Deutsches Institut für Bautechnik

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Technical authority granting approvals and permits for construction products and construction techniques

General construction technique permit

Date: 26 Sep 2024

Reference number: I 54-1.9.1-21/24

Number:
Z-9.1-905

Validity
from: **26 September 2024**
to: **12 August 2027**

Applicant:
HASSLACHER Holding GmbH
Feistritz 1
9751 SACHSENBURG
AUSTRIA

Subject of decision:
Wall and floor elements using HASSLACHER CROSS LAMINATED TIMBER elements

The subject named above is herewith granted a general construction technique permit (*allgemeine Bauartgenehmigung*).
This decision contains eleven pages and five annexes.
This general construction technique permit replaces general construction technique permit no. Z-9.1-905 of 12 August 2022. The subject concerned was granted approval for the first time on 12 August 2022.

Translation authorised by DIBt

I GENERAL PROVISIONS

1 The general construction technique permit confirms the fitness for application of the subject concerned within the meaning of the Building Codes of the federal states (*Landesbauordnungen*).

2 This decision does not replace the permits, approvals and certificates required by law for carrying out construction projects.

3 This decision is granted without prejudice to the rights of third parties, in particular private property rights.

4 Notwithstanding further provisions in the 'Special Provisions', copies of this decision shall be made available to the installer of the subject concerned. Furthermore, the installer of the subject concerned shall be made aware of the fact that this decision must be made available at the place of application. Upon request, copies of the decision shall be provided to the authorities involved.

5 This decision shall be reproduced in full only. Partial publication requires the consent of DIBt. Texts and drawings in promotional material shall not contradict this decision. In the event of a discrepancy between the German original and this authorised translation, the German version shall prevail.

6 This decision may be revoked. The provisions contained herein may subsequently be supplemented and amended, in particular if this is required by new technical findings.

7 This decision is based on the information and documents provided by the applicant on the subject concerned during the permit procedure. Alterations to the information on which this general construction technique permit was based are not covered by this decision and shall be notified to DIBt without delay.

II SPECIAL PROVISIONS

1 Subject concerned and field of application

The subject of the permit is the planning, design and execution of wall and floor elements using HASSLACHER CROSS LAMINATED TIMBER elements in accordance with the European Technical Assessment ETA-12/0281 of 27 March 2024.

The following provisions apply to wall and floor elements using HASSLACHER CROSS LAMINATED TIMBER CL26E11.8 and CL36E14.7 elements made of spruce (*Picea Abis*) or fir (*Abies alba*) in accordance with ETA-12/0281 with product performances as specified in Annex 2, Tables 2 and 3 of the ETA.

The following fasteners are used between two cross-laminated timber elements and between cross-laminated timber elements and adjacent elements: split ring connectors, shear plate connectors, toothed-plate connectors, dowels, bolts, screws and nails.

This general construction technique permit applies to floor and wall elements exposed to static and quasi-static loads that are used in the climatic ambient conditions of service classes 1 and 2 in accordance with DIN EN 1995-1-1. The cross-laminated timber elements may be loaded both perpendicular to the element plane and in the element plane. Fatigue-relevant loads shall be excluded.

With appropriate verification and in compliance with the provisions in Section 2.3.5, the construction techniques for the erection of fire-resistant wall and floor elements - using HASSLACHER CROSS LAMINATED TIMBER elements - may be used wherever, in accordance with the building regulations,

- fire-retardant (*feuerhemmend*)[1] elements are required or
- elements which, in deviation from highly fire-retardant (*hochfeuerhemmend*)[1] or fire-resistant (*feuerbeständig*)[1] elements, are permitted to be made of combustible (*brennbar*) building materials.

  The verification of resistance to fire was carried out on the condition that these construction techniques comply with the 'Model Guideline on Fire Protection Requirements for Structural Elements and External Wall Cladding in Wooden Construction (*MHolzBauRL*)'[2].

The verification of the connections in case of fire between the elements and towards other elements is not covered by this general construction technique permit.

The use of chemical substances (wood preservatives and fire retardants) in these elements is likewise not covered by this general construction permit.

2 Provisions for planning, design and execution

2.1 General

Unless otherwise specified below, the Technical Building Rules, in particular DIN EN 1995-1-1 in conjunction with DIN EN 1995-1-1/NA, shall apply to the planning, design and execution of the floor and wall elements using HASSLACHER CROSS LAMINATED TIMBER elements.

[1] Regulatory requirements, classes and required performance data in accordance with Technical Rule A 2.2.1.2 (Annex 4) of the Model Administrative Provisions - Technical Building Rules (*MVV TB*), 2021/1 edition, see www.dibt.de

[2] 'Model Guideline on Fire Protection Requirements for Structural Elements and External Wall Cladding in Wooden Construction – Model Timber Construction Guideline (*MHolzBauRL*)', October 2020 version, see www.dibt.de

2.2 Planning – Components and properties

2.2.1 General

All properties of the cross-laminated timber relevant to planning, such as the reaction to fire class of the cross-laminated timber elements, can be found in the declaration of performance on the basis of ETA-12/0281.

2.2.2 Fasteners

The following fasteners shall be used to create connections with the cross-laminated timber elements:

- split ring connectors, shear plate connectors, toothed-plate connectors in accordance with DIN EN 912 and DIN EN 14545,
- profiled nails, smooth shank nails, screws, dowels and bolts in accordance with DIN EN 14592,
- self-tapping screws in accordance with European Technical Assessment based on EAD 130118-01-0603.

The following provisions shall be observed when planning the connections:

- Connections created by nails or staples with a diameter of less than 4 mm shall have at least 4 fasteners; connections in a row parallel to the grain direction of the cross layers shall be offset by e = 10 mm.
- Axially loaded nails shall comply with load-bearing capacity class 3 in accordance with DIN EN 1995-1-1/NA:2013-08, Table NA.16.
- Laterally or axially loaded timber screws shall have an outer thread diameter of at least 4 mm in the wide faces of the cross-laminated timber and of at least 6 mm in the narrow faces.
- For the minimum spacings, minimum thicknesses, minimum board layer thicknesses and minimum penetration lengths, please refer to Annexes 1 and 2.

2.2.3 Joint sealing of floor elements with fire resistance requirements

For the special connection of the cross-laminated timber elements to each other by means of a rebate board - when executed as a floor - the following construction products shall be used to seal the joints:

- a flammable (*normalentflammbar*) rebate board in accordance with DIN EN 13986, dimensions: 110 mm (width) x 27 mm (thickness), made of
  - a multi-layer solid wood panel in accordance with DIN EN 13353, density $\rho_k \geq 420$ kg/m³, or
  - laminated veneer lumber (LVL) in accordance with DIN EN 14279, density $\rho_k \geq 480$ kg/m³, or
  - plywood in accordance with DIN EN 636, density $\rho_k \geq 400$ kg/m³

in conjunction with

- self-tapping screws in accordance with DIN EN 14592 or a European Technical Assessment based on EAD 130118-01-0603 with a nominal diameter of d ≥ 5.0 mm and a length of ≥ 55 mm and
- a 60 mm wide, at least flammable[1] adhesive tape suitable for the scopes of DIN 4108-7 and DIN 4108-11.

2.3 Design

2.3.1 General

The floor and wall elements shall be designed with the characteristic strength and stiffness values of the solid timber in accordance with the declaration of performance and Annex 2 of ETA-12/0281.

The values of DIN EN 1995-1-1 for the layer material concerned shall be used as calculation values for the modification factor k_{mod} and the deformation factor k_{def} of the individual layers.

The partial safety factor γ_M for strength and stiffness properties shall be taken as γ_M = 1.3 in accordance with DIN EN 1995-1-1/NA. For a design relating to the rolling shear strength $f_{v,9090,k}$, the partial safety factor γ_M shall be multiplied by a factor of 1.36.

2.3.2 Actions perpendicular to the element plane (panel stress)

The stress distribution within the element shall be calculated taking into account the shear deformation of the cross layers.

For simply supported cross-laminated timber elements with up to 5 layers, the stress distribution may be calculated in accordance with DIN EN 1995-1-1, Annex B as a mechanically jointed beam, where the value s_i / K_i is replaced by $\overline{t_i}$/(G9090, mean·b).

where:

$\overline{t_i}$ = thickness of the cross layer

$G_{9090,mean}$ = 50 N/mm² = mean value of the shear modulus of the cross layer

b = width of the cross layer

2.3.3 Actions in the element plane

The moment of inertia and section modulus as well as the shear strength shall be calculated in accordance with Annex 3 of ETA-12/0281.

In the case of actions in the element plane, only those layers with a grain direction parallel to the force component under consideration may be taken into account.

For bending strength verification, the design bending strength value of a layer of boards may be multiplied by a system strength factor k_ℓ :

$$k_l = min\begin{cases}1 + 0.025 \cdot n \\ 1.2\end{cases}$$ where n = number of longitudinal layers

2.3.4 Connections

The characteristic load-bearing capacities of connections with mechanical fasteners in the elements shall be determined in accordance with DIN EN 1995-1-1 in conjunction with DIN EN 1995-1-1/NA or in accordance with the national technical approval or European Technical Assessment granted / issued for the relevant fastener as for softwood or glued laminated softwood timber, taking into account the following provisions.

Wide faces are the surfaces of the element parallel to the element plane consisting of the surface of the outer layers.

Narrow faces are the lateral and the cross grain board surfaces perpendicular to the plane of the element.

If the position of the fasteners in the narrow faces is not clearly defined (gaps between the single boards, end grain, etc.), the most unfavourable case shall be assumed.

The following provisions shall apply:

1. Nails

   The nails shall have a diameter of at least 2.8 mm.

   <u>Wide faces:</u>

   The characteristic value of the load-bearing capacity of laterally loaded nails in the wide faces shall be determined in accordance with DIN EN 1995-1-1 in conjunction with DIN EN 1995-1-1/NA. The grain direction of the cover layers shall be decisive for the minimum spacing. The characteristic density of the cover layers shall be decisive for the density.

The effective number of nails n_{ef} in line parallel to the grain may be set equal to the actual number.

Narrow faces:

Nails in the narrow faces of the elements shall not be considered load-bearing.

2. Screws

The outer thread diameter shall be used as the decisive diameter d of the screw. The penetration depth shall be at least 4 d.

Laterally or axially loaded screws in the wide faces shall have an outer thread diameter of at least 4 mm, and of at least 6 mm in the narrow faces.

Laterally loaded screws in wide faces

The load direction shall be perpendicular to the screw axis and parallel to the wide face of the cover layers.

The characteristic load-bearing capacity of laterally loaded screws in the wide faces shall be determined in accordance with DIN EN 1995-1-1 in conjunction with DIN EN 1995-1-1/NA.

The characteristic value of the wood of the cover layers shall be used for density.

The grain direction of the cover layers shall be decisive for the minimum spacing.

For laterally loaded screws in the wide faces, the embedment strength value can be determined as for nails in solid timber in accordance with DIN EN 1995-1-1. The characteristic value of the wood of the cover layers shall be used for density.

The effective number of screws n_{ef} may always be set equal to the actual number n.

Laterally loaded screws in narrow faces

The load direction shall be perpendicular to the screw axis and parallel to the narrow face of the cross laminated timber.

Irrespective of the arrangement of a screw in the narrow face (i.e. under angles $0° \leq \alpha \leq 90°$ between screw axis and grain direction), the characteristic value of the embedment strength may be calculated as follows:

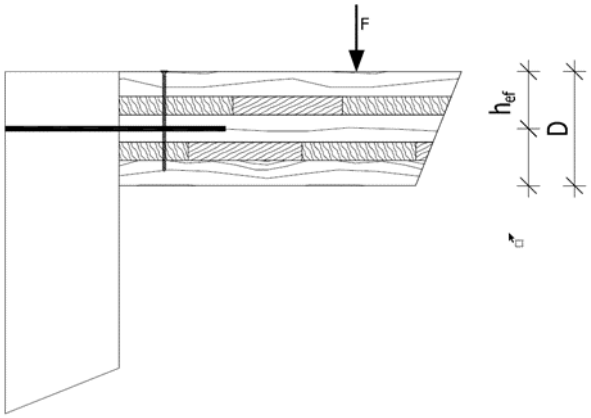
$$f_{h,k} = 20\ d^{-0.5} \quad \text{in N/mm}^2 \qquad (1)$$

where d = outer thread diameter of the screw in mm

The effective number of screws n_{ef} may be assumed as for bolts in solid timber in accordance with DIN EN-1995-1-1.

Note:

If a force component is oriented perpendicular to the wide face, there is a risk of a failure due to tension perpendicular to the grain. If the ratio h_{ef}/D is not greater than 0.7, a calculation due to tension perpendicular to the grain shall be required. In this case, it is recommended to prevent this failure by reinforcing with fully threaded screws parallel to the narrow face.



Withdrawal (pull-out)

The characteristic axial withdrawal capacity for screws in the wide faces shall be determined in accordance with DIN EN 1995-1-1 in conjunction with DIN EN 1995-1-1/NA, Clause 8.7.2, or in accordance with a national technical approval or a European Technical Assessment based on EAD 130118-01-0603 granted / issued for the fastener.

For angles $\alpha < 15°$ between screw axis and grain direction, screws may only be stressed in the 'short' and 'very short' load duration classes. This applies only to screws with a national technical approval or European Technical Assessment based on EAD 130118-01-0603, which include load-bearing capacities for an angle $\alpha < 15°$ between screw axis and grain direction.

Screws oriented parallel to the wide face of the cross-laminated timber shall be completely arranged within one layer. The thickness of the layer shall not be less than the outer thread diameter d of the screw.

The characteristic pull-through strength of the screw head shall be determined as for solid timber using the characteristic density of the layer at the head side of the screw.

3. Split ring connectors, shear plate connectors and toothed-plate connectors

Wide faces

The characteristic value of the load-bearing capacity of split ring connectors, shear plate connectors and toothed-plate connectors in the wide faces shall be determined in accordance with DIN EN 1995-1-1 in conjunction with DIN EN 1995-1-1/NA for $\alpha = 0°$, regardless of the angle between the force direction and grain direction of the cover layers.

When inserting split ring connectors, shear plate connectors and toothed-plate connectors into the wide faces, a minimum board thickness of 18 mm shall be observed for the cover layer.

Narrow faces

For inserting split ring connectors and toothed-plate connectors into the narrow faces, the provisions on connections in the end grain of timber elements in accordance with DIN EN 1995-1-1/NA, NCI NA.8.11 apply.

4. Dowelled and bolted connections

Wide faces

The characteristic load-bearing capacity of dowelled or bolted connections in the wide faces shall be determined in accordance with DIN EN 1995-1-1 in conjunction with DIN EN 1995-1-1/NA.

The characteristic embedment strength may be determined in accordance with equation (2):

$$f_{h,\alpha,k} = \frac{32 \cdot (1 - 0.015 \cdot d)}{1.1 \cdot \sin^2 \alpha + \cos^2 \alpha} \quad \text{in N/mm}^2 \qquad (2)$$

where:

d nominal diameter of the fastener in mm

α angle between force direction and grain direction of the cover layer

The grain direction of the cover layers shall be decisive for the embedment strength calculation.

For dowelled connectors with a diameter ≥ 10 mm, $n_{ef} = n$ may be used.

Narrow faces

The characteristic load-bearing capacity of dowelled or bolted connections in the faces shall be determined using the embedment strength in accordance with equation (3).

$$f_{h,k} = 9 \cdot (1 - 0.017 \cdot d) \quad \text{in N/mm}^2 \qquad (3)$$

where:

d nominal diameter of the fastener in mm

Note:

If a force component is oriented perpendicular to the wide face, there is a risk of a failure due to tension perpendicular to the grain. If the ratio h_{ef}/D is not greater than 0.7, a calculation due to tension perpendicular to the grain shall be required. In this case, it is recommended to prevent this failure by reinforcing with fully threaded screws parallel to the narrow face.

2.3.5 Fire protection

2.3.5.1 Load-bearing resistance in case of fire

Load-bearing resistance in case of fire shall be verified in accordance with Annex 2. The fire resistance required by the building authorities related to the resistance is specified by means of the duration of the verified fire resistance of 30, 60 or 90 minutes.

2.3.5.2 Verification of fire resistance for fire exposure from the top of the floor

Resistance to fire for fire exposure from the top (fire from top to bottom) is considered verified with the floor structures specified in Table 1.

Table 1:

Mineral wool[a] or expanded perlite[b]	Wood-based panels[c], parquet, boards[d]	Gypsum plasterboards, gypsum fibre boards[e]	Floor screed[f] or non-combustible[1] prefabricated screed panels, anhydrite screed or mastic asphalt
Minimum thicknesses in mm			
for floor elements with a fire resistance duration of 30 minutes			
15	16	-	-
15	-	9.5	-
15	-	-	20
for floor elements with a fire resistance duration of 60 minutes			
30	25	-	-
15	-	18	-
15			20
-	-	-	30
for floor elements with a fire resistance duration of 90 minutes			
15	-	-	30
-	-	-	40

[a] Mineral wool in accordance with DIN EN 13162, non-combustible (*nichtbrennbar*)[1], density $\rho_k \geq 30$ kg/m³, melting point ≥ 1000°C

[b] Expanded perlite in accordance with DIN EN 13169, non-combustible[1], density $\rho_k \geq 130$ kg/m³

[c] Wood-based panel in accordance with DIN EN 13986, flammable[1], density $\rho_k \geq 600$ kg/m³

[d] Boards in accordance with DIN 4072, density $\rho_k \geq 430$ kg/m³

[e] Gypsum plasterboards in accordance with DIN EN 520, non-combustible[1] or gypsum fibre boards in accordance with DIN EN 15283-2 or European Technical Assessment, non-combustible[1], density[3] $\rho_k \geq 1000$ kg/m³

[f] Floor screed in accordance with DIN EN 13813 and DIN 18560-1, non-combustible[1]

2.3.5.3 Separating function

The separating function was verified in the regulatory procedure under the following boundary conditions:

- the load-bearing capacity under fire exposure was verified for the cross-laminated timber element concerned in accordance with Section 2.3.5.1
- the element connections are at least 20 mm inside the dimensioned, residual cross-section (see Annex 3)
- the cross-laminated timber element connections and element connections are executed in accordance with the *MHolzBauRL*[2]
- the element joints in floor elements may be executed with a rebate board in accordance with Section 2.2.3, in conjunction with a corresponding floor structure in accordance with Section 2.3.5.2, and in accordance with Section 2.4.2.

[3] In the regulatory procedure, the verification was carried out with gypsum fibre boards having a density $\rho_k \geq 1000$ kg/m³.

2.3.6 Moisture, sound and thermal insulation

If the regulations, standards and guidelines of the Technical Building Rules for moisture, sound and thermal insulation of the construction technique do not contain any specifications for cross-laminated timber, the provisions for solid softwood timber may be applied.

2.4 Execution as fire-resistant elements

2.4.1 General

For the execution of cross-laminated timber elements as fire-resistant wall and floor elements, the provisions of *MHolzBauRL*[2] shall be observed for elements which, in deviation from highly fire-retardant[1] or fire-resistant[1] elements, are permitted to be made of combustible building materials.

When constructing floor elements made of cross-laminated timber elements, a floor structure in accordance with Section 2.3.5.2 may be used instead of a fire-protective cladding arranged on the top side as given in MHolzBauRL[2]. A non-combustible[1] floor screed divider shall be placed over the entire height of the floor structure in the area where rising elements are connected.

2.4.2 Element joints in floors

Where element joints are executed with a rebate board, the cross-laminated timber elements shall be aligned side by side and butted together.

The rebate board in accordance with Section 2.2.3 shall be arranged over the entire length of the element joint and fastened with the associated self-tapping screws in accordance with Section 2.2.3, spaced ≤ 300 mm apart. All joints shall be sealed tightly with adhesive tape in accordance with Section 2.2.3.

If these element joints are executed, the floor made of cross-laminated timber elements shall be executed with a floor structure in accordance with Section 2.3.5.2.

2.5 Declaration of conformity

The executing company shall provide a declaration of conformity in accordance with Section 16a(5) in conjunction with Section 21(2) of the Model Building Code to confirm the conformity of the construction technique with the general construction technique permit. If fire resistance requirements are to be met, the fire resistance duration determined shall be indicated in the declaration of conformity.

The following standards and references are referred to in this decision:

DIN EN 520:2009-10	Gypsum plasterboards – Definitions, requirements and test methods
DIN EN 636:2015-05	Plywood – Specifications
DIN EN 912:2011-09	Timber fasteners - Specifications for connectors for timbers
DIN EN 1365-2:2015-02	Fire resistance tests for loadbearing elements - Part 2: Floors and roofs
DIN EN 1995-1-1:2010-12	Eurocode 5: Design of timber structures – Part 1-+A2:2014-07 1: General – Common rules and rules for buildings
DIN EN 1995-1-1/NA:2013-08	National Annex – Nationally determined parameters – Eurocode 5: Design of timber structures – Part 1-1: General – Common rules and rules for buildings
DIN EN 1995-1-2:2010:12	Eurocode 5: Design of timber structures – Part 1-2: Common Rules – Structural fire design

DIN EN 1995-1-2/NA:2010-12	National Annex – Nationally determined parameters – Eurocode 5: Design of timber structures – Part 1-2: Common Rules – Structural fire design
DIN EN 13162:2015-04	Thermal insulation products for buildings – Factory made mineral wool (MW) products – Specification
DIN EN 13169:2015-04	Thermal insulation products for buildings – Factory made expanded perlite board (EPB) products – Specification
DIN EN 13353:2011-07	Solid wood panels (SWP) – Requirements
DIN EN 13813:2003-01:	Screed material and floor screeds – Screed material – Properties and requirements
DIN EN 13986:2015-06	Wood-based panels for use in construction – Characteristics, evaluation of conformity and marking
DIN EN 14279:2009-07	Laminated Veneer Lumber (LVL) – Definitions, classification and specifications
DIN EN 14374:2005-02	Timber structures – Structural laminated veneer lumber – Requirements
DIN EN 14545:2009-02	Timber structures – Connectors – Requirements
DIN EN 14566:2009-10	Mechanical fasteners for gypsum plasterboard systems - Definitions, requirements and test methods
DIN EN 14592:2012-07	Timber structures – Dowel-type fasteners – Requirements
DIN EN 15283-2:2009-12	Gypsum boards with fibrous reinforcement – Definitions, requirements and test methods – Part 2: Gypsum fibre boards
DIN 4072:2019-04	Boards tongued and grooved made of coniferous timber
DIN 4102-4:2016-05	Reaction to fire of building materials and building components; Part 4: Synopsis and application of classified building materials, components and special components
DIN 4108-7:2011-01	Thermal insulation and energy economy in buildings – Part 7: Air tightness of buildings – Requirements, recommendations and examples for planning and performance
DIN 4108-11:2018-11	Thermal insulation and energy economy in buildings – Part 11: Minimum requirements to the durability of bond strength with adhesive tapes and adhesive masses for the establishment of airtight layers
DIN 18560-1:2021-02	Floor screeds in building construction – Part 1: General requirements, testing and construction
MBO Building Code	Model Administrative Provisions – Technical Building Rules (MVV TB), 2021/1 edition, see www.dibt.de

Anja Dewitt
Head of Section

Drawn up by
Deniz

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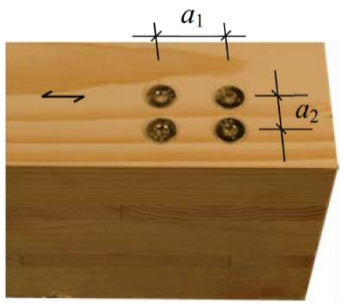
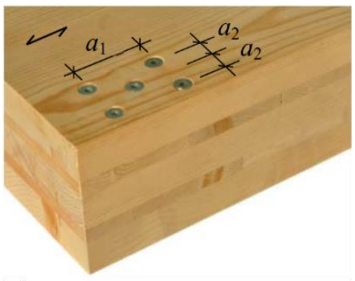
Minimum spacings of fasteners

Minimum spacings of fasteners in the wide faces

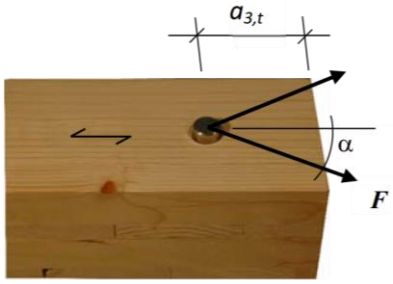
Spacing to spacing – parallel and perpendicular to the grain



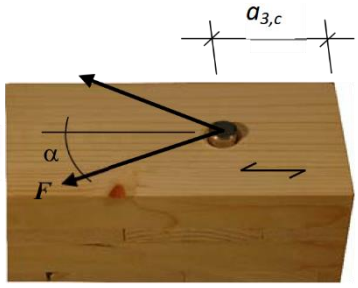


Edge and end distances

Loaded end $a_{3,t}$



Unloaded end $a_{3,c}$



Unloaded edge $a_{4,c}$
Loaded edge $a_{4,t}$

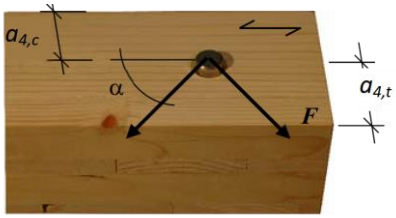


Table 3a: Minimum spacings of fasteners in the wide faces

Fasteners	a_1	a_2	$a_{3,t}$	$a_{3,c}$	$a_{4,t}$	$a_{4,c}$
Screws [1)]	4·d	2.5·d	6·d	6·d	6·d	2.5·d
Nails	(3+3·cosα)·d	3·d	(7+3·cosα)·d	6·d	(3+4·sinα)·d	3·d
Dowels	(3+2·cosα)·d	3·d	5·d	4·d·sinα min. 3·d	3·d	3·d
Bolts	(3+2·cosα)·d min. 4·d	4·d	5·d	min. 4·d	3·d	3·d
α angle between force direction and grain direction of the cover layers [1)] self-tapping screws						

Wall and floor elements using HASSLACHER CROSS LAMINATED TIMBER elements	Annex 1.1
Fasteners	

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Minimum spacings, minimum thicknesses, minimum layer thicknesses and minimum penetration lengths of fasteners in the narrow faces

The minimum spacings in the narrow faces are independent of the angle between fastener axis and grain direction.

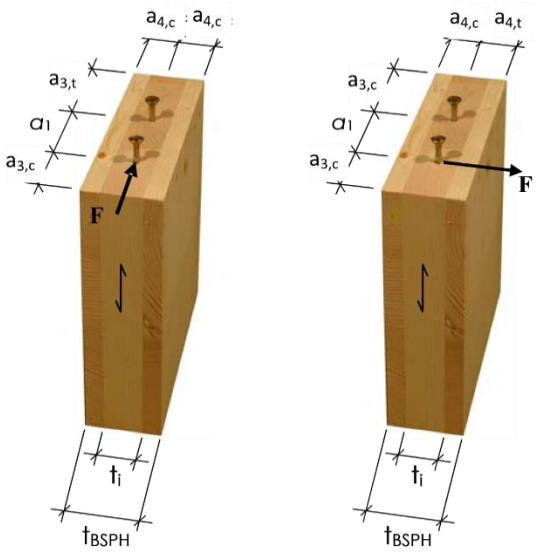

Table 3b: Minimum spacings of fasteners in the narrow faces

	a_1	$a_{3,t}$	$a_{3,c}$	a_2	$a_{4,t}$	$a_{4,c}$
Screws [1)]	10·d	12·d	7·d	3·d	6·d	5·d
Dowels	4·d	5·d	3·d	3·d	5·d	3·d
Bolts	4·d	5·d	4·d	4·d	5·d	3·d
[1)] Self-tapping screws						

Table 3c: **Minimum layer thicknesses, minimum thicknesses and minimum penetration lengths of fasteners in the narrow faces**

Fasteners	Minimum thickness of the cross-laminated timber	Minimum thickness of the relevant layer	Minimum penetration lengths of the fasteners t1 or t2 *)
	t_{BSP} in mm	t_i in mm	in mm
Screws [1)]	10·d	d > 8 mm: 3·d d ≤ 8 mm: 2·d	10·d
Dowels Bolts	6·d	d	5·d

*) t_1 Minimum penetration length of the fastener in side members (members to be connected)
t_2 Minimum penetration length of the fastener in middle members (cross-laminated timber elements)
[1)] self-tapping screws

Wall and floor elements using HASSLACHER CROSS LAMINATED TIMBER elements	Annex 1.2
Fasteners	

Provisions for designing the load-bearing resistance in case of fire

1. General

Load-bearing resistance of elements in case of fire in accordance with this general construction technique permit using cross-laminated timber elements made of spruce or fir in accordance with ETA 12/0281 dated 27 March 2024 may be verified on the basis of DIN EN 1995-1-2 in conjunction with DIN EN 1995-1-2/NA. The cross-sectional load-bearing resistance of the elements shall be determined using the reduced cross-section method in accordance with the provisions below.

The verification of the connections in case of fire between the elements and towards other elements is not covered by this general construction technique permit. This also applies to the connections and fasteners described in the text part of this construction technique permit.

2. Charring of the cross-laminated timber

The following charring rates shall be applied to determine the notional charring depth in accordance with DIN EN 1995-1-2 for unprotected horizontal and vertical elements made of cross-laminated timber (floors, roofs and walls) as described in this general construction technique permit:

- In the first layer, the design value of the one-dimensional charring rate β_0 in accordance with ETA-12/0281, Annex 2, Table 3, may be set at $\beta_0 = 0.65$ mm/min.
- In subsequent layers, the value $\beta_n = 0.8$ mm/min shall be used as the design value of the notional charring rate for the first 25 mm and, from a depth of 25 mm, the simple design value $\beta_0 \geq 0.65$ mm/min until the next adhesive joint is reached.

For initially protected elements made of cross-laminated timber (vertical and horizontal elements), the provisions of Clause 3.4.3 of DIN EN 1995-1-2 apply in conjunction with the afore-mentioned supplements. The protective effect of the cladding and its influence on the charring behaviour of the layers behind it shall be taken into account.

Once the cladding exposed to the fire has failed, the value of $\beta_n = 1.3$ mm/min shall be used as the design value for the notional charring rate for the first layer of the cross-laminated timber until a charring depth of 25 mm is reached.

To determine the effective charring depth d_{ef} in accordance with DIN EN 1995-1-2, Equation (4.1), $d_0 = 7$ mm shall be assumed for protected and unprotected cross-laminated timber elements in case of fire exposure on one side.

For fire exposure on the narrow faces of the cross-laminated timber elements, the charring rate of $2 \cdot \beta_n$ shall be taken into account relative to the surface area. There is no need to consider the influence of the corner rounding here. The protective effect of claddings may be included in the calculation of the charring depth.

3. Verification of the cross-sectional load-bearing resistance

The load-bearing resistance verification for cross-laminated timber elements shall be carried out using the above charring rates β_n with the effective cross-section in accordance with DIN EN 1995-1-2, Clause 4.2.2.
A factor of k_{fi} = 1.15 shall be assumed for determining the 20% quantile of the strength or stiffness property of cross-laminated timber:

The remaining outer layer of the effective cross-section exposed to the fire may be taken into account for the load-bearing resistance verification with its remaining thickness, provided that this thickness is at least 5 mm (see also Fig. 1 for an example of the 1st layer).

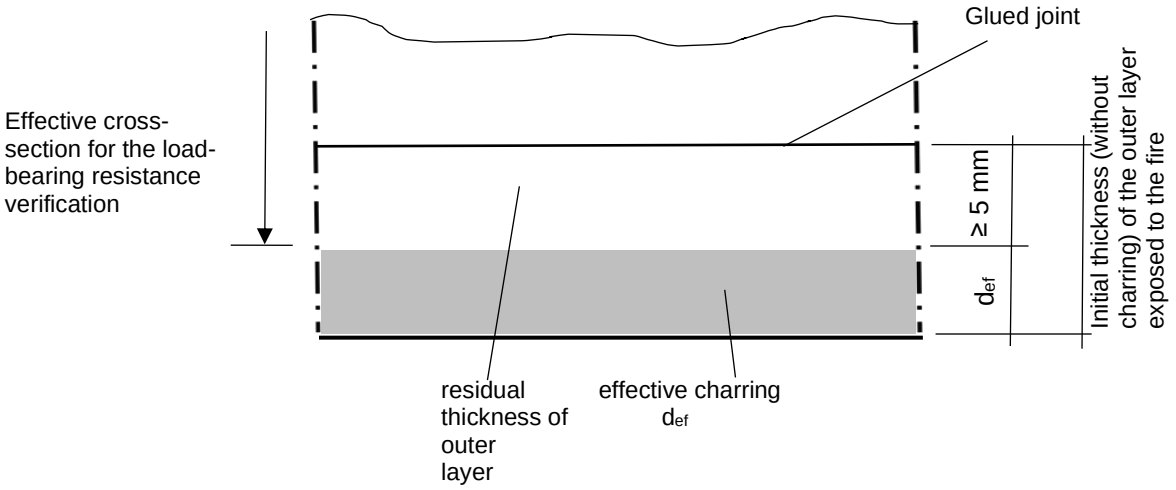

Figure 1: Example of the residual thickness of the outer layer exposed to the fire

Wall and floor elements using HASSLACHER CROSS LAMINATED TIMBER elements	Annex 2.2
Provisions for designing the load-bearing resistance in case of fire	

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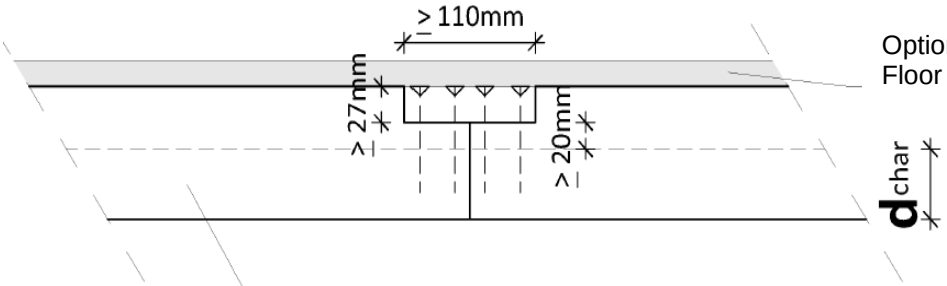

Optional additional cladding
Floor structure etc.

HASSLACHER CROSS LAMINATED TIMBER element

Wall and floor elements using HASSLACHER CROSS LAMINATED TIMBER elements	Annex 3
Execution of the element joints with a rebate board	