香港幕牆檢測中心有限公司
Hong Kong Curtain Wall Testing Centre Ltd.
Unit 1207, 12/F, Block A, New Trade Plaza, 6 On Ping Street, Shatin, N.T., Hong Kong.
Tel: (852) 2687 6122 Website: www.curtainwalltest.com
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HKLAS 109 TEST

Customer	: Nabtesco Corporation	Report No.	: CW-0942R13754
Address	: JA Kyosai Bldg., 7-9 Hirakawacho 2-Chome, Chiyoda-Ku, Toyo 102-0093, Japan	Page	: 1 / 7
Project	: Air Permeability of Automatic Hermetic Swing Door	Date of Test	: 24 April 2018
Test Specimen	: NABCO Automatic Hermetic Swing Door	Date of Issue	: 18 May 2018

Test Report

A swing door unit for the above project was delivered & installed at our laboratory by the customer in April 2018 for testing.

The following test was conducted on 24 April 2018 with the test results recorded in the following table.

Item	Tests & Sequence	Testing Standard or Specification	Compliance
1	Test for Air Permeability	BS EN 12207:2000 – Class 2, BS EN 1026:2000	Yes

Refer to Appendix A to C for details of the test specimen, test methodology, performance requirements & test results which form part of this report.

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Tested by : Mr. Lai Chun Yip

Checked by :

Approved Signatory : Mr. Leung Cho Ming, Albert

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Appendix A Testing Information

A.1 Test Information

A typical unit of automatic hermetic swing door of 1039mm wide 2200mm high was selected for the test. The full-size specimen was installed in a steel testing chamber to simulate the site installation conditions. The automatic hermetic swing door was fixed to the steel chamber by the Customer.

A.2 Test specimen information supplied by Customer

2.1 Construction details

The test specimen was constructed with full size sections and was verified by the customer before the test. Refer to the drawings provided by door supplier attached for details.

2.2 Material details of door panel & hardware

Skin	- 1.5mm thk. #304 Stainless Steel
Core	- Aluminium Honeycomb core
Glass	- 10mm tk. Tempered glass
Hinge	- Heavy duty stainless steel hinge
Door Frame	- 1.5mm thk. #304 Stainless Steel Frame
Door vertical & top sealing	- EPDM Rubber
Bottom sealing	- Automatic Drop-down Rubber Sealing system
Header box & Front cover	- Aluminium extruded material
Automatic System	- NABCO Automatic Door System for Hermetic Swing Door

A.3 Laboratory Information

3.1	Laboratory	- DD77, Lot 328, Ping Yuen Road, Ping Che, Fanling, N.T., Hong Kong		
3.2	Calibration	- All measuring equipment is calibrated with certificates traceable to National Standards.		
		Pressure	Air flow	
	Test Standards	BS EN 1026, 1027, 12211	BS EN 1026	
	Tolerance	±5%	±5%	
3.3	Test Specimen Representation	- The test specimen as received, assemble & installed by the customer was tested by the Hong Kong Curtain Wall Testing Centre Limited, and the test results shown in the test report relate to the tested specimen only.		
3.4	Schedule	Test specimen installed in April 2018	Test(s) commenced on 24 April 2018	Test(s) completed on 24 April 2018
3.5	Environment	Laboratory Temperature: 25°C	Atmospheric Pressure: 1011 mbar	Relative Humidity: 66%

A.4 Witness

4.1 Owner Representative

Mr. Chan Bing Lam, Danny
Wai Chow Engineering Work Limited

4.2 Laboratory

Mr. Lai Chun Yip
Hong Kong Curtain Wall Testing Centre Ltd.

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Appendix B Test Methodology & Performance Requirements

B.1 Test Methodology

The test was executed according to the testing procedure described in the Quality Manual of the Hong Kong Curtain Wall Testing Centre Ltd. for the test accredited by HOKLAS, detail of which can be conveyed if required.

B.2 Performance Requirements

1 Test for air permeability to BS EN 12207:2000 & BS EN 1026:2000

The air permeability of the specimen at each pressure step up to 300 Pa (Class 2 of BS EN 12207:2000) shall not exceed the line for class 2 of the diagram as follows:

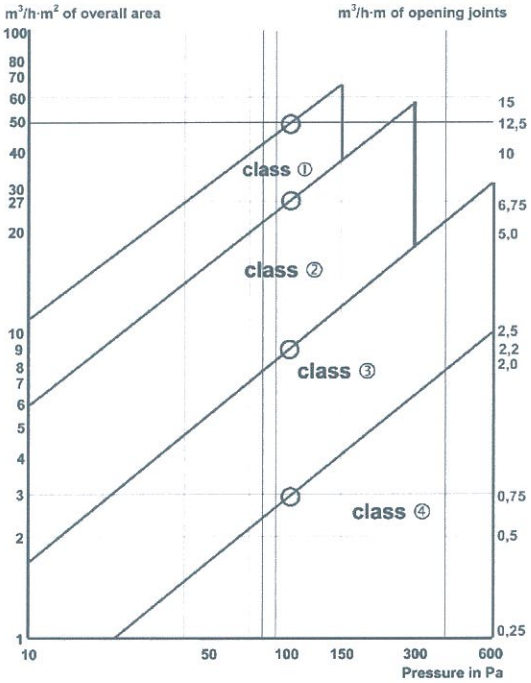

Figure 1 (Classification in BS EN 12207:2000)

Table 1 : Reference air permeabilities at 100 Pa and maximum test pressures, related to overall area, for classes 1 to 4

Class	Reference air permeability at 100 Pa $m^3/h \cdot m^2$	Maximum test pressure Pa
0	Not tested	
1	50	150
2	27	300
3	9	600
4	3	600

Table 1 (4.4, BS EN 12207:2000)

Table 2 : Reference air permeabilities at 100 Pa and maximum test pressures, related to joints length, for classes 1 to 4

Class	Reference air permeability at 100 Pa $m^3/h \cdot m$	Maximum test pressure Pa
0	Not tested	
1	12,50	150
2	6,75	300
3	2,25	600
4	0,75	600

Table 2 (4.5, BS EN 12207:2000)

Air permeability related to Class 2 calculated by $Q = Q_{100}\,(P/100)^{2/3}$, test results were shown in the following table:

Pressure (P),(Pa)	Reference air permeability of overall area in Class 2 (Q), ($m^3/hr/m^2$)	Reference air permeability of joints in Class 2 (Q), ($m^3/hr/m$)
50	17.009	4.252
100	**27.000(Q_{100})**	**6.750 (Q_{100})**
150	35.380	8.845
200	42.860	10.715
250	49.734	12.434
300	56.162	14.041

Sample calculation for Class 2 reference air permeability at 300Pa:

Allowable for overall area at 300Pa:
= 27*(300/100)^(2/3) = 56.162 $m^3/hr/m^2$

Allowable for joints length at 300Pa:
= 6.75*(300/100)^(2/3) = 14.041 $m^3/hr/m$

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Appendix C Test Result Data

C.1 Test for Air Permeability

No damages and functional defects were observed during the test. Air flow rate recorded is shown in the following table:

	Air flow in l/min		Calculation	
Inward Pressure (Pa)	Specimen sealed with tape	Specimen unsealed	Air leakage of overall area at test condition ($m^3/hr/m^2$)	Air leakage of joints at test condition ($m^3/hr/m$)
50	292	397	2.756	1.020
100	499	649	3.937	1.457
150	668	855	4.909	1.816
200	815	1027	5.565	2.059
250	941	1189	6.510	2.409
300	1068	1341	7.166	2.651

	Air flow in l/min		Calculation	
Outward Pressure (Pa)	Specimen sealed with tape	Specimen unsealed	Air leakage of overall area at test condition ($m^3/hr/m^2$)	Air leakage of joints at test condition ($m^3/hr/m$)
50	299	386	2.284	0.845
100	503	647	3.780	1.399
150	667	856	4.961	1.836
200	811	1049	6.247	2.311
250	936	1220	7.455	2.758
300	1051	1393	8.977	3.321

Vo = Vx *293/(273+Tx)* Px/101.3
V0 = air flow at normal conditions
Vx = air flow at each pressure step
Tx = actual temperature in °C =25.0
Px = atmospheric pressure in kPa =101.1

Length of opening joint:
= 2.15 + 2.15 + 0.939 + 0.939 m = 6.178 m

Overall area of door:
= 2.2 x 1.039 m^2 = 2.2858 m^2

Sample calculation for Outward Pressure 300Pa:

Test Condition of overall area at 300Pa:
Vx = [(1393-1051) x (60/1000) / (2.2858)]
= 8.977 $m^3/hr/m^2$

Test Condition of joints length at 300Pa:
Vx = [(1393-1051) x (60/1000) / (6.178)]
= 3.321 $m^3/hr/m$

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HOKLAS 109 TEST

Project : Air Permeability of Automatic Hermetic Swing Door
Test Specimen : NABCO Automatic Hermetic Swing Door

Air permeability related to Class 2 calculated by $Q = Q_{100} (P/100)^{2/3}$, test results were shown in the following table:

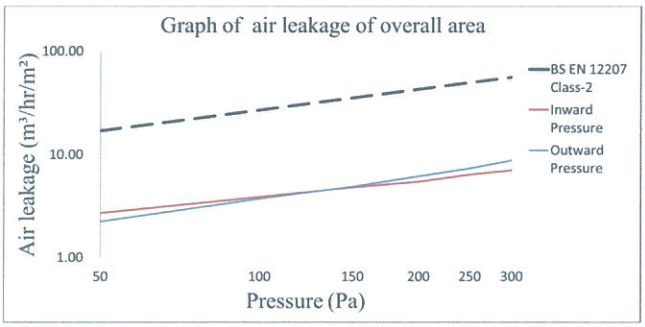
Pressure (P),(Pa)	Reference air permeability of overall area in Class 2 (Q), ($m^3/hr/m^2$)	Inward Pressure		Outward Pressure	
		Specimen air leakage of overall area Corrected to normal condition ($m^3/hr/m^2$)	Compliance	Specimen air leakage of overall area Corrected to normal condition ($m^3/hr/m^2$)	Compliance
50	17.009	2.705	OK	2.241	OK
100	27.000(Q_{100})	3.864	OK	3.709	OK
150	35.380	4.817	OK	4.868	OK
200	42.860	5.461	OK	6.130	OK
250	49.734	6.388	OK	7.315	OK
300	56.162	7.032	OK	8.809	OK

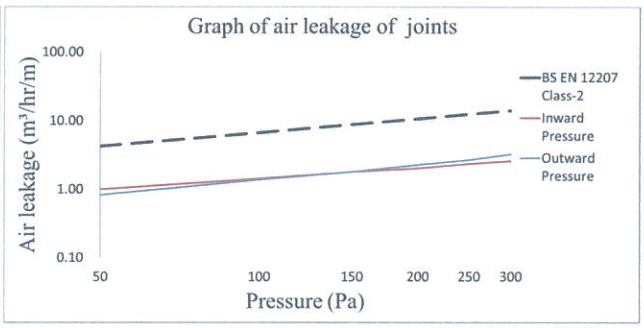
Pressure (P),(Pa)	Reference air permeability of joints in Class 2 (Q), ($m^3/hr/m$)	Inward Pressure		Outward Pressure	
		Specimen air leakage of joints Corrected to normal condition ($m^3/hr/m$)	Compliance	Specimen air leakage of joints Corrected to normal condition ($m^3/hr/m$)	Compliance
50	4.252	1.001	OK	0.829	OK
100	6.750 (Q_{100})	1.430	OK	1.372	OK
150	8.845	1.782	OK	1.801	OK
200	10.715	2.020	OK	2.268	OK
250	12.434	2.363	OK	2.707	OK
300	14.041	2.602	OK	3.259	OK

Sample calculation for Outward Pressure 300Pa:

Corrected to normal condition of overall area at 300Pa:
Vo = (8.977 x 293) / (273+25) x 101.1/101.3
= 8.809 $m^3/hr/m^2$ < 56.162 $m^3/hr/m^2$ OK

Corrected to normal condition of joints length at 300Pa:
Vo = (3.321 x 293) / (273+25) x 101.1/101.3
= 3.259 $m^3/hr/m$ < 14.041 $m^3/hr/m$ OK





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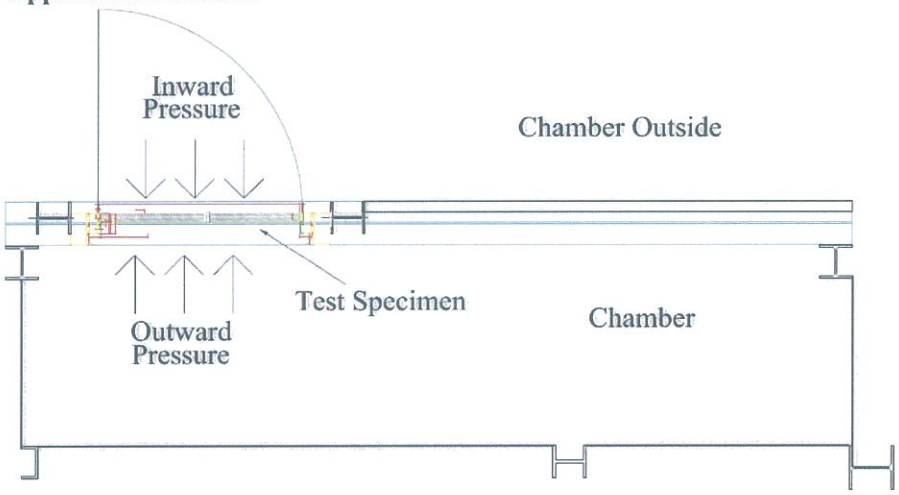
C.2 Pressure Application Direction



C.3 Photos

Test specimen