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Testing, inspection and certification body for
building materials, building products and building systems

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Classification report no. KB 3.2/15-222-2

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Classification of fire resistance acc. to
DIN EN 13501-2:2010-02

Subject matter:	Classification of a load-bearing and space-enclosing solid wood wall construction (cross laminated timber) with asymmetrical planking/cladding on both sides for the assignment to fire resistance class REI 90-M according to DIN EN 13501-2*:2010-02 with unilateral fire exposure of the outside or inside of the wall
Applicant:	STEICO SE Otto-Lilienthal-Ring 30 D-85622 Feldkirchen Germany
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This document consists of 8 pages.

The classification report is not a type approval or product certification. It does no replace any building authority certificate that may be necessary according to German building laws (state building code) and is only valid in conjunction with the corresponding test report.

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Testing laboratory accredited by DAkkS GmbH in accordance with DIN EN ISO/IEC 17025. The accreditation only applies to the testing methods listed in the certificate (marked with * in this document). The certificate can be seen at www.mfpa-leipzig.de.
Testing, monitoring and certification authority accredited in accordance with the state building code (SAC 02) and notified in accordance with the building products act (NB 0800).

Gesellschaft für Materialforschung und Prüfungsanstalt für das Bauwesen Leipzig mbH (MFPA Leipzig GmbH)

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1 Introduction

This classification report defines the classification assigned to the load-bearing, space-enclosing and thermally insulating solid wood wall construction (cross laminated timber) with asymmetrical panelling/cladding on both sides in accordance with the procedure set out in DIN EN 13501-2*):2010-02.

2 Details of the classified product

2.1 Type of function

The solid wood wall construction (cross laminated timber) with asymmetrical panelling/cladding on both sides, which is to be classified, is defined as a load-bearing, space-enclosing and thermally-insulating wall construction. It is classified as a load-bearing wall construction in accordance with DIN EN 13501-2:2010-02 section 7.3.2. Its function is to resist fire corresponding to the characteristic fire behaviour in accordance with section 5.2.1 to 5.2.3 of DIN EN 13501-2:2010-02.

2.2 Description

The tested wall construction with a thickness of approx. 279 mm includes a load-bearing solid wood wall structure (cross laminated timber) and asymmetrical planking/cladding on both sides. The design will be explained in the following according to the data in the test reports. For design details of the wall construction, please refer to table 1.

*) The references to standards and directives refer to the version valid at the time of issue of this classification report as amended.

Table 1 List of structural details of the tested wall construction

Overall dimensions of the tested construction: Width: w = 2980 mm, height: h = 3000 mm, thickness: t = 279 mm		
Item	**Material/ dimensions**	**Comments**
Supporting structure:	Cross laminated timber element made of coniferous wood of strength class C24 acc. to DIN EN 338 Individual element dimensions b x h = 1525 mm x 3000 mm The cross laminated timber element with a thickness of 80 mm must consist of at least three cross laminated layers (20-40-20). The gluing of the individual layers of wood of the cross laminated timber elements, i.e. surface gluing, wedge gluing and edge gluing, complies with ETA1)-14/03493). Information on the adhesive used was submitted to MFPA Leipzig GmbH. The two outer board layers must have a board thickness of at least 20 mm (length-wise mounting direction, load transfer) and the inner board layer must have a minimum thickness of 40 mm (transversal mounting direction). The adjoining board layers are glued together at an angle of 90°. The cross section layout must be symmetrical. The three-layer design can be extended to five layers by adding two more, symmetri-cally arranged layers. If the cross section thickness of the load-bearing elements is enlarged and the number of board layers is increased, the static requirements must be adjusted.	<u>Element connection:</u> For the assembly of the elements, two different types of element joints were designed: **Design of a butt joint as overlap** The overlap must be designed symmetrically and the two elements must overlap for at least 50 mm. **Design of a butt joint with coupling board** The coupling board must be made of coniferous wood C24, have a thickness of at least 27 mm and/or a width of 160 mm. The overlap of the coupling board must be at least 80 mm for each adjoining element. In addition, a self-adhesive sealing strip was installed in the area of the joints (joint sealing strip) 4) Overlap = one layer in the fold Coupling board = one sealing strip per fold side <u>Fasteners:</u> For the force-fitted connection in the area of the overlap, the following screws were installed at an angle of 60° measured towards the screw surface every ≤ 200 mm: Ø 8.0x80/50 mm countersunk milling head. In the area of the joint design with coupling board, Ø 6.0x80/50 mm countersunk milling head screws were installed alternately at angles of 60° and 150° measured towards the surfaces every ≤ 200 mm.
Design of the outer side of the wall of the supporting structure	Wood fibre insulating board: STEICOprotect L dry Butt-joint Individual board dimensions l x w x d = 3000 mm x 1250 mm x 160 mm Vertical alignment	<u>Fasteners:</u> Screw-in anchor H / Ejot Ejotherm STR-H 200 Ø 5.0 x 180 mm, approx. 7 pcs/m² Fastening gap a ≤ 344 mm in the cross laminated timber structure Row spacing: 475 mm Edge distance: 150 mm <u>Note:</u> The boards were butt-joint
	"STEICOsecure base" plaster layer d = 6 mm With "STEICOsecure Mesh F" glass fibre mesh	<u>Note:</u> Glass fibre mesh 100 mm imbricated

Table 1 continued *List of the design details of the tested wall construction*

Item	Material/ dimensions	Comments
Design of the inside of the wall of the supporting structure	FERMACELL gypsum fibreboard (GF) 2 layers Individual board dimensions: w x l: 1250 mm x 3000 mm d = 15 mm (inner layer) d = 18 mm (outer layer) Joint offset between inner and outer board layer: vertical joints ≥ 480 mm ETA [1]: ETA-03/0050 or Gbia [2]: Z-9.1-434 (AbZ)	Fasteners: **1st layer (inner layer):** Steel wire clip dimensions: Back width 11.25 mm, Ø 1.53 mm, clip length 45 mm Fastening gap a ≤ 200 mm in the supporting structure (all round) Row spacing: 625 mm Edge distance ~ 30 mm **2nd layer (outer layer):** Steel wire clip dimensions: Back width 11.25 mm, Ø 1.53 mm, clip length 35 mm Fastening gap a ≤ 150 mm board in board Row spacing: 400 mm Edge distance ~ 30 mm Connecting joints of both layers designed as butt joints (joint width ≤ 1.0 mm)
Information on the installation at the inside of the wall		
At the inside of the wall, the following fittings may be installed - Cavity wall box: installed in a plaster bed - Kaiser Elektro socket HWD 90 (fire protection socket, Gbia [2]: Z-19.21-1788) For the feed lines of the individual fittings, a duct with the dimensions w x d = 27 mm x 27 mm may be installed at the cross laminated timber level (aligned to the inner Fermacell gypsum fibreboard layer). The depth of the holes in the cross laminated timber level may not exceed 30 mm.		

[1] ETA – European Technical Approval

[2] Gbia - General building inspectorate approval (AbZ – allgemeine bauaufsichtliche Zulassung)

[3] Manufacturer's certificate: The elements were manufactured according to ETA-14/0349, which was issued based on the Construction Products Regulation. A corresponding marking of the cross laminated timber elements with the CE mark was not possible since there is no approved inspection and certification body for this area yet. This is why the comparable elements were still marked with the Ü mark according to the Z-9.1-559 approval and the CE mark according to ETA-08/0271

[4] Sealing tape made of polyurethane foam: Pre-compressed sealing tape, self-adhesive on one side, with a width of 15 mm and a thickness of 2 mm (compressed), B 2 acc. to DIN 4102, gross density approx. 70 kg/m³

Further structural details as well as the materials used and their building material characteristic values can be found in the test reports PB 3.2/15-222-1, dated 2 November 2011, and PB 3.2/14-406-1, dated 31 July 2015, of the Gesellschaft für Materialforschung und Prüfungsanstalt für das Bauwesen Leipzig mbH (MFPA Leipzig GmbH).

3 Test reports and test results supporting this classification

3.1 Test reports

Organisation that performed the test	Applicant	Number of the test report	Test method
Gesellschaft für Materialforschung und Prüfungsanstalt für das Bauwesen Leipzig mbH (MFPA Leipzig GmbH) Hans-Weigel-Straße 2b 04319 Leipzig	STEICO SE Otto-Lilienthal-Ring 30 D-85622 Feldkirchen Germany	PB 3.2/15-222-1 dated 02 November 2015 PB 3.2/14-406-1 dated 31 July 2015	DIN EN 1363-1: 2012-10 DIN EN 1365-1: 2013-08

3.2 Fire protection capability of the outside of the wall

Table 2 Performance characteristics of the load-bearing, space-enclosing and thermally-insulating solid wood wall construction (cross laminated timber) – Test report PB 3.2/15-222-1

Test method	Parameter	Test results Criterion exceeded acc. to:		
DIN EN 1365-1:2013-08 in conjunction with DIN EN 1363-1:2012-10	**Strength (R)**			
	Applied load	**100 kN/m**, corresponding to a total load of **300 kN** (on w = 3.0 m wall width), cross laminated timber d = 80 mm		
	Vertical compression C = h/100 [mm]	Limit not exceeded in the test time of 94 test minutes		
	Speed of vertical compression dC/dt = 3 h/1000 [mm/min]	Limit not exceeded in the test time of 94 test minutes		
	Integrity (E)			
	Combustion of the cotton ball	Test not necessary		
	Appearance of gaps	Did not appear		
	Appearance of flames on the opposite side	Did not appear		
	Thermal insulation (I)- Rise in temperature on the side which is not exposed to flames above the initial temperature after the 90th minute of test			
	Mean value > 140 K	2 K		
	max. single value > 180 K	11 K		
DIN EN 1363-2:1999-10	**Resistance to mechanical stress (M)** Impact test after the classification time has been achieved			
	R, E and I behaviour were complied with despite the impact test	Impact 1	Impact 2	Impact 3
		yes	yes	yes

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3.3 Fire protection capability of the inside of the wall

Table 3 Performance characteristics of the load-bearing, space-enclosing and thermally-insulating solid wood wall construction (cross laminated timber) – Test report PB 3.2/14-406-1

Test method	Parameter	Test results Criterion exceeded acc. to:		
DIN EN 1365-1:2013-08 in conjunction with DIN EN 1363-1:2012-10	**Strength (R)**			
	Applied load	**120 kN/m**, corresponding to a total load of **360 kN** (on w = 3.0 m wall width), cross laminated timber d = 80 mm		
	Vertical compression C = h/100 [mm]	Limit not exceeded in the test time of 93 test minutes		
	Speed of vertical compression dC/dt = 3 h/1000 [mm/min]	Limit not exceeded in the test time of 93 test minutes		
	Integrity (E)			
	Combustion of the cotton ball	Test not necessary		
	Appearance of gaps	Did not appear		
	Appearance of flames on the opposite side	Did not appear		
	Thermal insulation (I)- Rise in temperature on the side which is not exposed to flames above the initial temperature after the 90th minute of test			
	Mean value > 140 K	3 K		
	max. single value > 180 K	30 K		
DIN EN 1363-2:1999-10	**Resistance to mechanical stress (M)** Impact test after the classification time has been achieved			
	R, E and I behaviour were complied with despite the impact test	Impact 1	Impact 2	Impact 3
		yes	yes	yes

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4 Classification and direct field of application

4.1 Classification

This classification has been carried out in compliance with section 7.3. 2 of DIN EN 13501-2: 2010-02 .

The load-bearing, space-enclosing and thermally insulating solid wood wall construction (cross laminated timber) with asymmetrical planking/cladding on both sides according to section 2.2 is classified based on the fire resistance tests performed at both wall sides. The following combinations of performance parameters and classes are allowed. Other classifications are not allowed.

R	E	I	W	-	t	-	M	P	C	IncSlow	sn	ef	r
R	E	I	-		90		M	-	-	-	-	-	-

Fire resistance classification: REI 90-M

4.2 Direct field of application

This classification is valid for the following application conditions:

- Based on the evidence of the test performed at both sides, a classification up to REI 90-M applies to the unsymmetrical wall cross-section for the outside of the wall (plastered wood fibre insulating board) and for the inside of the wall (two-layer FERMACELL gypsum fibre board).
- The maximum permissible height of the wall construction is 3000 mm.
- The minimum wall thickness is t ≥ 279 mm.
- The width of the wall can be increased.
- The number of horizontal joints may be increased if the joints are designed as butt joints according to the test reports PB 3.2/15-222-1 and PB 3.2/14-406-1.
- The joints must be designed according to the tested type.
- The thicknesses of the material used may be increased.
- The reduction of the length dimensions of planking or cladding layers.
- The gaps between the fixings may be reduced.
- The cross laminated timber construction must be designed at least according to the tested construction including all design details.
- The maximum superimposed load of 100 kN/m may be reduced.
- Fittings may be used (design in accordance with section 2.2).

5 Limitations

This classification report is not a type approval or certification of the product. It does no replace any building authority certificate that may be necessary according to German building laws (state building code) and is only valid in conjunction with the corresponding test report.

It is the responsibility of the certification body to check whether the relevant test and classification standards are valid and/or that no significant changes have been made that may have an effect on the safety level.

Leipzig, 08 December 2015

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