

台北市消防設備師公會
「空間外殼氣密測試」功能驗證驗證實例

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氣密測試功能驗證工作重點



一、風門測試安裝與操作步驟

風門安裝與設定解說：

- 1.設備主要元件
- 2.注意事項
- 3.金屬框架組裝步驟
- 4.壓力軟管功能說明
- 5.微壓力計安裝與設定步驟
- 6.風扇及風速調整器設定步驟
- 7.量測時校正盤的調整步驟
- 8.量測要領

1.設備主要元件



風速調整器含電線兩條(公/母)



DM4微壓力計



微壓力計與風速調整器固定基座



綠色軟管(長)
機/出壓力軟管



紅色軟管(短)
風扇壓力軟管



固定基座





校正盤蓋



風扇本體含控制器



隔牆門罩



校正盤



金屬門框支架



2.注意事項

- 確認待測空間是否盡可能的氣密且關閉空調，檢視項次如：
 - 窗戶/門
 - 空調出/回風口
 - 排水孔
 - 其他孔隙，如插座等
- 確認風扇氣流方向，當方向相反時，以重新安裝方向或連接風扇參考壓力軟管校正，切勿直接採用“reverse”逆轉。
- 目標壓力須至少為 10 Pa，待測得兩點以上的空間狀態後，始可輸入程式進行運算。



3.E3 金屬框架組裝步驟

- 將四邊金屬框組合成矩形，且旋鈕面向自身。
- 放鬆旋鈕及轉把



- 將金屬框架伸展至約略小於門框大小，並將旋鈕上緊。



- 將金屬框架移開門框，並套上隔離門罩。



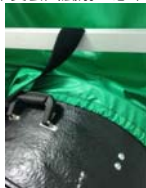
- 將覆上隔離門罩的金屬框架重新嵌入門框，並且旋上轉把。
- 檢視四邊是否接緊密貼合門框，或是有無任何縫隙。



- 安裝水平金屬架，延伸適當長度後上緊旋鈕與轉把。



- 安裝風扇，門罩下方收縮帶確實套入風扇，懸吊風扇並保持水平垂直。



4. 壓力軟管功能說明

□ 風扇壓力軟管 (紅)

當風扇上無校正盤時，壓力軟管連接自 DM4 微壓力計 右上角的尖嘴至風扇電力控制盒上；當風扇上有校正盤時，則連接至校正盤上。

□ 進/出壓力軟管 (綠)

壓力軟管連接自 DM4 微壓力計 左上角的尖嘴至隔離門罩上的穿孔，並向外延伸 至少 10 英尺以上 避免氣流擾動。

□ 風扇參考壓力軟管

當風扇順流的風向是朝操作者的方向吹時，將以 T 型軟管橋接 DM 4 微壓力計左上角及右下角的尖嘴，再連接軟管至隔離門罩上的穿孔；當風扇順流的風向是朝待測空間吹時，則無需安裝風扇參考壓力軟管。



5. DM4 微壓力計安裝與設定步驟

- 選取適當的位置夾上固定底座
- 掛上微壓力計底座與風速調整器
- 安裝微壓力計，與底座上之魔鬼氈固定
- 連接壓力軟管
- 連接風速控制器之電源線，一端於風扇本體，一端於市電



DEVICE 鍵
選擇至 "E3" 型號。

當測試洩漏量大的空間時，按壓 **LOW FLOW** 鍵，選擇至 "LF off" 並取下校正盤。

當測試洩漏量小的空間時，裝置校正盤於風扇上按壓 **LOW FLOW** 鍵，選擇至 "7 h" 並保持所有校正孔為全開。

UNITS 鍵
設定單位為英制或公制。

TIME AVG 鍵
選擇至 1 sec 或 2 sec 平均量測時間。

Hold 鍵
鎖定即時讀值，便於測試人員記錄讀值。

ON/OFF 鍵
開啟電源並注意電量。(低於 7.5 伏時更換電池)

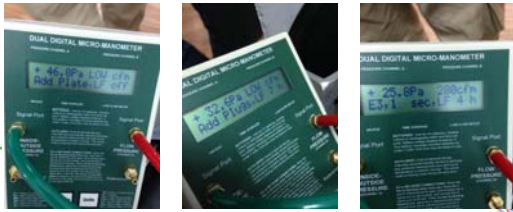
6.E3 風扇及風速調整器設定步驟

- 將風扇電力控制盒“風向開關”調至“Forward Flow”順流。
- 將風扇電源線插入風速調整器，並將旋鈕以逆時針方式調至OFF。
- 將風速調整器電源線插入升壓器再轉入交流市電。
- 啟動風扇，使風速保持一定並確認風扇正常運轉。



7.量測時校正盤的調整步驟

- 按壓 LOW FLOW 鍵對應至校正盤的狀態：
 - “LF off” 為風扇無安裝校正盤，高流量之狀態。
 - “7 h” 為風扇有安裝校正盤，且所有校正孔為全開，中流量之狀態。
 - “4 h” 為低流量之狀態。
- 調整風扇速度以達到目標壓力。
 - 當 DM4 微壓力計於目標壓力，讀值顯示“LOW”時，代表流量過小而無法準確進行量測，此時須安裝校正盤或增加校正蓋。
 - 當 E3 風扇全速運轉仍無法達到目標壓力時，此時須減少校正蓋或拆除校正盤。
- 確認每當校正盤配置變更時，DM4 微壓力計同時變更 LOW FLOW 模式以同步校正。



8.量測要領

- 完善的量測程序必須包含正壓與負壓試驗。
 - 正壓試驗時，氣流方向由測試人員向待測空間行進。(測得正壓)
 - 負壓試驗時，氣流方向由待測空間向測試人員行進。(測得負壓)
- 負壓試驗時，必須以T型軟管橋接微壓力計尖嘴。
- 試驗時，一律先以無校正盤進行試驗，遂依微壓力計讀值指示安裝或新增校正盤蓋。
- 新增校正盤蓋時須依照校正盤上的配置方式新增。
- 當微壓力計讀值呈現“LOW FLOW” “ADD PLATE” “ADD PLUGS” 所量測之讀值無參考性，必須校正至正常方可開始記錄讀值。
- 確認每當校正盤配置變更時，DM4 微壓力計同時變更 LOW FLOW 模式以同步校正。



二、氣密測試參考實例

- Air Leakage Test Report
- Taipei Fire Protection Engineer Association
- Date: August 23 · 2014



2. Summary of Test Conditions and Results

Weather conditions during test – Sunny

The envelope area for air permeability performance criteria is defined as the area of external walls, the area of the ceilings, roofs and ground floor.



The randomly selected 5 dwelling units of the building are tested.

5F-01	
The Envelope Area (AE):	406.5 m ²
The Net Floor Area (AF):	130 m ²
The Volume (V):	418 CFM(50Pa)

5F-02	
The Envelope Area (AE):	557.81 m ²
The Net Floor Area (AF):	187 m ²
The Volume (V):	953 CFM(50Pa)



7F-01	
The Envelope Area (AE):	406.5 m2
The Net Floor Area (AF):	130 m2
The Volume (V):	819 CFM(50Pa)

7F-02	
The Envelope Area (AE):	557.81 m2
The Net Floor Area (AF):	187 m2
The Volume (V):	720 CFM(50Pa)

13F-01	
The Envelope Area (AE):	775.11 m2
The Net Floor Area (AF):	250.95 m2
The Volume (V):	1213 CFM(50Pa)

The maximum air leakage rate is 1.25 square inches leakage area per 100 square feet



3. Openings and Temporary Sealing

Detail	Response
All external doors and windows closed (but not sealed)	Y
All internal doors open	Y
All extracts sealed (check kitchen and bathroom(s) extracts and the oven hood)	Y
All drainage traps filled with water (check all toilet sinks)	Y
Combustion appliances turned off (if inside the conditioned space of the dwelling. Temporary seal air supply / flue.	Y
Trickle vents to be closed (Do not seal)	Y
Fireplace temporary sealed.	Y



All building works completed to the air boundary envelope, any missing items note below along with action taken (i.e. no action taken or temp sealed with tape etc.):	Y
Extractor fan to GF WC	Y
Extractor fan to bathroom	Y
Kitchen Extractor	Y
En-suite	Y
Fire place opening	Y



4. Test Method

The blower door test was carried out in accordance with the following standards:-

- ⊙ ASTM-779-03: Standard Test Method for Determining Air Leakage Rate By Fan Pressurization.
- ⊙ LEED V3 Reference Guide

The purpose of the test was to prevent or minimize exposure of building occupants, indoor surfaces and ventilation air distribution systems to environmental tobacco smoke (ETS)

The building was pressurised using a **Infiltec E3** System. The **DM4** system comprises of a portable fan capable of supplying at **50 Pascal's**. The system is calibrated by **Infiltec** in accordance with manufacturer requirements.



The fan was set up in the front door with the tester in the room.

Pressure differences across the fan at door and the dwelling units were measured using a digital manometer at the start, during and the end of the test. All equipment used is calibrated by SGS annually.

Air temperatures were measured using a digital thermometer. Measurements were taken at the start and end of test. The sensors were located in the dwelling unit.



5. Test Data / Results

Environmental Conditions

		Before			After
Inside Temperature		28 °C			28 °C
Outside Temperature		30 °C			30 °C
Static Pressure	P01+	0.0 Pa		P02+	0.0 Pa
(other)					

Baseline static pressure measured before test.

0.0	0.0	0.0	0.0	0.0
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Baseline static pressure measured after test.

0.0	0.0	0.0	0.0	0.0
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Fan Flow Data

Fan Range

Room Pressure (Pa):	0	0	0	0	0
Corrected Room Pr (Pa):	0	0	0	0	0
Flow Pressure (Pa):	-50	-50	-50	-50	-50
Corrected Flow Pr (Pa):	-50	-50	-50	-50	-50
Measured Flow (m ³ /h):	418	953	819	720	1213
Best Fit Flow (m ³ /h):	418	953	819	720	1213
Error (%):	0	0	0	0	0



Data Analysis

Dwelling unit	Slope (n)	Intercept (C) (m ³ /h)	Correlation (r ²)
Depressurize	0.36	418	100
Depressurize	0.61	953	100
Depressurize	0.715	819	100
Depressurize	0.4581	720	100
Depressurize	0.5554	1213	100



Results

		5F-01	5F-02	7F-01	7F-02	13F-01
Air Flow Coefficient, CL	(m ³ /h)	418	953	819	720	1213
Air Flow Coefficient, Cenv	(m ³ /h)	418	953	819	720	1213
Air flow Exponent						
Correlation Coefficient, r ²	(%)	0	0	0	0	0
Flow @ 50 Pa	(m ³ /h)	418	953	819	720	1213
Air Changes/Hour @ 50 Pa	/hr	1.02	1.552	1.909	1.166	1.464
Air Permeability @ 50 Pa	(m ³ /h/ m2)					
Specific Leakage Rate @ 50 Pa	(m ³ /h/ m2)	0.36	0.61	0.715	0.4581	0.5554



Supporting photos of the Temporary Sealing



