EKANAL
HELLENIC DEVELOPMENTAL CENTRE OF ALUMINIUM S.A.

IRAS & SPIROU MILIOU
GR 124 62 CHAIDARI
GREECE
Tel : ++30 (210) 55.82.320-2
Fax : ++30 (210) 55.82.323
E-mail : ekanal@hol.gr

TEST REPORT

Report Number	**0602**	**Report Date**	**21 / 02 / 2006**

Client	**ETEM S.A.** **LIGHT METALS COMPANY** **1, IROON POLYTEHNIOU STR.** **GR 190 18 MAGOULA ATTIKIS** **GREECE**
Specimen description	**Curtain Wall Specimen** **With three fixed and one projecting elements** **System E – 8000 STRUCTURAL** **External dimensions 2230 x 1835 mm** *(code E02 0106 01)*
Delivery Date	**13 / 01 / 2006**
Conducted Tests	**Air permeability – Watertightness** **Resistance to wind load**
Date of tests	**23 / 01 / 2006 and 24 / 01 / 2006**

Notes : Twenty-six (26) original pages in Greek with the constructional data of the specimen which has been tested are attached, as they were given by the client. No further verification of the above mentioned data has been conducted by E.K.AN.AL.

- The choice of the specimen has been made by the client.

- **THE RESULTS CONCERN ONLY THE SPECIMEN TESTED.**
- **THE PRESENT DOCUMENT DOES NOT CONSIST PRODUCT APPROVAL BY E.K.AN.AL.**

SIGNATURE OF TECHNICAL MANAGER	**SIGNATURE OF GENERAL MANAGER**
SINOPI PAPADOPOULOU **Chemical Engineer**	**IOANNIS GKERTSOS** **Management Director**

EXACT TRANSLATION FROM THE GREEK ORIGINAL

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Report Number	0602 / 1	Report Date	21 / 02 / 2006

Conducted Tests & Technical Standards	Testing Date
AIR PERMEABILITY (EN 12153 / 2000 & EN 12152 /2004)	23 / 01 / 2006

Laboratory Equipment

- Door and window Test Rig — K. SCHULTEN GmbH & Co KG (EK 01)
- Temperature – moisture recorder — CLIM (EK 03)
- Barometer — EVEREST (EK 04)
- Measure tape — FACOM (EK 05)

RESULT REPORT

The air permeability test, aiming at determining the quantity of the air which escapes from the specimen, is conducted in accordance with the procedure described in ΛΔ1005 of E.K.AN.AL.

- **Specimen condition before the test :**

The specimen had a metal frame perimetrically for mounting and fixing in the test chamber. It did not appear to have any external damage or functional defect which could affect the test.

- **Specimen preparation :**

After the specimen had been cleaned and dried, it was left in the allowed ambient conditions for at least 4 hours before the test.
After the chamber had been built to fit to the specimen dimensions, the specimen was mounted and fixed on it by perimetrical placing of hand clamps.

- **Testing laboratory conditions :**

T : 13 ^{0}C, RH : 55 %, P : 101.4kPa

RESULTS

The specimen is classified in the **AE Air Permeability Class.**

The specimen is classified in the AE class related to the overall surface (m^3 / h / m^2).

The table of relative air loss related to the overall surface of the specimen and the relative graph follow.

Specimen Dimensions

External : 2230 x 1835 mm
Internal (glazing) : 1040 x 845 mm

Notes

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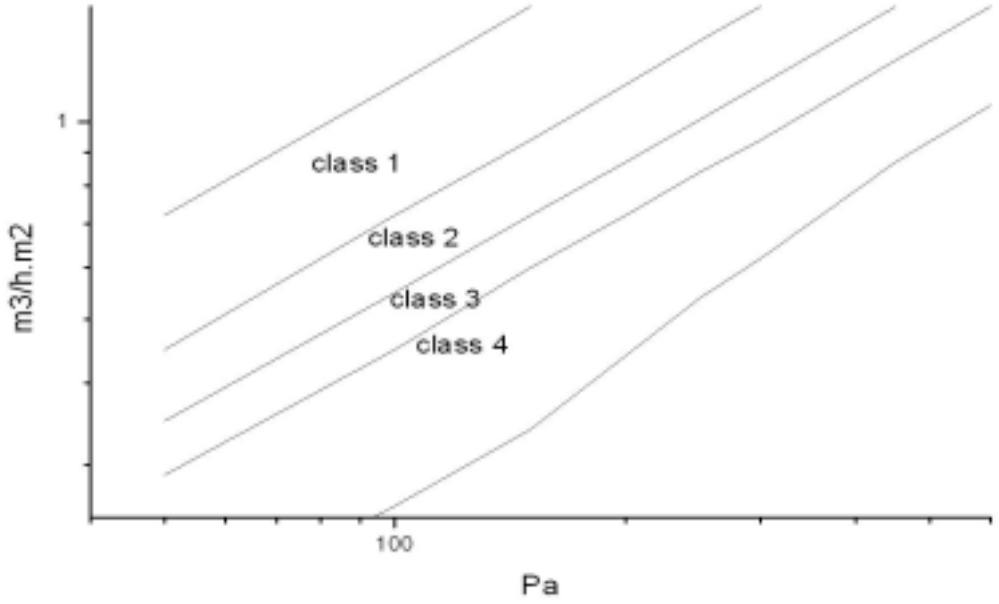
Report Number	0602 / 1	Report Date	21 / 02 / 2006

Conducted Tests & Technical Standards **AIR PERMEABILITY** (EN 12153 / 2000 & EN 12152 /2004)	Testing Date 23 / 01 / 2006

RESULT REPORT

Air permeability at positive pressures

Air permeability related to the overall area of the specimen



Static Pressure (Pa)

Airloss	50	100	150	200	250	300	450	600	750	900	1000
m^3/h	0.70	1.08	1.38	1.81	2.20	2.52	3.54	4.34	5.24	5.98	6.91
$m^3/h.m^2$	0.17	0.26	0.34	0.44	0.54	0.62	0.87	1.06	1.28	1.46	1.69

The specimen is classified in AE air permeability class, according to EN 12152:2004.

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Report Number	0602 / 2	Report Date	21 / 02 / 2006

Conducted Tests & Technical Standards	Testing date
WATERTIGTHTNESS (EN 12155 / 2000 & EN 12154 /2000)	23 / 01 / 2006

Laboratory Equipment

- Door and window Test Rig — K. SCHULTEN GmbH & Co. KG (EK 01)
- Temperature – moisture recorder — CLIM (EK 03)
- Barometer — EVEREST (EK 04)

RESULT REPORT

The water tightness test, aiming at determining the water leak points of the specimen under specific static pressure, is conducted in accordance with the procedure described in ΛΔ 1006 of E.K.AN.AL.

- **Specimen condition before the test :**

The specimen had a metal frame perimetrically for mounting and fixing in the test chamber. It did not appear to have any external damage or functional defect which could affect the test.

- **Specimen preparation :**

After the specimen had been cleaned and dried, it was left in the allowed ambient conditions for at least 4 hours before the test.
After the chamber had been built to fit to the specimen dimensions, the specimen was mounted and fixed on it by perimetrical placing of hand clamps.

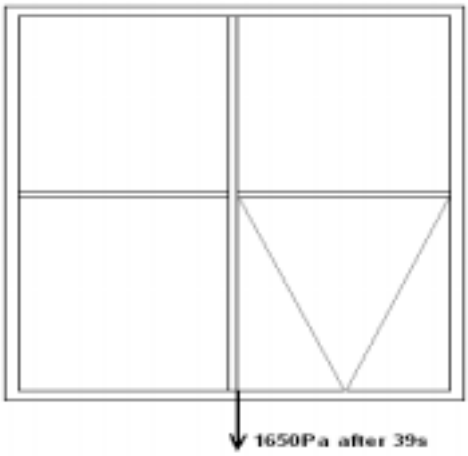
- **Testing laboratory conditions :**

T : 13 ^{0}C, RH : 55 %, P : 101.4kPa

The specimen spraying was conducted at a spraying rate of ~2 l/min· m^2 and by means of a horizontal spraying device with five nozzles. The specimen spraying, after the first fifteen minutes at zero pressure, continued for five minutes at each pressure step. The water tightness test was contacted twice, the first time for pressures up to 600Pa and the second (after the wind resistance test) for pressures up to 1650Pa. The exerted pressures were the following: 50, 100, 150, 200, 250, 300, 450, 600, 750, 900, 1050. 1200, 1350, 1500 and 1650Pa.

RESULTS

The specimen is classified in RE_{1500} Watertightness Class.



Notes

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Report Number	0602 / 3	Report Date	21 / 02 / 2006

Conducted Tests & Technical Standards	Testing date
RESISTANCE TO WIND LOAD (EN 12179 / 2000 & EN 1316 / 2001)	24 / 01 / 2006

Laboratory Equipment

- Door and window Test Rig — K. SCHULTEN GmbH & Co. KG (EK 01)
- Temperature – moisture recorder — CLIM (EK 03)
- Barometer — EVEREST (EK 04)

RESULT REPORT

The resistance to wind load test, aiming at determining the distortions of the frame and the resilience of the specimen under high pressures, is conducted in accordance with the procedure described in ΛΔ1007 of E.K.AN.AL.

- **Specimen condition before the test :**

The specimen had a metal frame perimetrically for mounting and fixing in the test chamber. It did not appear to have any external damage or functional defect which could affect the test.

- **Specimen preparation :**

After the specimen had been cleaned and dried, it was left in the allowed ambient conditions for at least 4 hours before the test.

After the chamber had been built to fit to the specimen dimensions, the specimen was mounted and fixed on it by perimetrical placing of hand clamps.

- **Testing laboratory conditions :**

T : 13 ^{0}C, RH : 43 %, P : 101.4kPa

The specimen was tested according to the procedures of EN 12179:2000 and for pressures up to ±1500Pa.The tables showing the frontal displacement, the relative frontal deflection and the remaining deformation follow.

RESULTS

1a.Frontal Displacement – Deflection (Positive pressures up to +1500 Pa)

Pressure (Pa)	Sensor 1a	Sensor 2b	Sensor 3c	Frontal deflection b-((a+c)/2)	Relative Frontal deflection (l=2130mm)
375	-0.3	-0.7	-0.1	-0.5	**1 / 4260**
0*	0.0	0.0	0.0	0.0	**0**
750	-1.0	-1.7	-0.4	-1.0	**1 /2130**
0*	0.0	0.0	0.0	0.0	**0**
1125	-1.6	-2.9	-0.9	-1.7	**1 / 1253**
0*	0.0	0.0	0.0	0.0	**0**
1500	-2.0	-4.0	-1.3	-2.3	**1 / 926**
0*	0.0	0.0	0.0	0.0	**0**

* (after 60s)

1b. Frontal Displacement – Deflection (Negative pressures up to -1500 Pa)

Pressure (Pa)	Sensor 1a	Sensor 2b	Sensor 3c	Frontal deflection b-((a+c)/2)	Relative Frontal deflection (l=2130mm)
-375	0.4	0.7	0.1	0.5	**1 / 4260**
0*	0.0	0.0	0.0	0.0	**0**
-750	1.1	1.8	0.4	1.0	**1 / 2130**
0*	0.0	0.0	0.0	0.0	**0**
-1125	1.8	3.0	0.9	1.6	**1 / 1331**
0*	0.0	0.0	0.0	0.0	**0**
-1500	2.4	4.2	1.3	2.3	**1 / 926**
0*	0.0	0.0	0.0	0.0	**0**

* (after 60s)

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Report Number	0602 / 3		Report Date	21 / 02 / 2006

Conducted Tests & Technical Standards **RESISTANCE TO WIND LOAD** (EN 12179 / 2000 & EN 13116 / 2001)	Testing date 24 / 01 / 2006

Laboratory Equipment

- Door and window Test Rig — K. SCHULTEN GmbH & Co. KG (EK 01)
- Temperature – moisture recorder — CLIM (EK 03)
- Barometer — EVEREST (EK 04)

RESULT REPORT

- **Specimen condition before the test :**

The specimen had a metal frame perimetrically for mounting and fixing in the test chamber. It did not appear to have any external damage or functional defect which could affect the test.

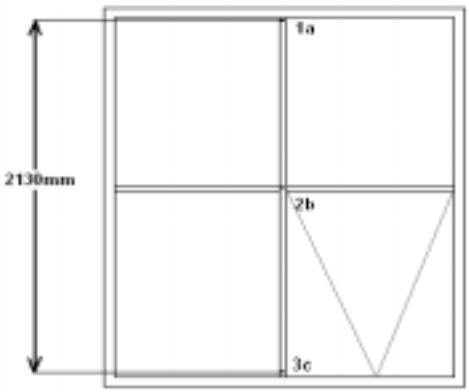
- **Specimen preparation :**

After the specimen had been cleaned and dried, it was left in the allowed ambient conditions for at least 4 hours before the test.
After the chamber had been built to fit to the specimen dimensions, the specimen was mounted and fixed on it by perimetrical placing of hand clamps.

- **Testing laboratory conditions :**

T : 13 ^{0}C, RH : 43 %, P : 101.4 kPa

RESULTS (continued)



Positions of way transducers
1a, 2b and 3c.

2. Air permeability (follow up)

Increase of the air permeability of the specimen was observed. That increase was not greater than 0.3m^3/h.m.

3. Watertightness (follow up)

During the follow up of the specimen testing, water leakage was observed at 1650Pa.

4. Safety test (±1800Pa)

No damage, separation or detachment of parts of the door was observed after the applied pressure of safety pulse.

Notes:

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Certificate Number	0602 / 4		Certificate Date	21 / 02 / 2006

Conducted Tests & Technical Standards	Testing Date
AIR PERMEABILITY (ELOT EN 12153 / 2000 & ELOT EN 12207 /2000)	23 / 01 / 2006

Laboratory Equipment

- Door and window Test Rig — K. SCHULTEN GmbH & Co KG (EK 01)
- Temperature – moisture recorder — CLIM (EK 03)
- Barometer — EVEREST (EK 04)
- Measure tape — FACOM (EK 05)

RESULT REPORT

The air permeability test, aiming at determining the quantity of the air which escapes from the specimen, is conducted in accordance with the procedure described in ΛΔ1005 of E.K.AN.AL.

- **Specimen condition before the test :**

The window had a metal frame perimetrically for mounting and fixing in the test chamber. It did not appear to have any external damage or functional defect which could affect the test.

- **Testing laboratory conditions :**

T : 13 ^{0}C, RH : 55 %, P : 101.4kPa

RESULTS

The tested window is classified in the **4th Air Permeability Class.**

The specimen is classified in the 4th class related to the overall surface (m^3 / h / m^2), and the joining length of its parts (m^3 / h / m).

The relative air loss graphs related to the overall surface and the joining length of the parts of the specimen follow.

Projecting Element Dimensions

1040 x 845 mm

The increase of air escape during the follow up of the air permeability test did not exceed 0.3m^3/h.m in any case.

Notes

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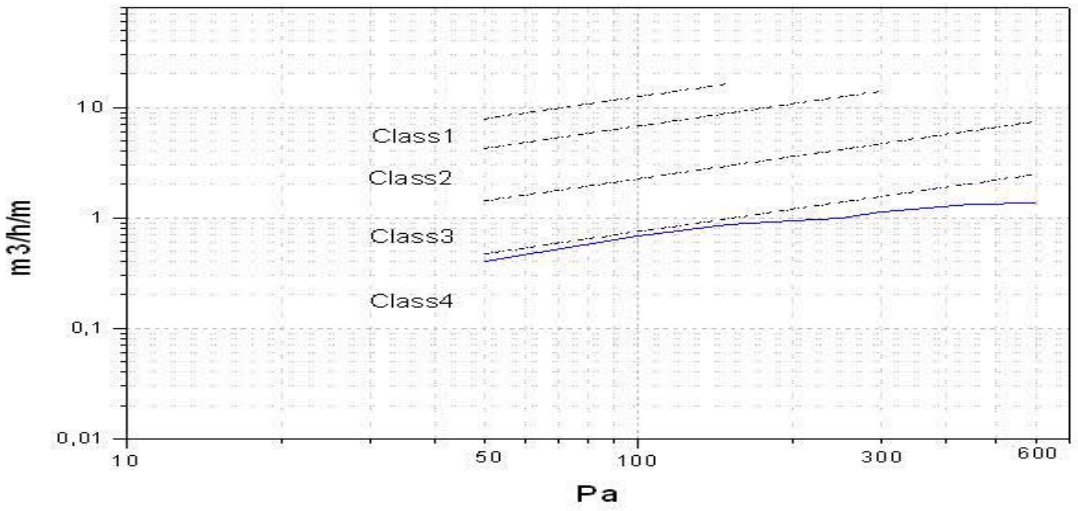
Certificate Number	0602 / 4		Certificate Date	21 / 02 / 2006

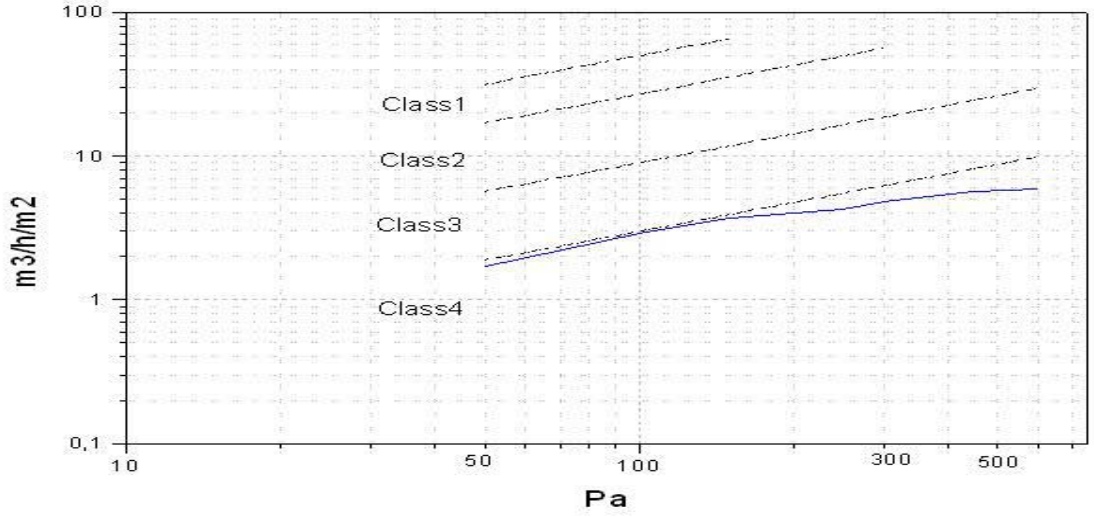
Conducted Tests & Technical Standards **AIR PERMEABILITY** (ELOT EN 12153 / 2000 & ELOT EN 12207 /2000)	Testing Date 23 / 01 / 2006

RESULT REPORT

Air permeability related to the joining length of the parts of the specimen



Air permeability related to the overall area of the specimen



Static Pressure (***Pa***)

Airloss	**50**	**100**	**150**	**200**	**250**	**300**	**450**	**600**
m^3/h	1.50	2.56	3.25	3.55	3.77	4.26	4.95	5.16
$m^3/h \cdot m$	0.40	0.68	0.86	0.94	1.00	1.13	1.31	1.37
$m^3/h \cdot m^2$	1.70	2.91	3.69	4.03	4.28	4.84	5.63	5.86