TECHNOLOGY CENTRE

Technical Report

Title: Wind resistance testing of a sample of Millboard Envello Shadow Line cladding boards

Report No: N950-22-18365

Technical Report

Title: Wind resistance testing of a sample of Millboard Envello Shadow Line cladding boards

Customer: Millboard Company Limited
Unit A, Castle Court,
Bodmin Road, Coventry CV2 5DB

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Author(s): D. Bennett - Technician

Checked by: N. McDonald – Manager

Authorised by: S. R. Moxon – Operations Director

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(confidential) 1 copy to project file

UKAS TESTING
0057

VINCI Technology Centre UK Limited,
Stanbridge Road, Leighton Buzzard, Bedfordshire, LU7 4QH

Registered Office, Watford. Registered No. 05640885 England.

Tel. 0333 5669000
email info@technology-centre.co.uk
web www.technology-centre.co.uk

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1 INTRODUCTION

This report describes tests carried out at VINCI Technology Centre UK Limited at the request of Millboard.

The test sample consisted of a sample of cladding system manufactured by Millboard.

The tests were carried out in August 2022 and were to determine the wind resistance of the test sample. The test methods were in accordance with the CWCT Standard Test Methods for building envelopes, 2005, for:

Wind resistance – serviceability, cyclic & safety.

The testing was carried out in accordance with Technology Centre Method Statement C9083/MS rev 0.

This test report relates only to the actual sample as tested and described herein.

The results are valid only for sample(s) tested and the conditions under which the tests were conducted.

VINCI Technology Centre UK Limited is accredited to ISO/IEC 17025:2017 by the United Kingdom Accreditation Service as UKAS Testing Laboratory No. 0057 for a schedule of tests. Tests listed above and marked with an asterisk are not on our schedule.

VINCI Technology Centre UK Limited is Approved Body No. 1766.

VINCI Technology Centre UK Limited is certified by BSI for:

- ISO 9001 Quality Management System,
- ISO 14001 Environmental Management System,
- ISO 45001 Occupational Health and Safety Management System.

2 SUMMARY AND CLASSIFICATION OF TEST RESULTS

The following summarises the results of the tests carried out. For full details refer to Section 6.

2.1 SUMMARY OF TEST RESULTS

TABLE 1

Date	Test number	Test description	Result
18 August 2022	1	Wind resistance – serviceability	Pass
23-26 August 2022	2	Wind resistance – cyclic	Pass
31 August 2022	3	Wind resistance – safety	Pass

2.2 CLASSIFICATION

TABLE 2

Test	Standard	Classification / Declared value
Wind resistance	CWCT / BS EN 13116	2155/-2650 pascals serviceability 3233/-3975 pascals safety

3 DESCRIPTION OF TEST SAMPLE

3.1 GENERAL ARRANGEMENT

The sample was as shown in the drawings and the photograph below and measured 3.0 m x 3.0 m.

The boards were fitted in both the vertical and horizontal orientation, fixed to timber battens with a window inserted into the centre of the construction. The battens were set at 400mm centres max, with battens fully lining the window opening

The boards were fixed to the battens with 30mm Envello Board fixings through the tongue, where the tongue was taken off (around the window or at the edges) the boards were fixed to the battens with 16g brad nails.

The window reveal was lined with fascia boards, these were fixed to the timber battens with 16g brad nails.

PHOTO 5139

TEST SAMPLE ELEVATION

3.2 CONTROLLED DISMANTLING

During the dismantling of the sample no discrepancies from the drawings or damage to the support frame were found.

PHOTO 5237

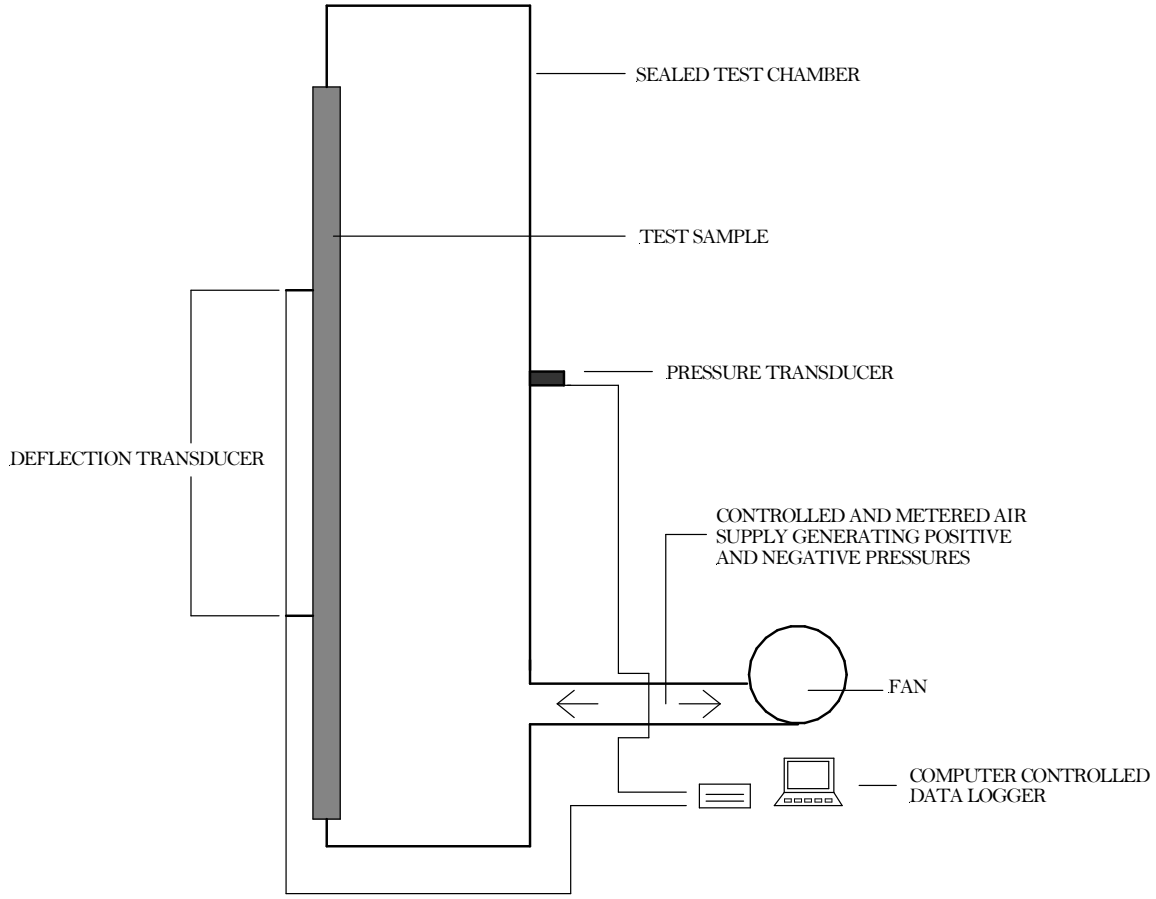
PLANKS REMOVED FROM SUPPORT FRAME

4 TEST RIG GENERAL ARRANGEMENT

The test sample was mounted on a rigid test rig with support steelwork designed to simulate the on-site/project conditions. The test rig comprised a well sealed chamber, fabricated from steel and plywood. A door was provided to allow access to the chamber. Representatives of Millboard installed the sample on the test rig. See Figure 1.

FIGURE 1

TEST RIG SCHEMATIC ARRANGEMENT



SECTION THROUGH TEST RIG

5 TEST SEQUENCE

The test sequence was as follows:

(1) Wind resistance – serviceability

(2) Wind resistance - cyclic

(3) Impact resistance - safety

6 WIND RESISTANCE TESTING

6.1 INSTRUMENTATION

6.1.1 Pressure

One static pressure tapping was provided to measure the chamber pressure and was located so that the readings were unaffected by the velocity of the air supply into or out of the chamber.

A pressure transducer, capable of measuring rapid changes in pressure to within 2% was used to measure the differential pressure across the sample.

6.1.2 Deflection

Dial gauges were used to measure the deflection of the sample to an accuracy of 0.1 mm. The gauges were set normal to the sample. The gauges were located at the positions shown in Figure 2.

6.1.3 Temperature

Platinum resistance thermometers (PRT) were used to measure air temperatures to within 1°C.

6.1.4 General

Electronic instrument measurements were scanned by a computer controlled data logger, which also processed and stored the results.

All measuring instruments and relevant test equipment were calibrated and traceable to national standards.

6.2 FAN

The air supply system comprised a variable speed centrifugal fan and associated ducting and control valves to create positive and negative static pressure differentials. The fan provided essentially constant air flow at the fixed pressure for the period required by the tests and was capable of pressurising at a rate of approximately 600 pascals in one second.

6.3 PROCEDURE

6.3.1 Wind Resistance – serviceability

Three positive pressure differential pulses of 1078 pascals were applied to prepare the sample. The displacement transducers were then zeroed.

The sample was subjected to one positive pressure differential pulse from 0 to 2155 pascals to 0. The pressure was increased in four equal increments each maintained for 15 ±5 seconds. Displacement readings were taken at each increment. Residual deformations were measured on the pressure returning to zero.

Any damage or functional defects were recorded.

Three negative pressure differential pulses of 1325 pascals were applied to prepare the sample. The displacement transducers were then zeroed.

The sample was subjected to one negative pressure differential pulse from 0 to -2650 pascals to 0. The pressure was increased in four equal increments each maintained for 15 ±5 seconds.

Displacement readings were taken at each increment. Residual deformations were measured on the pressure returning to zero.

Any damage or functional defects were recorded.

6.3.2 Wind Resistance – cyclic

The following cyclic load tests were carried out on the sample.

No of cycles	Applied pressure (pascals)
1	0.9 x WP = +1940 / -2385
960	0.4 x WP = +862 / -1060
60	0.6 x WP = +1293 / -1590
240	0.5 x WP = +1078 / -1325
5	0.8 x WP = +1724 / -2120
14	0.7 x WP = +1509 / -1855

Where WP = design wind load

The sequence above was repeated for a total of five times and then a single pulse of Wp (+2155 / -2650 pascals) was applied.

The frequency of oscillation was seven seconds between loading, with loading applied in a sinusoidal manner.

Any damage or functional defects were recorded.

6.3.3 Wind Resistance – safety

Three positive pressure differential pulses of 1078 pascals were applied to prepare the sample. The displacement transducers were then zeroed.

The sample was subjected to one positive pressure differential pulse from 0 to 3233 pascals to 0. The pressure was increased as rapidly as possible but not in less than 1 second and maintained for 15 ±5 seconds. Displacement readings were taken at peak pressure. Residual deformations were measured on the pressure returning to zero.

Any damage or functional defects were recorded.

Three negative pressure differential pulses of -1325 pascals were applied to prepare the sample. The displacement transducers were then zeroed.

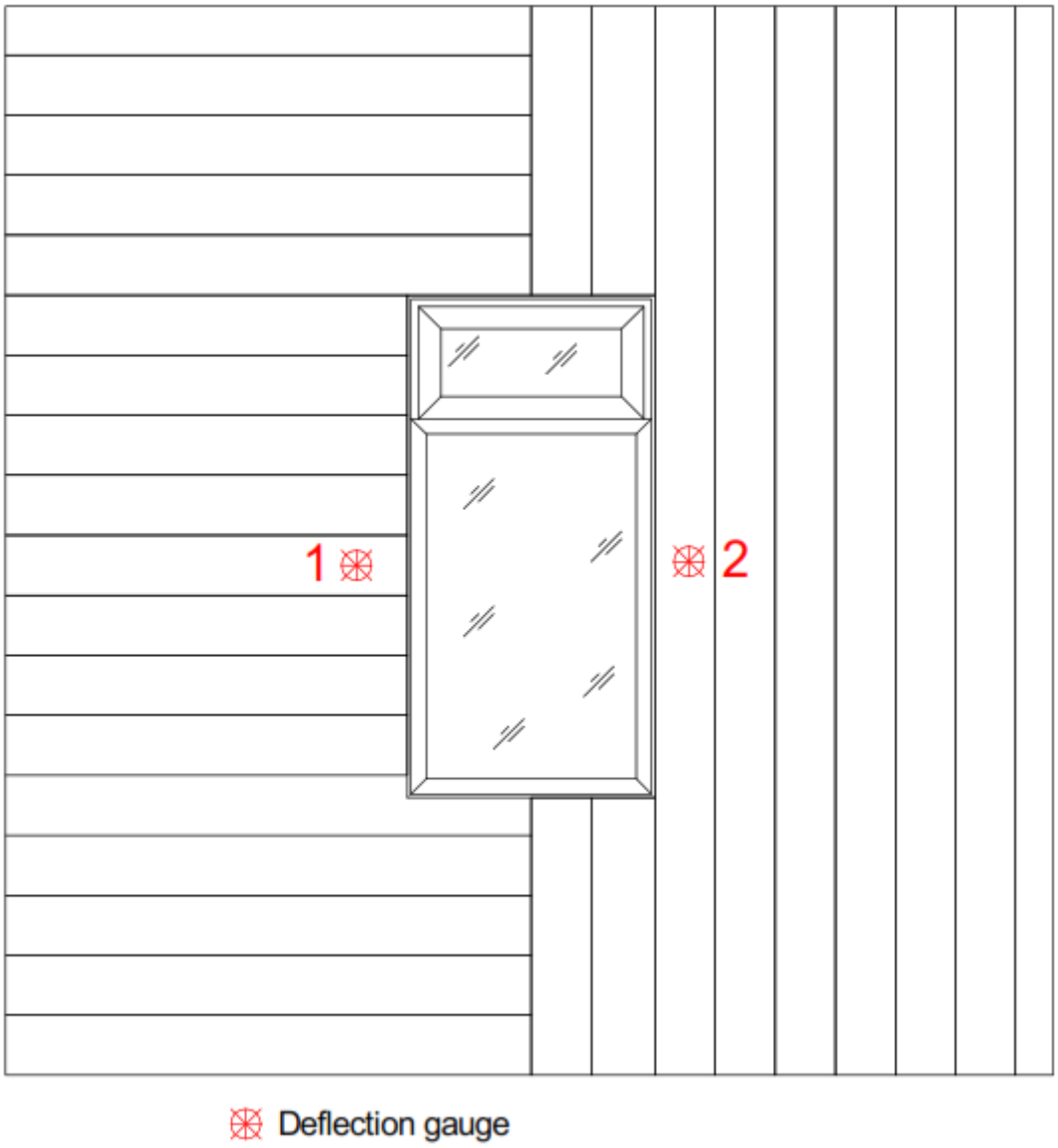
The sample was subjected to one negative pressure differential pulse from 0 to -3975 pascals to 0. The pressure was increased as rapidly as possible but not in less than 1 second and maintained for 15 ±5 seconds. Displacement readings were taken at peak pressure. Residual deformations were measured on the pressure returning to zero.

Any damage or functional defects were recorded.

FIGURE 2

DEFLECTION GAUGE LOCATIONS

External View



6.4 PASS/FAIL CRITERIA

6.5 RESULTS

Test 1 (serviceability) Date: 18 August 2022

The deflections measured during the wind resistance test, at the positions shown in Figure 2, are shown in Tables 3 and 4.

No damage to the test sample was observed.

Ambient temperature = 23°C
Chamber temperature = 23°C

Test 2 (cyclic) Date: 23-26 August 2022

No damage to the test sample was observed.

Ambient temperature = 20-26°C
Chamber temperature = 20-26°C

Test 3 (safety) Date: 31 August 2022

The deflections measured during the structural safety test, at the positions shown in Figure 2, are shown in Table 5.

No damage to the sample was observed.

Ambient temperature = 24°C
Chamber temperature = 24°C

TABLE 3

WIND RESISTANCE – POSITIVE **SERVICEABILITY** TEST RESULTS

Position	Pressure (pascals) / Deflection (mm)				
	539	**1078**	**1616**	**2155**	**Residual**
1	0.8	1.3	2.1	2.8	0.1
2	0.6	1.6	2.6	3.5	0.0

TABLE 4

WIND RESISTANCE – NEGATIVE **SERVICEABILITY** TEST RESULTS

Position	Pressure (pascals) / Deflection (mm)				
	-663	**-1325**	**-1988**	**-2650**	**Residual**
1	-0.8	-1.6	-2.5	-3.4	-0.1
2	-0.9	-1.9	-2.8	-3.8	0.0

TABLE 5

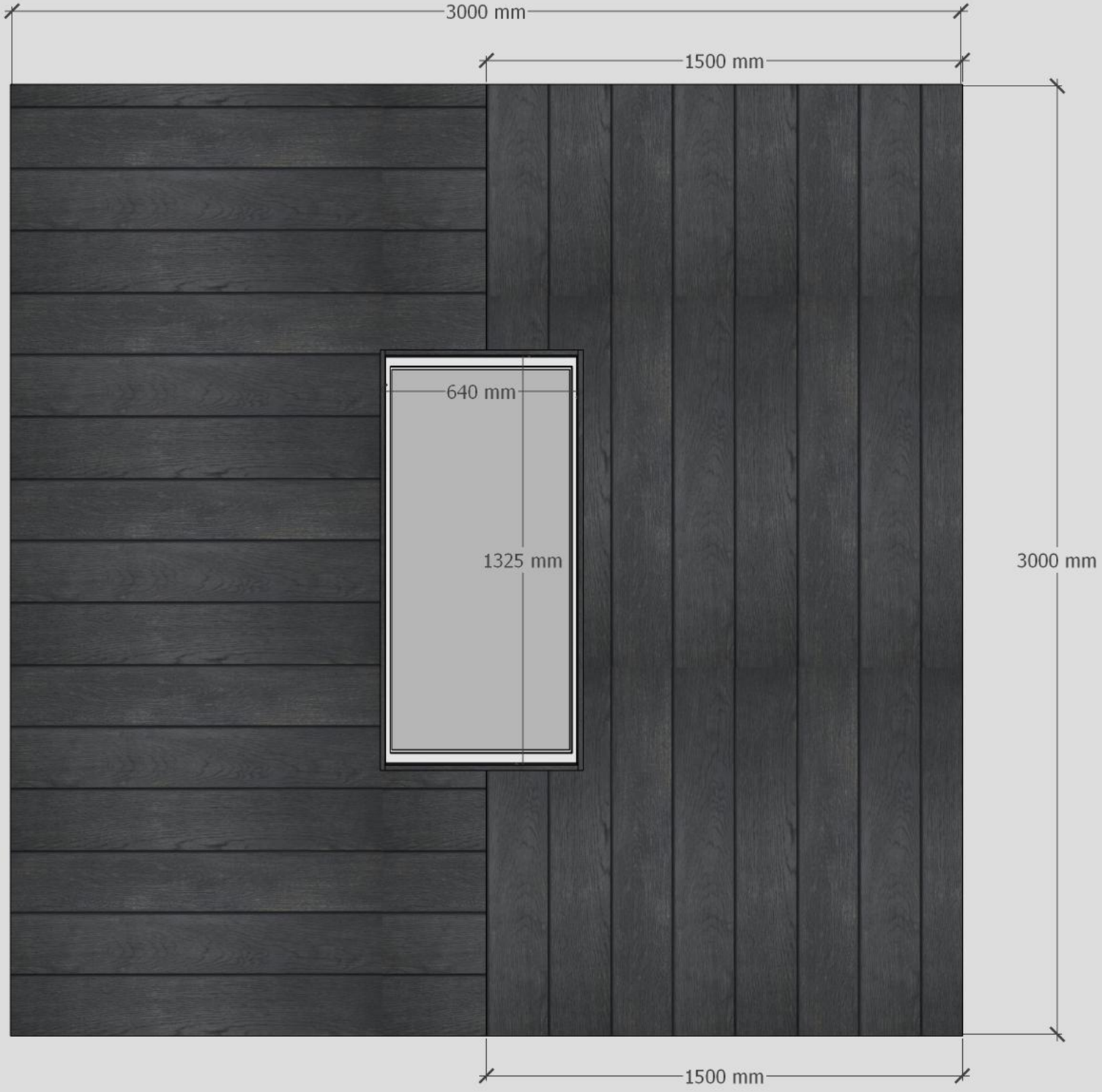
WIND RESISTANCE - **SAFETY** TEST RESULTS

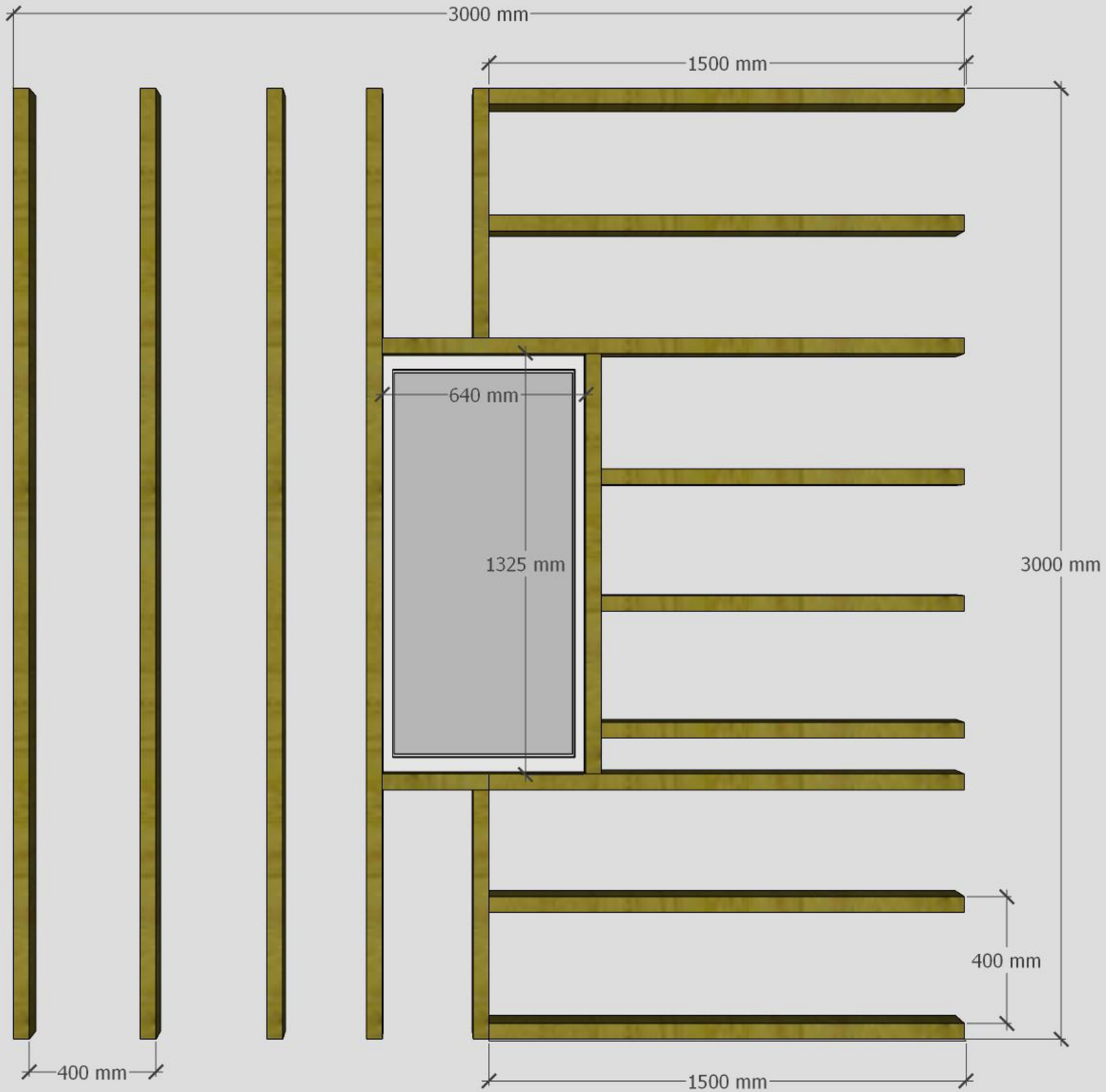
Position	Pressure (pascals) / Deflection (mm)			
	3233	**Residual**	**-3975**	**Residual**
1	4.3	0.2	-5.2	-0.2
2*	5.4	0.1	-5.6	-0.2

7 APPENDIX - DRAWINGS

The following 3 unnumbered pages are copies of millboard drawings of the test sample.

END OF REPORT


3000 mm
1500 mm
640 mm
1325 mm
3000 mm
1500 mm


3000 mm
1500 mm
640 mm
1325 mm
3000 mm
400 mm
400 mm
1500 mm

VINCI Technology Centre UK Limited
Stanbridge Road
Leighton Buzzard
Bedfordshire
LU7 4QH
UK

0333 5669000

info@technology-centre.co.uk

www.technology-centre.co.uk