	BUILDING RESEARCH INSTITUTE **European Notified Body № 1488**
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Building Structures Laboratory

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Customer **SAPA Building System Poland Sp. z o.o.**
ul. Graniczna 60,
93-428 Łódź - Poland

Object of tests Curtain wall SAPA® ELEGANCE EL 52 with windows IT
declared load – 1200 Pa

Accepted for testing: 02.03.2010
with the protocol LK—04243/09/Not
in accordance with the procedure no. 18.

Date of test: 04.03.2010÷16.03.2010

TEST METHODS:

Initial type testing (ITT) – AoC system 3 PN-EN 13830:2005

PN-EN 12153:2004	Curtain walling – Air permeability – Test method.
PN-EN 12155:2004	Curtain walling – Watertightness – Laboratory test under static pressure
PN-EN 12179:2004	Curtain walling – Resistance to wind load - Test method.

The test equipment used comply with the above-mentioned standards

1 The scope of tests

The scope of initial type testing covered the verification of:
– air permeability,
– watertightness,
– resistance to wind load.

Personnel executing the tests:
Msc. Łukasz Pietrzykowski

Object of tests:

The curtain wall made of aluminium profiles type SAPA® ELEGANCE EL52 with windows IT - external dimensions SzxHz= 4240x3000 mm, was subjected to tests with regard to wind resistance, air permeability and watertightness.
The tested object was designed for initial type testing with regard to wind load resistance with a value of 1200Pa.
Date of assembly of the curtain wall in the laboratory march 2010. The assembly was performed by SAPA Building System Poland Sp.z o.o. from Łódź - Poland.
The test sample was typified by SAPA Building System Poland Sp.z o.o. from Łódź – Poland.
Transparent filing: insulating glass units (6/15/44.1).
The scheme of the tested element is shown in fig. 1.

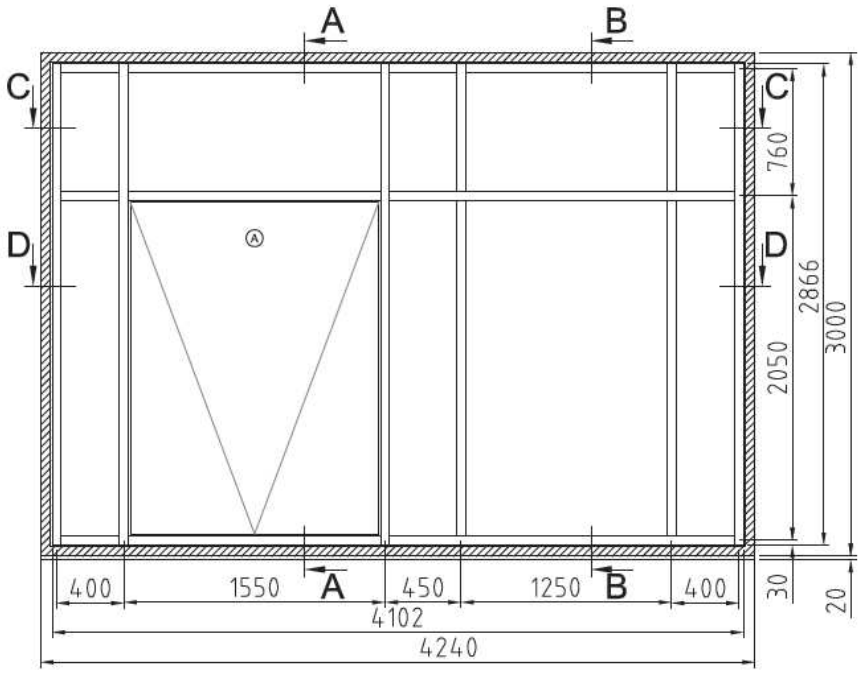


Fig.1. View of the tested fragment of the curtain wall made of **SAPA® ELEGANCE EL52 with windows IT** aluminium – designed test pressure - **1200Pa**

Components (profiles, weather stripping) are shown on figures at report annex.

1 Test results

1.1 Sample identification

The object of the tests was the SAPA® ELEGANCE EL52 curtain wall with dimensions S x H = 4240 x 3000 mm, with windows IT (top-hung casement opening outwards), assembled in 2010. The detailed figures of the tested element were provided as an annex to the test report.

The information about the specimen:

Manufacturer: SAPA Building System Poland Sp. z o.o., ul.Graniczna 60, 93-428 Łódź –Poland,

Place of sampling: SAPA Building System Poland Sp. z o.o., ul.Graniczna 60, 93-428 Łódź -Poland

Number of samples: 1

Description of the sample: curtain wall SAPA® ELEGANCE EL52 with dimensions S x H = 4240x3000mm, with windows IT (top hung window and parallel window with dimensions S x H = 1500x2200mm), construction made of aluminium profiles, with insulating glass units (6/15/44.1).

Date: March 2010

Components (profiles, weather stripping) are shown on figures at report annex.

1.2 Air permeability

The test was carried out in accordance with PN-EN 12153:2004.
Air permeability was measured at positive and negative test pressure, before and after test of resistance to wind load. The test results (taking into account the leakiness of chamber) are shown in tables no. 1 ÷ 6.

The test was subjected to:

- the fragment of the curtain wall with external dimensions - SzxHz= 4240x3000 mm

- area of the element – 11,79 m^2,
- join length – 42,19 m – without windows; 51,20 m – with windows.

Before the test of resistance to wind load

Tab. 1 Air permeability – curtain wall without windows

Pressure	Air permeability – positive test pressure				
	Q	Q	Q_{dop}	Q	Q_{dop}
Pa	m^3/h	$m^3/(h\ m)$	$m^3/(h\ m)$	$m^3/(h\ m^2)$	$m^3/(h\ m^2)$
50	3,5	0,08	0,06	0,30	0,29
100	5,6	0,13	0,15	0,47	0,45
150	7,3	0,17	0,20	0,62	0,60
200	8,8	0,21	0,24	0,75	0,72
250	9,9	0,23	0,28	0,84	0,84
300	10,6	0,25	0,31	0,90	0,94
450	13,4	0,32	0,41	1,14	1,24
600	15,5	0,37	0,50	1,31	1,50

PN-EN 12152:2004 classification	class A4

Tab. 2 Air permeability – curtain wall without windows

Pressure	Air permeability – negative test pressure		
	Q	Q	Q
Pa	m^3/h	$m^3/(h\ m)$	$m^3/(h\ m^2)$
50	3,7	0,09	0,06
100	6,0	0,14	0,15
150	7,3	0,17	0,20
200	9,4	0,22	0,24
250	10,2	0,24	0,28
300	11,4	0,27	0,31
450	14,8	0,35	0,41
600	17,9	0,42	0,50

Tab. 3 Air permeability – windows

Pressure	Air permeability	
	Q positive test pressure	Q negative test pressure
Pa	m^3/h	m^3/h
50	2,6	1,4
100	2,8	1,9
150	2,4	3,1
200	2,7	4,4
250	1,5	5,1
300	2,1	6,0
450	1,4	9,9
600	2,5	14,7

<u>After the test of resistance to wind load</u>

Tab. 4 Air permeability – curtain wall without windows

Pressure	Air permeability – positive test pressure				
	Q	Q	Q_{dop}	Q	Q_{dop}
Pa	m^3/h	$m^3/(h\ m)$	$m^3/(h\ m)$	$m^3/(h\ m^2)$	$m^3/(h\ m^2)$
50	4,1	0,10	0,06	0,35	0,29
100	7,5	0,18	0,15	0,64	0,45
150	8,5	0,20	0,20	0,72	0,60
200	9,4	0,22	0,24	0,80	0,72
250	11,2	0,27	0,28	0,95	0,84
300	13,1	0,31	0,31	1,11	0,94
450	14,8	0,35	0,41	1,26	1,24
600	17,4	0,41	0,50	1,48	1,50

PN-EN 12152:2004 classification	class A4

Tab. 5 Air permeability – curtain wall without windows

Pressure	Air permeability – negative test pressure		
	Q	Q	Q
Pa	m^3/h	$m^3/(h\ m)$	$m^3/(h\ m^2)$
50	3,5	0,08	0,30
100	5,8	0,14	0,49
150	7,2	0,17	0,61
200	9,5	0,23	0,81
250	10,6	0,25	0,90
300	12,0	0,28	1,02
450	15,5	0,37	1,31
600	18,1	0,43	1,49

Tab. 6 Air permeability – windows

Pressure	Air permeability	
	Q positive test pressure	Q negative test pressure
Pa	m^3/h	m^3/h
50	0,8	0,9
100	0,5	2,0
150	0,9	3,1
200	0,9	4,0
250	2,6	6,5
300	2,3	7,6
450	1,9	12,1
600	2,9	26,7

The tests were performed on the HOLTEN chamber for testing windows, doors and walls
Test conditions:
- temperature 19^{0}C, - humidity 29%, - pressure 1004 hPa
Measurement uncertainty ±5%.

1.3 Watertightness

The test was carried out in accordance with PN-EN 12155:2004.
Test results (for curtain wall with windows) have been presented in tables no. 7 and 8.

Tab. 7 Watertigtness – before wind load

Pressure, Pa	Testing time, min	Remarks and observations
0	15	no leakage
50	5	no leakage
100	5	no leakage
150	5	no leakage
200	5	no leakage
250	5	no leakage
300	5	no leakage
450	5	no leakage
600	5	no leakage
750	5	no leakage
900	5	no leakage
1050	5	no leakage
1200	5	no leakage
PN-EN 12154:2004 classification		Class RE 1200

Tab. 8 Watertightness – after wind load

Pressure, Pa	Testing time, min	Remarks and observations
0	15	no leakage
50	5	no leakage
100	5	no leakage
150	5	no leakage
200	5	no leakage
250	5	no leakage
300	5	no leakage
450	5	no leakage
600	5	no leakage
750	5	no leakage
900	5	no leakage
1050	5	no leakage
1200	5	no leakage
PN-EN 12154:2004 classification		Class RE 1200

1.4 Resistance to wind load

The test was carried out in accordance with PN-EN 12179:2004.

Calculated load: 1200 Pa

The spacing of measurement points is presented in figure no. 2.
Test results have been presented in tables no. 9 and 10.

Measurement of deflection with P1

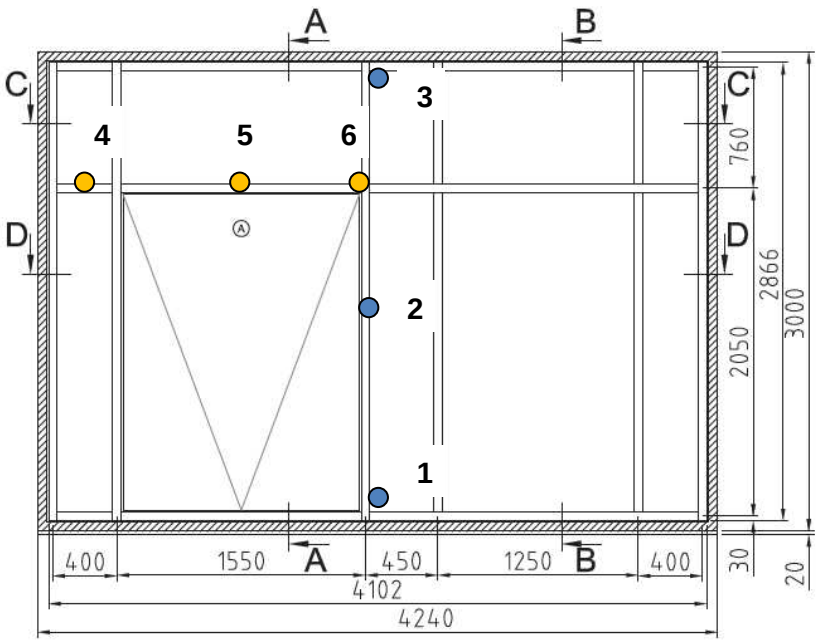
Tab. 9 Displacement values - pressure

Pressure, Pa	300	600	900	1200	0
Mullion – L=2867mm					
P1, mm	0,1	0,4	0,9	1,3	0,1
P2, mm	1,7	4,5	7,8	11,0	0,1
P3, mm	0,1	0,3	0,9	1,4	0,1
displacement, mm	1,6	4,2	6,9	9,7	---
deflection	1/1792	1/683	1/416	1/296	---
Transom – L=1500mm					
P4, mm	1,5	3,9	6,8	9,5	0,1
P5, mm	0,9	3,1	5,8	8,3	0,2
P6, mm	1,3	3,2	5,5	7,6	0,2
displacement, mm	0,5	0,5	0,4	0,3	---
deflection	1/3000	1/3000	1/3750	1/5000	---
Requirement: deflection not bigger than 1/200 and not bigger than 15 mm					

Tab. 10 Displacement values - suction

Pressure, Pa	300	600	900	1200	0
Mullion – L=2867mm					
P1, mm	0,1	0,4	0,8	1,2	0,3
P2, mm	1,6	4,3	7,5	10,5	0,6
P3, mm	0,2	0,2	0,8	1,3	0,4
displacement, mm	1,5	4,0	6,7	9,3	---
deflection	1/1911	1/717	1/428	1/308	---
Transom – L=1500mm					
P4, mm	1,4	3,7	6,5	9,2	0,6
P5, mm	1,0	3,0	5,7	8,3	0,8
P6, mm	1,3	3,0	5,3	7,3	0,6
displacement, mm	0,4	0,4	0,2	0,1	---
deflection	1/3750	1/3750	1/7500	1/15000	---
Requirement: deflection not bigger than 1/200 and not bigger than 15 mm					

Measurement uncertainty ±0.1mm.Trust level 95%.



Measuring points on the transom

Measuring points on the mullion

Fig. 2. Spacing of measurement points - declared pressure 1200Pa

Safety test P3

The curtain wall was subjected to a brief safety test pressure of 1800 Pa.
After test no visible changes were observed.

2 Classification

On the base of test results the classification for curtain is presented in tables no. 11.

Tab. 11 Classification of the testing curtain wall – SAPA® ELEGANCE EL52 with windows IT (top-hung casement opening outwards)

Properties	Classification	Classification standards
Air permeability	**class A4** (600 Pa)	PN-EN 12152:2004
Watertightness	**class RE 1200**	PN-EN 12154:2004
Resistance to wind load	**1200 Pa**	PN-EN 13116:2004
Safety test	**+1800 Pa**	PN-EN 13116:2004

Responsible for the test:	Authorizing Person
MSc. Eng. Marzena Jakimowicz	*dr eng. Krzysztof Kuczyński*
Warsaw 28.07.2010	
Date of the translation 29.04.2011	

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Head of Testing Laboratory
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