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Testing of Garage Door Panels

1. Test object
Panels for residential sectional overhead doors. The tested panels are shown in the test results. The tests were performed in accordance with EN 13241-1.

Garage Door Type:	Tecsedo panels
Dayligth width:	2500 mm
Dayligth height:	2610 mm
Hardware:	FlexiForce Type RES 70
	RES 200
	RES X
Balancing system for 160 kg:	2 torsion springs $\quad$ l $= 670$ mm
	$Di = 67$ mm
	$D = 6.5$ mm

Date of testing
The testing was performed from 2004-11-01 to 2005-02-10. The doors were selected by the client without assistance from SP. The test result shown in this report refers only to the tested sample.

2. Testing
Following tests were performed: Resistance to wind load, determination of air permeability, determination of resistance to water penetration, dangerous substances, thermal resistance.

2.1 Resistance to wind load

2.1.1 Testing of fully assembled door
The size of the door was 2500 mm daylight width and 2610 mm daylight height. The door was fitted in the opening of an airtight chamber, with its exterior facing inwards towards the chamber and tested in accordance with *EN 12444 Resistance to wind load – testing and calculation*. Before the test steps were taken to eliminate air leakage in the door and its supporting construction. An inner air pressure was increased in steps in accordance with the different classes given in *EN 12424 Resistance to wind load – classification*. The air pressure was then increased until the door ruptured. The test was performed at ambient temperature.

SP 302

REPORT

Date
2005-09-21

Reference
P 403076 S

Page
2 (2)

2.1.2 Testing of door panels

Door panels were subjected to four-point bending tests in accordance with *EN 12444 Resistance to wind load – testing and calculation*. The loading points were symmetrical positioned in the test set-up. The distance between the loading points was half of the distance between the points of support. The applied load was increased in steps in accordance with the different classes given in *prEN 12424 Resistance to wind load – classification*. After each step the deflection of the door panels was measured. The test was performed at ambient temperature.

2.2 Determination of air permeability

The door was fitted in the opening of an airtight chamber, with its exterior facing inwards towards the chamber and tested in accordance with *EN 12427 Air permeability – test method*.

2.3 Resistance to water penetration

The door was fitted in the opening of an airtight chamber, with its exterior facing inwards towards the chamber and tested in accordance with *EN 12489 Resistance to water penetration – test method*.

2.4 Dangerous substances

The different doors were examined in accordance with the requirements of the Construction Products Directive, CPD, (89/106/EEC). The interpretative Document Essential Requirements No 3 related to the CPD identifies aspects where hygiene, health and the environment may be concerned. Technical specifications are required to define release of pollutants to indoor air, outdoor air, soil and water, taking account of the concentration of pollutants in the products.

2.5 Thermal resistance

Calculation of the U-values of the door sections was performed using the FRAM 5.1 program. The tests were performed in heat-flow meter apparatus HFM2000 single specimen symmetrical configuration with double heat-flow meters.

3 Test result

3.1 Resistance to wind load

3.1.1 Test of fully assembled door

The inner pressure in the air chamber was increased in steps.

Door (panel) type	Width [m]	Height [m]	Wind load class	Maximum pressure [Pa]
Tecsedo	2.50	2.61	5	1300

3.1.1.1 Measurement uncertainty wind load

The total calculated measurement uncertainty is for the wind load < 1.5% and for the deformations < 1.5%. Reported uncertainty corresponds to an approximate 95 % confidence interval around the measured value. The interval has been calculated in accordance with GUM (The ISO guide to the expression of uncertainty in measurements), which is normally accomplished by quadratic addition of the actual standard uncertainties and multiplication of the resulting combined standard uncertainty by the coverage factor $k=2$.

REPORT

Date
2005-09-21

Reference
P 403076 S

Page
3 (3)

3.1.2 Bending test of door panels

The door panels were subjected to four-point bending tests in accordance with *prEN 12444 Resistance to wind load – testing and calculation*. The panels were supported and the load was applied as shown in Figure 1. The loading points were symmetrical positioned in the test set-up. The distance between the loading points was half of the distance between the points of support. The applied load was increased in steps in accordance with the different classes given in *prEN 12424 Resistance to wind load – classification*, 300, 450, 700 and 1000 Pa. After each step the deflection of the door panels was measured. The test was performed at ambient temperature.
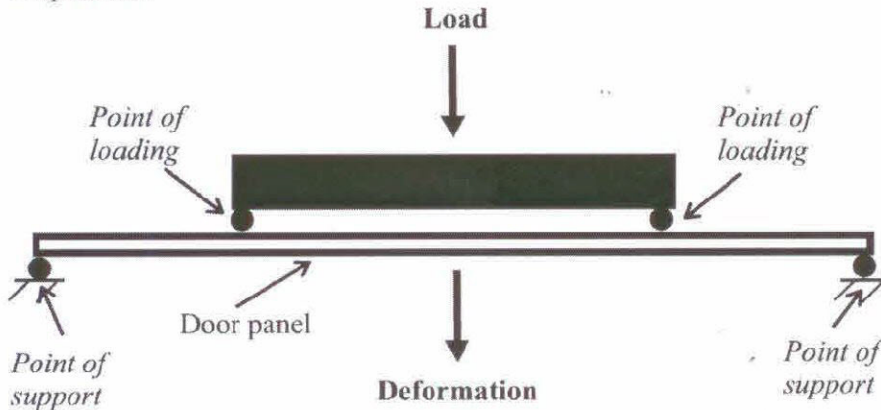

Figure 1   Schematic figure of test set-up

The panel test results are shown below and in figures 2 to 5 as wind load vs. displacement curves.

Door panel	Length [m]	Width [m]	Wind load class		Maximum pressure [Pa]	Remarks/Fracture
				[Pa]		
Tecsedo,	2.50	0.49	5	2 649	3 642	BoP at the point of loading
Tecsedo,, Three windows	2.54	0.49	5	1 137	1 563	BoP at the centre window
Tecsedo,	5.00	0.49	2		918	BoP at the point of loading
Tecsedo Five windows	5.00	0.49	1		530	BoP at both sides of the second window

BoP = Buckling of the panel
DoP = Delaminating of the panel

Figure 2   Wind load vs. displacement   TECSEDO 2500x490 [mm]

REPORT

Date
2005-09-21

Reference
P 403076 S
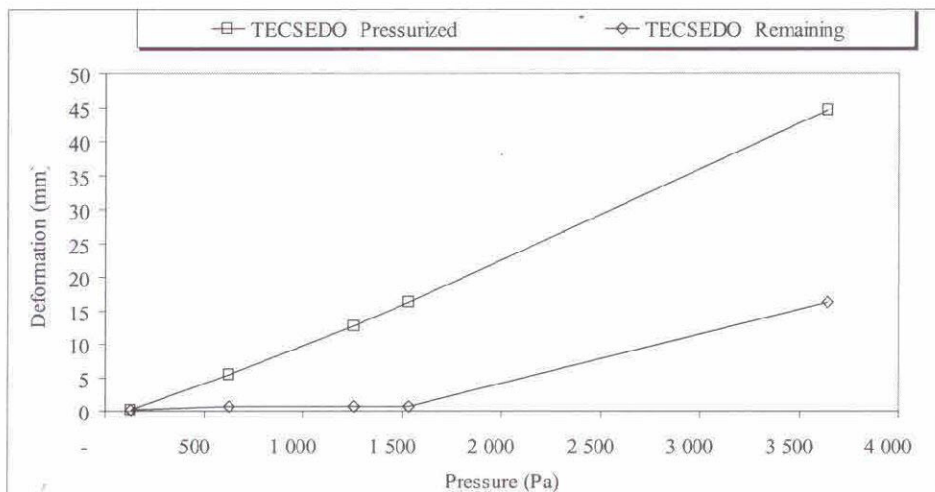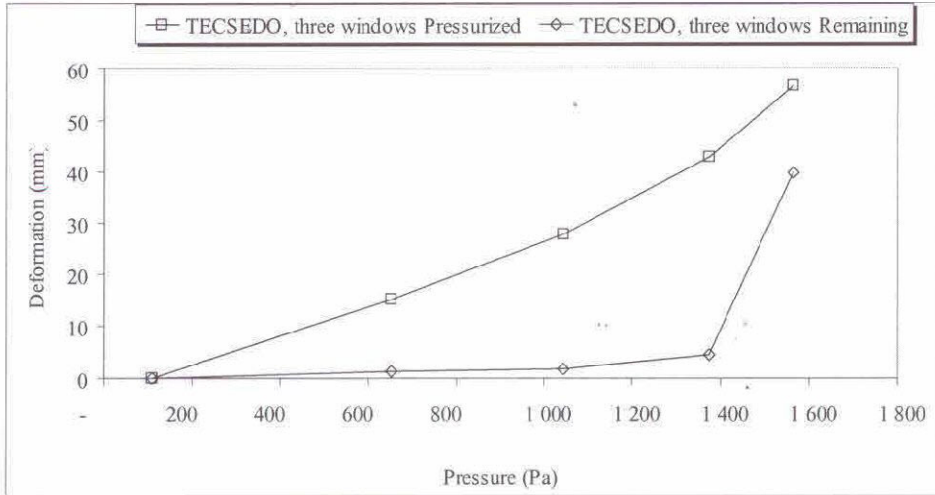
Page
4 (4)

Figure 3   Wind load vs. displacement   TECSEDO 2540x490 [mm]
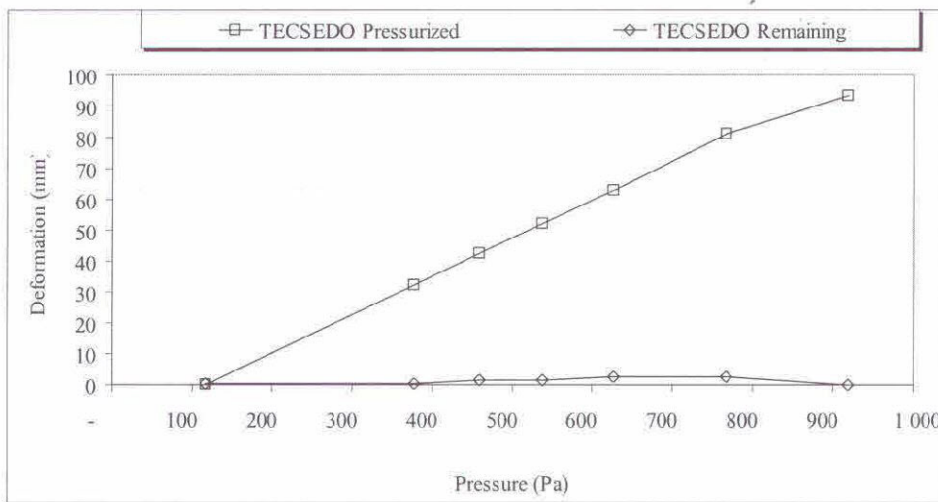

Figure 4   Wind load vs. displacement   TECSEDO 5000x490 [mm]

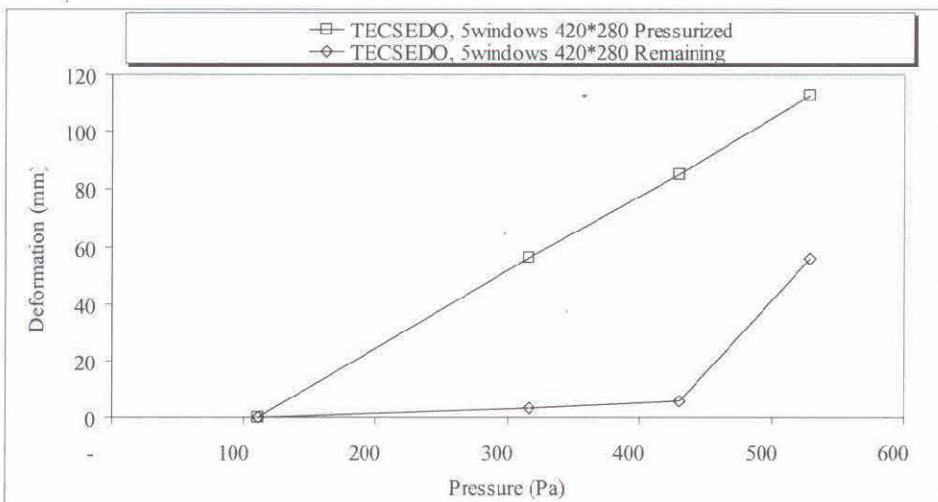Figure 5   Wind load vs. displacement   TECSEDO 5000x490 [mm]

SP 302

3.1.2.1 Measurement uncertainty bend test

The total calculated measurement uncertainty is for the wind load < 1.5% and for the deformations < 1.5%. Reported uncertainty corresponds to an approximate 95 % confidence interval around the measured value. The interval has been calculated in accordance with GUM (The ISO guide to the expression of uncertainty in measurements), which is normally accomplished by quadratic addition of the actual standard uncertainties and multiplication of the resulting combined standard uncertainty by the coverage factor $k=2$.

3.2 Determination of air permeability

Door type	Width [m]	Height [m]	Air permeability class
Tecsedo	2.50	2.61	3

3.3 Resistance to water penetration

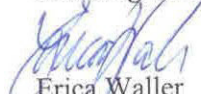| Door type	Width [m]	Height [m]	Water penetration class
Tecsedo	2.50	2.61	3 (110 Pa)

3.4 Dangerous substances
Door components described in this report are made of material that complies with the Construction Products Directive (89/106/EEC).

3.5 Thermal resistance

Calculations with a garage door with width (W) = 2.50 m and height (H) 2.61 m;

Supplier	Thermal transmittance, W/(m²K)	
	without windows $U_{door} =$	with four windows $U_{door} =$
Tecsedo	1.4	1.6

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SP 302