

REPORT

Contract no.	1471/2020/1 - RB replaces report of 20 August 2020	7 October 2020 TIJ/WOS
Customer:	THEURL TIMBER STRUCTURES GMBH Industriezone 1 9754 Steinfeld, Austria	
Subject:	Investigation regarding the Air Tightness of Cross-laminated Timber Elements	
Date of contract:	29 April 2020	
Date of sample delivery:	8 July 2020	
Date/Period of service:	July 2020	
Period of validity:		
Pages:	9	
Enclosures:	1 (3 pages)	



1. Order

On 29 April 2020, Theurl Timber Structures GmbH commissioned Holzforschung Austria to carry out the necessary tests to obtain a European Technical Assessment for the product glued cross laminated timber. The determination of air tightness required for this purpose was carried out on two cross laminated timber elements (1x 3-layered – 60mm thickness, 1x 5-layered – 100mm thickness) on the window test rig in combination with the Laminar Master Flow system (LMF) of Holzforschung Austria based on EN 12114.

The report dated 20 August 2020 was changed due to an incorrect entry in the address field of the client. It was adjusted according to the information provided by the client. In addition, the order number has been adjusted as this report is the first in a series of reports totaling three.

2. Test item description

The following cross laminated timber (short: BSP or CLT) test items from Theurl Timber Structures GmbH were delivered to Holzforschung Austria, 2100 Stetten, Austria, on 8 July 2020 for airtightness measurement on the window test rig:

Quantity	Layers	Single layer thickness	Width	Length	Height	Area	Relevant Area*	Designation
[#]	[#]	[mm]	[mm]	[mm]	[mm]	[m²]	[m²]	
1	3	20	2400	2400	60	5.76	5.29	Test Item 1
1	5	20	2400	2400	100	5.76	5.29	Test Item 2

*The test items were taped all around with 5cm wide sealing tape for the test

The surface condition of the test items can be seen in figures 1–5. Cracks, knotholes and unevenness were partially visible on both test items.





Figure 1: Chippings of a finger joint and an adjacent crack on test item 1



Figure 2: Resin pocket on test item 1





Figure 3: Branch on test item 1



Figure 4: Knothole on test item 2





Figure 5: Unevenness/pressure points on test item 2

The air tightness tests on both test items were conducted on 21–23 July 2020.



3. Test execution

The test was carried out on the window test rig in combination with the LMF of Holzforschung Austria (Figure 6). The test rig used ensures the correct clamping of the test items as well as the correct performance of the test based on EN 12114. A reference measurement was carried out before each measurement, based on which the air flow rate was determined on the basis of pressure losses at the test rig itself. No conditioning of the test items was performed prior to the test.



Figure 6: Clamped test item 2 at the window test rig (left) of Holzforschung Austria with connected Laminar Master Flow system (LMF – right).



3.1 Measurement accuracy

Table 1: Manufacturer's information on the measuring accuracy of the LMF system

Device	Measured variable	Unit	Measurement range	Accuracy (acc. to manu- facturer)
Laminar Flow Element (LFE-EA-50MH10- 02.00)	Flow (air)	l/min	0–1000 l/min	±1%vM
PDP01020A	Differential pressure at the LFE	mbar	0–20 mbar	±0.2%vM
PDP01020A	Absolute pressure at the LFE	mbar	800–2000 mbar	±0.2%vM
HUMTMP-MF-G12	Temperature at the LFE	°C	20–30°C	±0.151 °C
HUMTMP-MF-G12	Rel. Humidity at the LFE	%	0–100 %	±3%
PDP00001D-F	Differential pressure in the test rig	mbar	-1 – +1 mbar	±0.5%∨M
WIT-S-PTM8-SO- 20100-GB03	Temperature in the test rig	°C	0–50°C	±0.1°C + 0.0017 x meas- urement value

3.2 Air tightness measurement based on EN 12114 on test items 1 and 2

The air tightness measurement for the quantitative analysis of the leakage volume flow was carried out based on EN 12114:2000. The test item was tested by applying negative differential pressures of 10 Pa, 15 Pa, 20 Pa, 25 Pa, 30 Pa, 40 Pa, and 50 Pa. To account for a possible directional dependence of the airtightness, the board was turned over and tested again in this direction. In the following, this additional measurement is referred to as "overpressure measurement".

For each pressure difference, the air loss was measured in m³/h over 120 seconds. The assessment of the leakage volume flow was made using the average value of the air loss over the measurement period.

Ambient conditions during the test (test item 1):Temperature:23.0 to 25.1°CHumidity:52 to 55%Air pressure:1000.5 mbar

A wood moisture content of 11.7% was measured on test item 1 before the start of the test. Ambient conditions during the test (test item 2): Temperature: 23.5 to 25.3°C Humidity: 51 to 55% Air pressure: 998.2 mbar A wood moisture content of 11.1% was measured on test item 2 before the start of the test.



4. Results of air tightness based on EN 12114

Detailed information on the measured pressure differences and air volume flows can be found in Appendix 1. The test showed that both test items can be assumed to be airtight under the boundary conditions applied.

5. Summary

The results of the test at a pressure difference of 50 Pa are summarized in Table 2.

Table 2: Average air volume flow at 50 Pa differential pressure minus the air volume flow of the reference measurement

Test Item	Overpres ure	ssure meas- ement	Negativ meas	ø	
	∆p _i [Pa]	V [m³/h/m²]	∆p _i [Pa]	V [m³/h/m²]	V [m³/h/m²]
<u>Test Item 1</u> 60 mm 3-layered	50	0.00	50	-0.01	0.00
<u>Test Item 2</u> 100 mm 5-layered	50	0.00	50	0.00	0.00



HOLZFORSCHUNG AUSTRIA

Ing. Rupert Wolffhardt Authorisation to sign

DI Johannes Tieben

Technical execution

This document was approved electronically in accordance with an internal HFA process by the designated authorized signatory, traceable and documented.

1 Enclosures

Accreditation is given for the following procedures. It is not allowed to use included accreditation marks for own purposes.

Accreditation mark	Type of accreditation	Procedure/s
NAME editierung Austrie 00055 150/IEC 170251	testing	• EN 12114

The results and statements given in this document relate only to the tested materials as received, the present information and the state of the art at the time of investigation.

Publication in excerpts is only permitted with the written approval of Holzforschung Austria

The conformity assessment of the results is subjected of the shared-risk approach.

In case of dispute the original German version prevails. This translation is for information purposes only.



	Air po	ermeabilit	y based on	С	LT <i>,</i> 60mm	, 3 layer	S			
C) measur	ement wall, o	alibration, pr	ressure	Mea	isurement, ne	gative	0 mea	surement	-
Pressure target	Ра	Pressure in Pascal is	Total m³/h	Area m³/h/m²	Pressure in Pascal is	Total m³/h	Area m ³ /h/m ²	Total	m³/h	Area m³/h/m²
	-10	-10	0.10	0.02	-10	0.09	0.02		-0.02	0.00
	-15	-15	0.14	0.03	-15	0.11	0.02		-0.02	0.00
	-20	-20	0.16	0.03	-20	0.14	0.03		-0.02	0.00
	-25	-25	0.19	0.04	-25	0.17	0.03		-0.02	0.00
	-30	-30	0.22	0.04	-30	0.19	0.04		-0.03	-0.01
	-40	-40	0.26	0.05	-40	0.23	0.04		-0.03	-0.01
	-50	-50	0.31	0.06	-50	0.27	0.05		-0.04	-0.00
								Test item a	area	5.29

() measur	ement wall, o	alibration, pr	ressure	Mea	asurement, ov	verpressure	0 measurement -		
Pressure target	Ра	Pressure in Pascal	Total m³/h	Area m³/h/m²	Pressure in Pascal is	Total m³/h	Area m³/h/m²	Total m³/h	Area m ³ /h/m ²	
	10	10	0.09	0.02	10	0.10	0.02	0.01	0.00	
	15	15	0.12	0.02	15	0.13	0.02	0.01	0.00	
	20	20	0.15	0.03	20	0.16	0.03	0.01	0.00	
	25	25	0.18	0.03	25	0.19	0.04	0.01	0.00	
	30	30	0.20	0.04	30	0.21	0.04	0.01	0.00	
	40	40	0.25	0.05	40	0.26	0.05	0.01	0.00	
	50	50	0.30	0.06	50	0.31	0.06	0.01	0.00	

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Air permeability based on EN 12114								LT, 100mm	, 5 laye	rs
0) measur	ement wall, c	alibration, pr	essure	Mea	isurement, ne	egative	0 Meas	urement	-
Pressure target	Ра	Pressure in Pascal	Total m³/h	Area m³/h/m²	Pressure in Pascal is	Total m³/h	Area m ³ /h/m ²	Total	m³/h	Area m³/h/m²
	-10	-10	0.09	0.02	-10	0.09	0.02		0.00	0.00
	-15	-15	0.12	0.02	-15	0.12	0.02		0.00	0.00
	-20	-20	0.14	0.03	-20	0.15	0.03		0.00	0.00
	-25	-25	0.17	0.03	-25	0.17	0.03		0.01	0.00
	-30	-30	0.20	0.04	-30	0.19	0.04		0.00	0.00
	-40	-40	0.24	0.04	-40	0.24	0.05		0.01	0.00
	-50	-50	0.28	0.05	-50	0.28	0.05		0.00	0.00
								Test item ar	ea	5.29

0) measur	ement wall, c	alibration, pr	essure	Mea	asurement, o	verpressure	0 Measurement -	
Pressure target	Ра	Pressure in Pascal is	Total m³/h	Area m³/h/m²	Pressure in Pascal is	Total m³/h	Area m³/h/m²	Total m³/h	Area m³/h/m²
	10	10	0.10	0.02	10	0.09	0.02	-0.01	0.00
	15	15	0.13	0.02	15	0.11	0.02	-0.01	0.00
	20	20	0.16	0.03	20	0.15	0.03	-0.01	0.00
	25	25	0.19	0.04	25	0.17	0.03	-0.02	0.00
	30	30	0.21	0.04	30	0.19	0.04	-0.02	0.00
	40	40	0.26	0.05	40	0.24	0.05	-0.02	0.00
	50	50	0.29	0.05	50	0.28	0.05	-0.01	0.00

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Differential pressure curve with pressure surges (-55 Pa) during the test (example: 0 measurement wall, calibration, pressure – test item 1 - CLT, 60mm, 3-layer)