

**TEST REPORT Nº 096255**

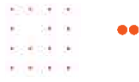
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APPLICANT	JOSE ANTONIO ENRÍQUEZ
ADDRESS	POL. MUNICIPAL, C/COLOMBIA s/n 06360 FUENTE DEL MAESTRE (BADAJOZ)
OBJECT	BIOCLIMATIC PERGOLA ESSAY
MATERIAL TESTED	REF.<<WATERPROOF ALUMINIUM PERGOLA SYSTEM WITH ROTATING LOUVERS>>
DATE OF RECEIPT	29.11.2021
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Technical Manager
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- The present document is the English version of the original report in Spanish 096255 (24th January, 2022). In case of law suit, the original document will be taken as reference.
- Test results are detailed in the inside pages. Uncertainties of measurements are available to the applicant.

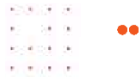
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1. INTRODUCTION

On 29 November 2021, TECNALIA installed a bioclimatic pergola system with reference:

<<WATERPROOF ALUMINIUM PERGOLA SYSTEM WITH ROTATING LOUVRES>>

The system is completely made of aluminium and offers protection against sunlight during sunny days and from rainwater and snow with its special drainage system.

The bioclimatic pergola is mainly composed of two differentiated parts:

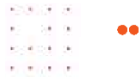
- 1.- Support structure.
- 2.- Rotating louvres.

Below, a photograph of the tested sample can be seen.



Photo 1. Upper view of the sample tested in the laboratory.

Annex A provides technical information on the sample supplied by the customer and Annex B provides photographs taken during tests.



2. TESTS REQUESTED

- 2.1. Watertightness, taking as a reference UNE EN 1873:2006, section 6.3
- 2.2. Resistance to wind suction, taking as a reference UNE EN 13659:2016
- 2.3. Snow load resistance, according to internal methodology.
- 2.4. Impact resistance, according to internal methodology.

3. TESTS PERFORMED

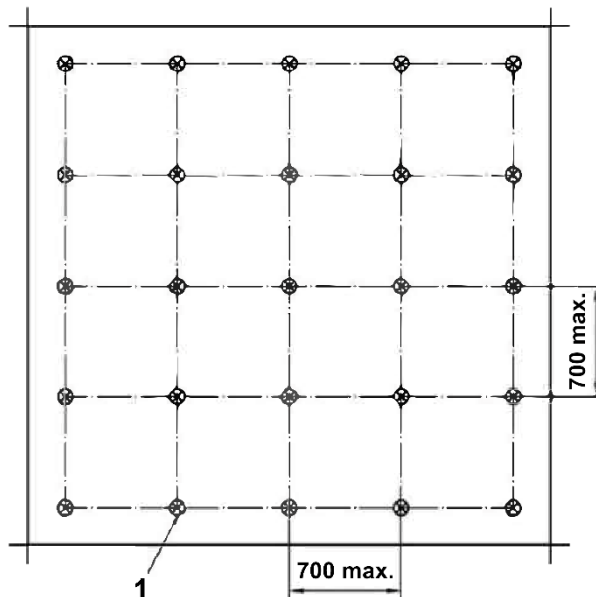
3.1. Watertightness, taking as reference UNE EN 1873:2006, section 6.3

This test simulates the effect of rainwater or melting snow that may accumulate on the pergola surface.

The sample, with its louvres in the closed position, shall be sprayed with water as follows:

- The horizontal surface of the sample is sprayed with water, with the nozzles in horizontal position.
- The water flow rate over the test area is 2 l/(m².min) to 3 l/(m².min).
- Test duration is 60 minutes.

The following image shows the distribution of the sprinklers:



1. Spray nozzles.

Image 1. Distribution of sprinkler grid on the sample.



3.2 Resistance to wind suction, using as a reference UNE-EN 13659: 2016

It is subjected to a load of pneumatic origin, uniformly distributed over the entire horizontal surface of the sample.

The values of p , nominal test pressure, are specified in the following table:

Rated test suction (Pa)	50	100	150	250	400	600
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The nominal pressure is applied for 2 minutes. After that time, the product is examined and the condition of the pergola is checked. If there is no apparent malfunction, the next level of pressure is applied.

3.3 Snow load resistance, according to internal methodology.

This test simulates the effect of accumulated snow on the surface of the pergola.

The load values indicated in the Basic Document SE-AE of the Technical Building Code (CTE) in section 3.5.1 are taken as reference values. A snow load of 1.0 kN/m² is considered sufficient.

It is agreed with the client to apply the load indicated in the CTE, plus 20%. Once this load has been reached, it will be maintained for 10 minutes.

After this, the pergola should still function correctly.

3.4 Impact resistance, according to internal methodology.

This test simulates the effect of hard and soft bodies falling on the horizontal surface of the pergola.

3.4.1 Resistance to hard body impact.

The test method consists of dropping a 0.5 kg steel ball from a height of 0.45 m onto three points on the sample.

After the impacts:

- The sample must function correctly.
- There must be no unacceptable appearance defects such as pronounced marks or cracks on the louvers. The average value of the diameter of the markings must not exceed 20 mm.

3.4.1 Resistance to soft body impact.

The test method consists of dropping a 50 kg bag from a height of 1.2 m onto the centre of the sample being studied.

After impact, the sample should function properly.



4. RESULTS

Environmental conditions:

Temperature: **15 °C** Relative humidity: **61%**

4.1 Watertightness.

Water Flow rate applied	Duration of spraying	Remarks	Result
0.82 l/s	60 minutes	No damage visible	SATISFACTORY

The test result is considered satisfactory if no water enters the system during the test.

4.2 Wind suction resistance

Applied suction (PA)	Duration	Remarks	Result
50	2 minutes	No damage is visible	SATISFACTORY
100	2 minutes	No damage is visible	SATISFACTORY
150	2 minutes	No damage is visible	SATISFACTORY
250	2 minutes	No damage is visible	SATISFACTORY
400	2 minutes	No damage is visible	SATISFACTORY
600	2 minutes	No damage is visible	SATISFACTORY



The test result is considered satisfactory if no damage is seen during the test and the sample functions correctly.

4.3 Snow load resistance.

The customer requests the application of a load of 120 kg/m² on the sample.

Sample surface tested = (5,500 x 4,500) mm² = 24.75 m²

Load requested by the customer = 24.75 m² * 120 kg/m² = 2,970 kg

Applied load	Duration of test	Remarks	Result
2.970 kg	10 minutes	No damage visible	SATISFACTORY

The test result is considered satisfactory if no defects are visible after the test and the sample functions correctly.

4.4 Impact resistance.

4.4.1 Resistance to hard body impact.

Impactor	Impact height of 0,45 m	Remarks	Result
0,5 Kg Steel ball	First impact	No damage visible	SATISFACTORY
0,5 Kg Steel ball	Second impact	No damage visible	SATISFACTORY
0,5 Kg Steel ball	Therst impact	No damage visible	SATISFACTORY

The test result is considered satisfactory if the louvres operate correctly after the test and no defects can be seen on the surface of the sample.

The following image shows the impact points.

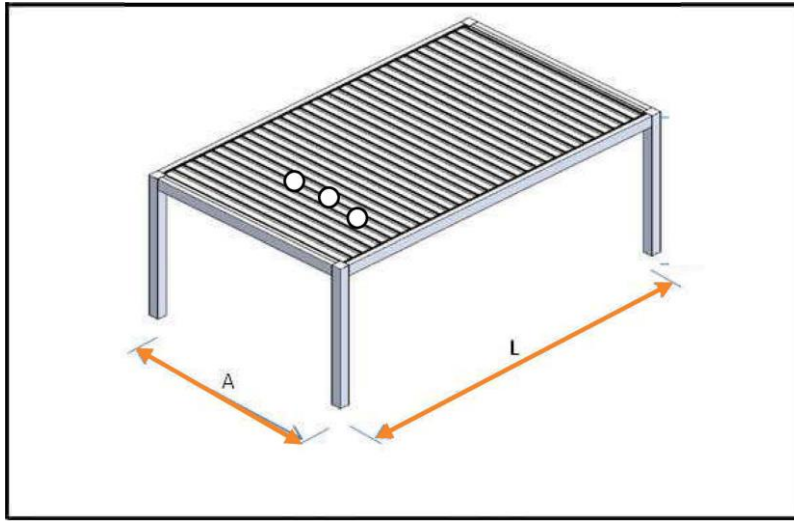


Image 2. Location of hard body impact points.

4.4.2 Resistance to soft body impact.

Impactor	Impact height	Remarks	Result
50 kg bag	1,2 m	No damage visible	SATISFACTORY

The test result is considered satisfactory if the louvers operate correctly after the test.

The impact point is identified in the following image.

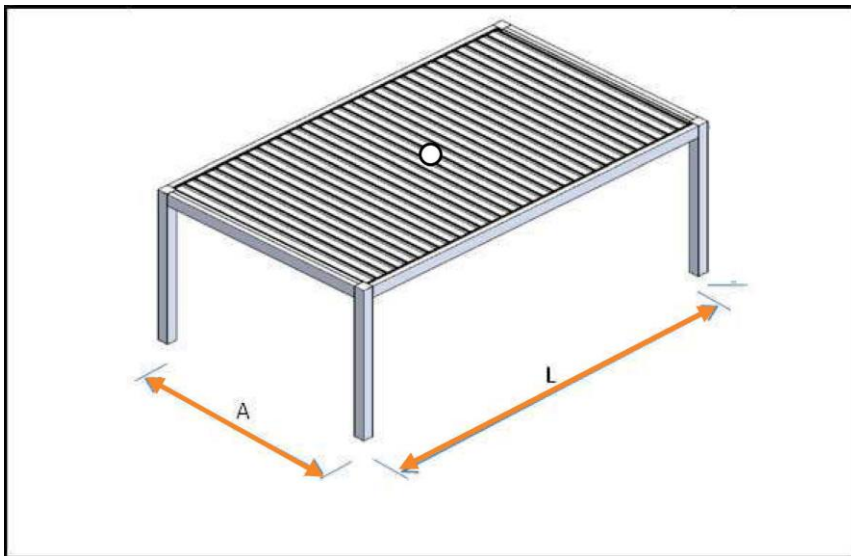
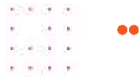


Image 2. Location of hard body impact points.



Upon completion of the sequence, at the request of the customer, the wind suction resistance test is resumed.

Starting at 600 Pa, the suction is increased at a rate of 200 Pa on the sample until it breaks.

Up to 2,400 Pa, the sample shows no apparent damage to the naked eye. Before reaching 2.600 Pa, the louvers come out of the guides.



ANNEX A:

TECHNICAL INFORMATION PROVIDED BY THE CUSTOMER



ANNEX B:

PHOTOGRAPHS TAKEN DURING TESTS



Photo 1. Side view of the sample mounted in the laboratory.



Photo 2. Top view of the sample with the water spray system.



Photo 3. Photograph taken during the watertightness test.



Photo 4. View of the drainage system during the watertightness test.

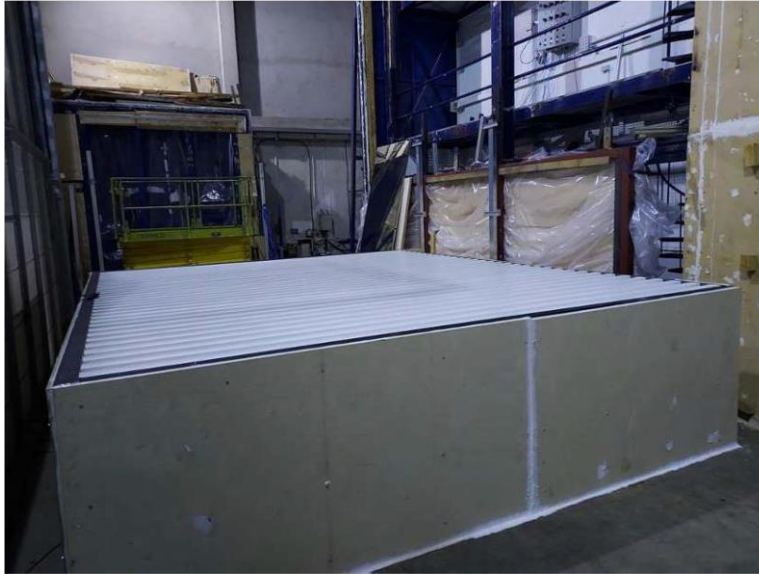


Photo 5. Image of the perimeter closure on the sample to reach the desired wind suction.



Photo 6. Sample failure before reaching 2600 Pa of suction.



Photo 7. Photograph taken during the snow load resistance test.



Photo 8. Photograph taken during the snow load resistance test.





Photo 9. Photograph taken during the hard body strength test.



Photo 10. Photograph taken during the hard body strength test.

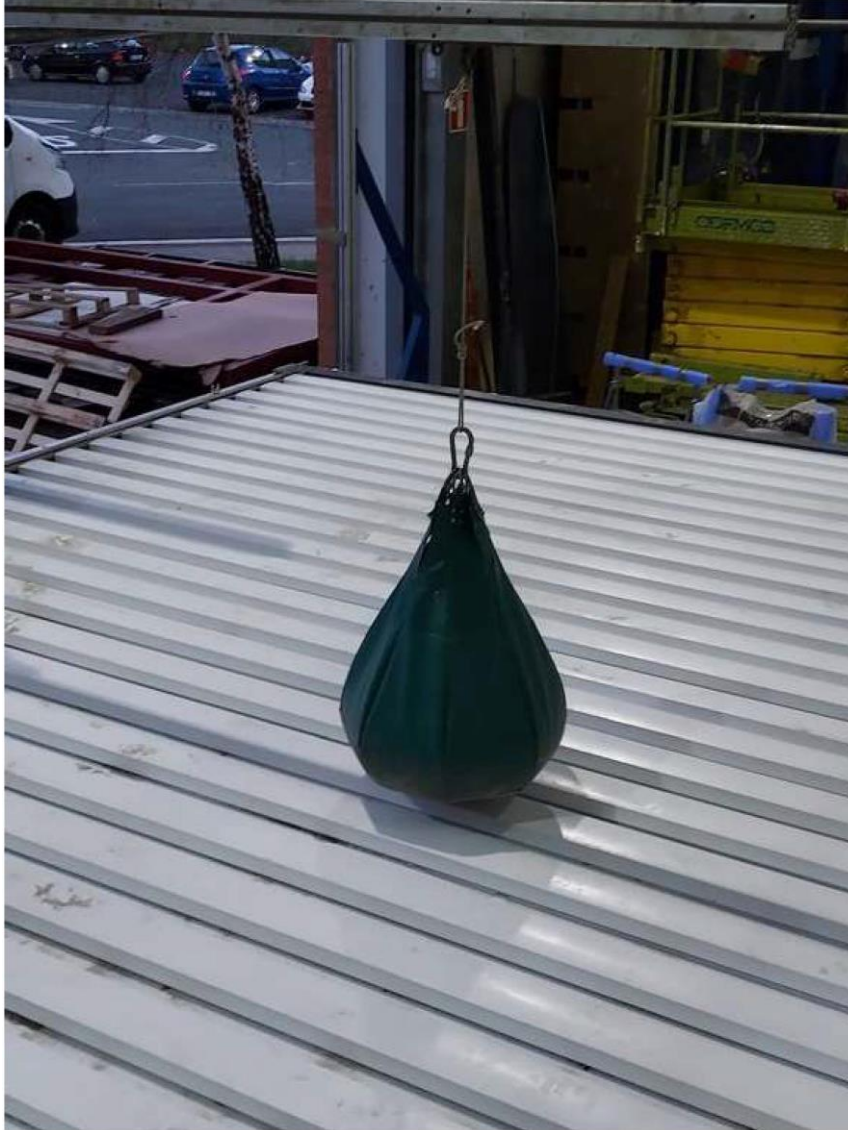


Photo 11. Photograph taken during the hard body resistance test.