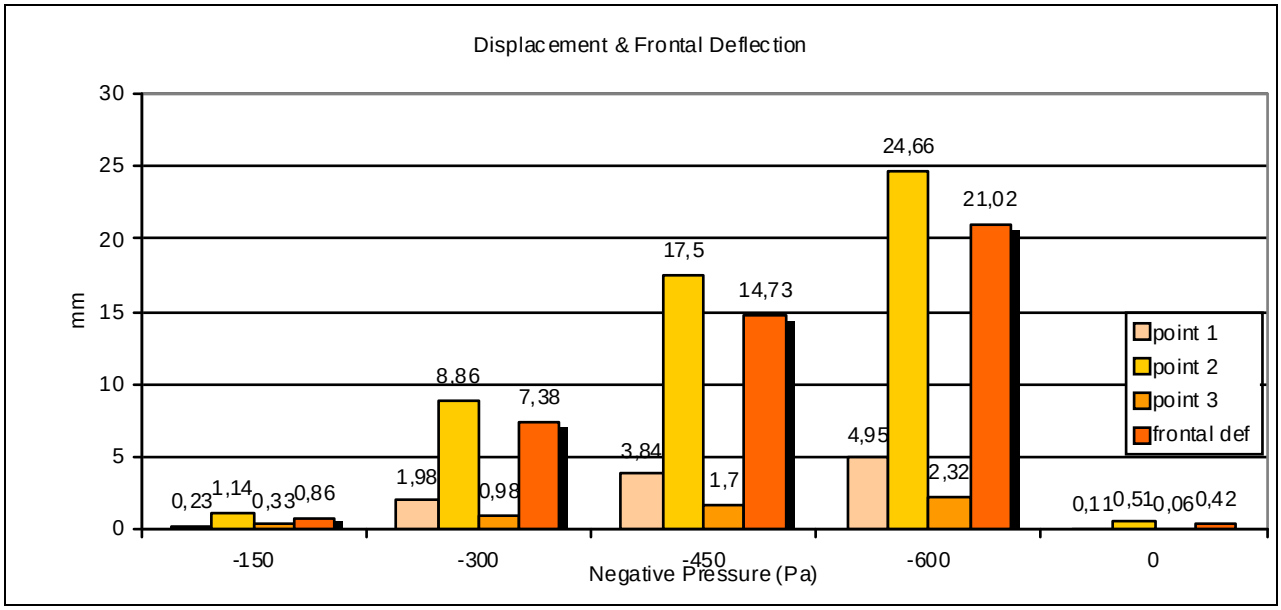
Positive Pressure (Pa)	Point 1 (mm)	Point 2 (mm)	Point 3 (mm)	Frontal Deflection (mm)
0	0,00	0,00	0,00	0,00
150	0,00	0,78	0,37	0,60
300	0,00	9,30	1,02	8,79
450	0,00	17,67	1,67	16,83
600	1,31	25,61	2,33	**23,79**
0	0,44	0,51	0,05	0,26

Test No : 2011.131.10

Negative Pressure (Pa)	Point 1 (mm)	Point 2 (mm)	Point 3 (mm)	Frontal Deflection (mm)
0	0,00	0,00	0,00	0,00
-150	0,23	1,14	0,33	0,86
-300	1,98	8,86	0,98	7,38
-450	3,84	17,50	1,70	14,73
-600	4,95	24,66	2,32	**21,02**
0	0,11	0,51	0,06	0,42

Test No : 2011.131.11





4.6 Increased Load Test (Safety Test - Secure Load)

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

Test Pressure	Applied	Observations
PE = ± 900 Pa	± 900 Pa	No damage was observed

Test No : 2011.131.12

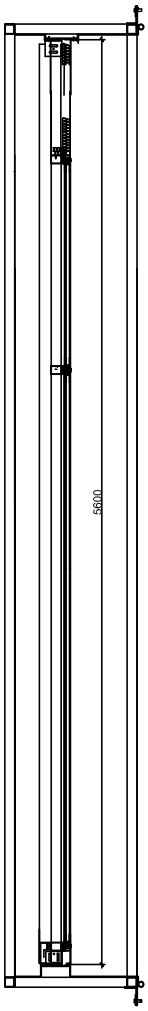
5. REVISIONS MADE ACCORDING TO TEST RESULTS

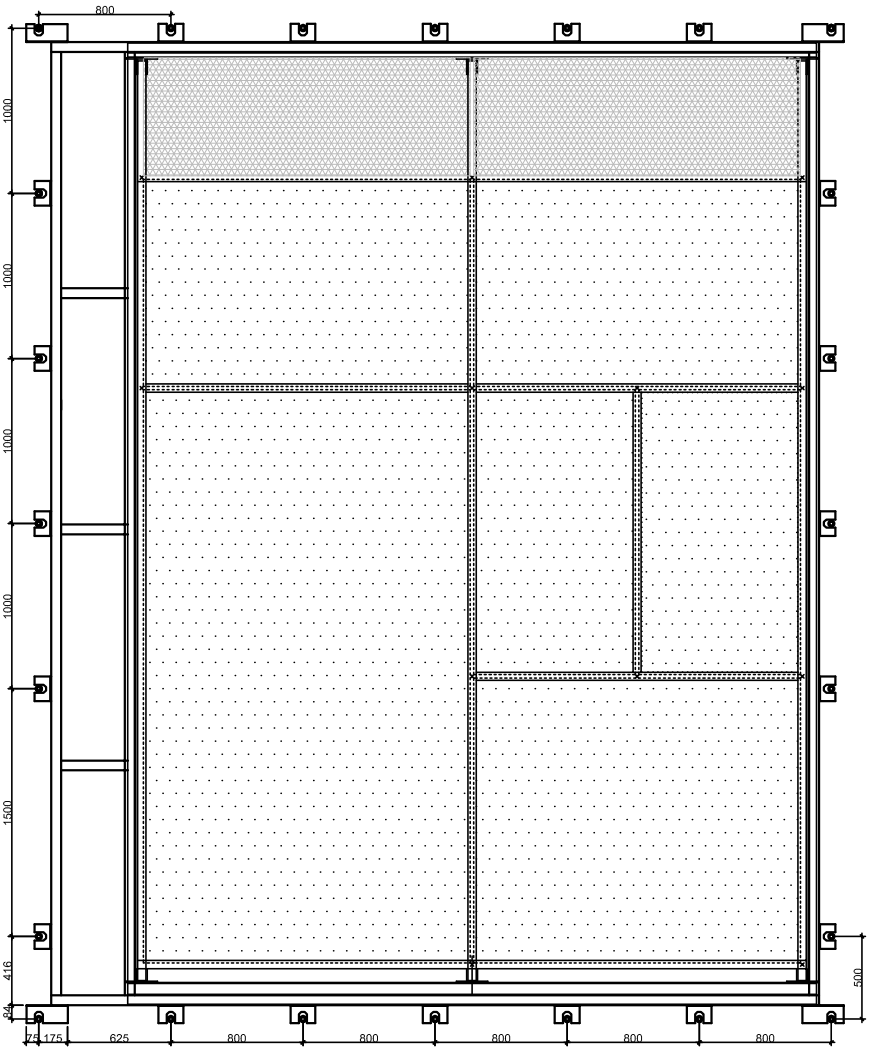
- No revision was made.

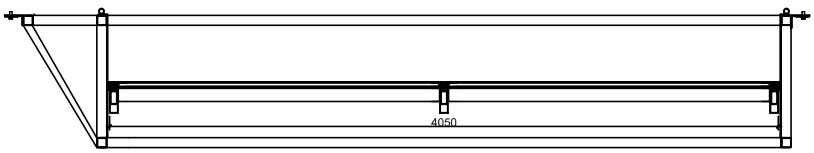
6. RESULT

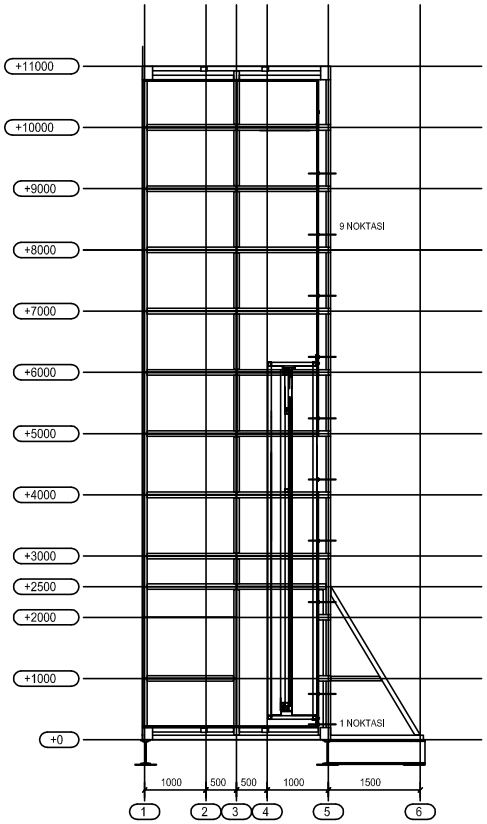
6.1. Results and Classification

	CONDITIONS	RESULTS		CLASSIFICATION
AIR PERMEABILITY EN 12152	at 600 Pa ϕ < 1,5 m³/h,m²	Positive Pressure	1,31	**A4**
	at 600 Pa ϕ < 0,5 m³/h,m		0,57	**A3**
	at 600 Pa ϕ < 1,5 m³/h,m²	Negative Pressure	0,79	**A4**
	at 600 Pa ϕ < 0,5 m³/h,m		0,34	**A4**
WATER-TIGHTNESS (Static Pressure) EN 12154	There will be no water leakage at 600 Pa	Water leakage was observed at 450 Pa.		**R5**
RESISTANCE TO WIND LOAD EN 13116	Deflection < 15,0 mm at +600 Pa and -600 Pa	OK (max. + 23,79 mm) (max. - 21,02 mm)		**FAIL**
	There will be no damage at secure load (+900 Pa, -900 Pa)	No damage was observed at positive or negative pressure		**OK**

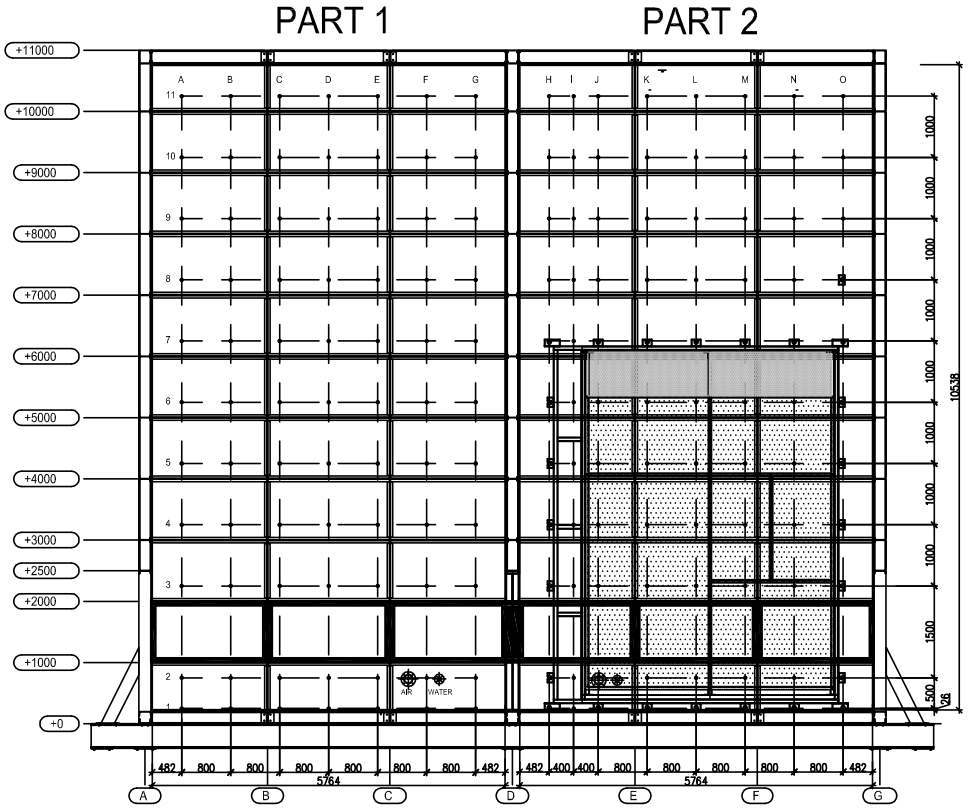

5600


800
1000
1000
1000
1000
1500
416
84
500
75
175
625
800
800
800
800
800


4050

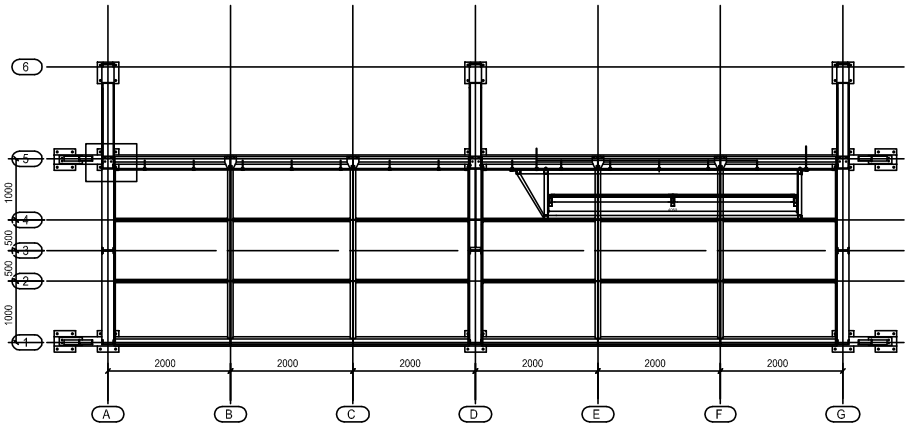


KESIT



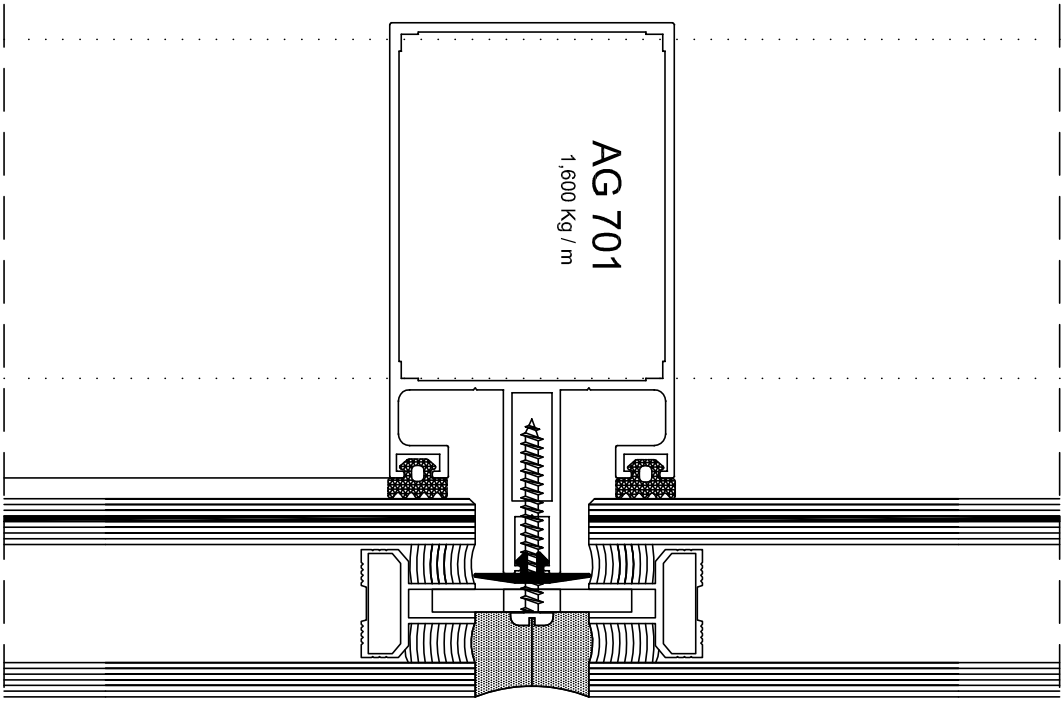
GORUNUS

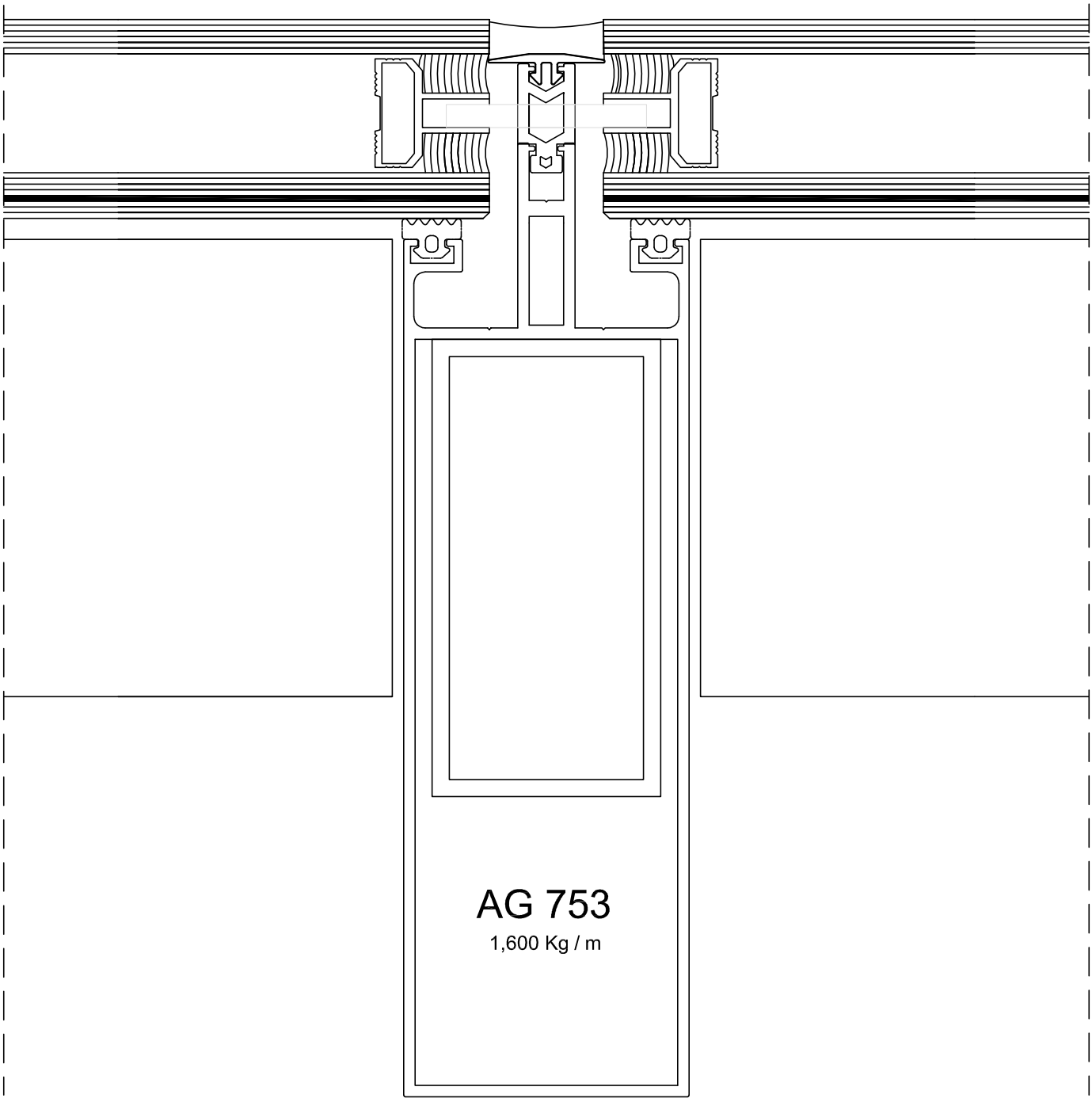
TEST YAPILACAK BOLUM -PART 2
KOORDINATLAR- (1-H)-(1-L)-(4H)-(4-L)



TEST YAPILACAK BOLUM -PART 2
KOORDINATLAR- (1-H)-(1-L)-(4H)-(4-L)

PLAN


AG 701
1,600 Kg / m



AG 753

1,600 Kg / m

Elancourt le : 7 mars 2011

INGENIERIE EUROPE
GROUPE
GINGER CEBTP

Division Enveloppe du bâtiment

Service : **Produits de l'Enveloppe**

Tél. 01 30 85 23 22 Fax. 01 30 85 23 20

Entreprise:

Nom **FTI Façade Testing institute**
Adresse **CAKIL KOYU BAGLAR MEVKII**
PK.39 CATALCA ISTAMBUL
TURQUIE

à l'attention de M : **OKTAY USTA**

RAPPORT DE VERIFICATION N° : BEB1.B.2013-2

SITE: CATALCA

MYTECH 24

RECAPITULATIF des CONTRÔLES EFFECTUES PAR LE CEBTP

L'étalonnage doit être renouvelé tous les 3 ans. *L'Autocontrôle doit être effectué tous les 6 mois par l'entreprise, sous sa responsabilité, afin de vérifier les dérives éventuelles du banc.*

Date du Contrôle **mars-11**	*Prochain contrôle à faire pour* ***mars - 2014***

CONDITIONS DE MESURES (au début des vérifications)

TEMPÉRATURE 10.0 °C HYGROMÉ 38.0 % PRESSION ATMOSPHÉRIQUE 1026.0 Hpa

Pour avoir la pression atmosphérique téléphoner si nécessaire: 08 92 68 02 + N°département.

Les résultats des calculs sont à corriger en fonction des conditions réelles.

FORMULES POUR LE CALCUL DES DEBITS D'AIR

MESURES EFFECTUEES EN PRESSION						MESURES EFFECTUEES EN DEPRESSION *Nota: Ce tableau n'est remplis que si les formules à utiliser sont différentes*			
N°	plage	FORMULE			formule simplifiée	N°	Diam	FORMULE	formule simplifié
1	0 à 65 m3/h	0.422	x Qb +	0.09	0.429				
2	65 à 140 m3/h	1.525	x Qb +	-23.45	1.166				

Les formules sont rapportées à T° = 20° et Patm = 101325 Pa

Planification: Auto Contrôles

L'entreprise doit avoir réalisé son auto-contrôle interne aux dates suivantes

Date	**mars - 11**	A
Date	**août - 11**	B
Date	**févr - 12**	C
Date	**août - 12**	D
Date	**févr - 13**	E
Date	**août - 13**	F

Si la dérive est > 10%, refaire le contrôle par le CEBTP, sans attendre les 3 ans

CORRECTION DES DÉBITS D'EAU

N°1		
AFFICHE	RÉEL	CORRECT
2000.0	1692.0	18%
3000.0	2720.9	10%
4000.0	3700.8	8%

Le chef de service
Produits de l'enveloppe
Aurélien GAUDRON


alu-line


Time
Current 15:19:07
Starting 15:08:45
Ending
Elapsed 0000h:10m:22s
Actual Displacements
Deflection Sensor Replacements
593
Current Pressure (Pascal)
600
Target Pressure (Pa)
Digital Input
I'm Ready Start The Process
Stop The Process
Conversion Table
Application Terminate & Close


Time
Current 15:54:11
Starting 15:43:00
Ending
Elapsed 0000h:11m:12s
Actual Displacements
Deflection Sensor Replacements
-81
Current Pressure (Pascal)
-30
Target Pressure (Pa)
Digital Input
I'm Ready Start The Process
Stop The Process
Conversion Table
Application Terminate & Close


Time
Current 16:04:07
Starting 15:58:21
Ending
Elapsed 0000h:05m:47s
Actual Displacements
Deflection Sensor Replacements
-913
Current Pressure (Pascal)
-900
Target Pressure (Pa)
Digital Input
I'm Ready Start The Process
Stop The Process
Conversion Table
Application Terminate & Close