MM crosslam

Cross-laminated timber

WHERE IDEAS CAN GROW.

Mayr-Melnhof Holz Holding AG is one of the leading companies in the timber-processing industry in Europe, a major producer of glued laminated timber, and a driving force in the advance of cross-laminated timber, the material for buildings of the future. Only with strong roots you can grow and flourish; processing timber exclusively from sustainably managed forests, the roots of the Mayr-Melnhof Holz group of companies go back to 1850. Secure raw material supply, chain of custody traceability, transparent product quality assurance and ongoing process optimization are the foundations of more than 170 years of reliability and product quality at Mayr-Melnhof Holz.

Products of Mayr-Melnhof Holz

MM masterline
Glued-laminated timber

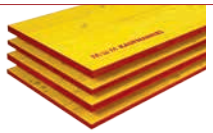
MM vistaline
Duo-/Trio beams

MM profideck
Glulam ceiling elements

MM blockdeck
Floor and wall beams

MM HBE
Solid timber construction element

MM crosslam
Cross-laminated timber



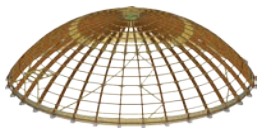
K1 yellowplan
Formwork panels

HT 20plus
Formwork beams

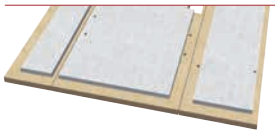
MM sawn timber

MM royalpellets

Custom elements & engineering solutions



MM complete
Timber engineering & turn-key construction
by HUTTEMANN



Timber-concrete composite element
by MMK

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MM crosslam

Cross-laminated timber (CLT)

The solid wood building material for our future – Developed for use in timber structures

MM crosslam is a solid, statically effective and at the same time space-building wood element suitable for any structural requirement thanks to its flexible dimensions and excellent structural and physical properties.
The crosswise build-up encompassing three to nine layers of high-quality softwood lamellas ensures dimensionally stable and rigid components with extremely low dead weight thanks to structural bonding. Simple connection details ensure economical application in all areas of construction.

Benefits

- Free forms and multiple dimensions
- High load-bearing capacity with low dead weight in comparison to its bulk density
- Excellent dimensional stability
- High degree of prefabrication leads to easy, low-noise and low-dust installation and short construction times
- Large spans
- Space gain due to low thicknesses
- Solid, value-retaining construction with high-quality visible wooden surface
- Excellent sound insulation
- Flexible design without grid pattern
- Precise customisation for individual project requirements

Components

- Walls
- Ceilings
- Roof structures
- Beams
- System elements

Areas of application

- Single and multi-family homes
- Multi-storey residential housing
- Modular and temporary buildings
- Municipal buildings such as kindergartens, schools and nursing homes
- Commercial, office and industrial buildings
- Agricultural buildings
- Buildings for tourism, such as hotels and restaurants
- Recreational facilities, such as gymnasiums

PEFC
PEFC/06-38-79
Promoting Sustainable Forest Management
www.pefc.org

European Technical Assessment
ETA-09/0036

Quality seal for ecologically sound construction*
(IBR Rosenheim)

*Valid only for spruce and fir.

Facts MM crosslam:

Wood species

- Spruce
- Additional wood species on request

Surfaces

- Non-visible (NVI)
- Industrial-visible (IVI)
- Residential-visible (RVI)

Dimensions

Format PUR

- Thickness: 60 mm – 320 mm
- Height: 2.4 m – 3.5 m
- Length: max. 16 m

Format MUF

- Thickness: 60 mm – 300 mm
- Height: 2.4 m – 3.0 m
- Length: max. 16.5 m

Strength class

- C24/T14

Technical approval

- European Technical Assessment ETA-09/0036

Combined structures

- Timber-concrete composite prefabricated components
- Rib and box elements

Ecological, individual and ready for immediate use

The trend towards ecological construction is increasingly prompting architects and engineers to use the natural building material wood as an architectural element in a wide variety of construction projects. Good for the climate, good for all of us!

The areas of application of MM crosslam range from individually designed single-family homes to large construction projects. With large-format cross-laminated timber panels, even special static challenges can be executed effortlessly.

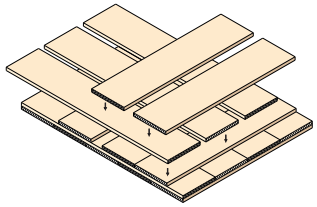
MM crosslam raw panels are precisely manufactured to the individual project specifications in our plant's own processing facility using modern CNC machines. The high degree of prefabrication and the flexible dimensions of the cross-laminated timber elements enable quick, straightforward and low-dust erection on the construction site. Its wide range of design possibilities meets the needs of both modern architecture and traditional architectural styles.

Technical data

MM crosslam is a large-format solid wood panel with a multi-layer, crosswise build-up.

Structure and manufacture

Finger-jointed and planed boards are laid next to each other, stacked crosswise (at 90 degrees) and glued together on their wide faces. The cross-section consists of at least three layers of boards with a typical symmetric layup. The single board layers are pushed together laterally before applying the required pressure in order to obtain an almost gap-free surface. To avoid uncontrolled cracks the narrow sides of the lamellae are not structurally bonded.



Bonding

Depending on customer requirements, we offer adhesives based on melamine resin (MUF) or polyurethane (PUR). Both adhesive types are approved according to EN 301 and EN 15425 for the bonding of load-bearing wood components.

Service classes

MM crosslam is approved for the use in service classes 1 and 2 according to EN 1995-1-1.

Dimensions

PUR format	up to max. 3.5 m x 16 m
MUF format	up to max. 3.0 m x 16.5 m
Thicknesses	60 mm to 320 mm
Standard widths	2.40 m / 2.50 m / 2.65 m / 2.75 m 2.90 m / 3.00 m / 3.20 m / 3.50 m

Technical approval

European Technical Assessment ETA-09/0036

Wood species

Softwood (spruce/fir/pine) from domestic forests; additional wood species on request.

Lamellas

Technically dried, strength graded

Strength class of the lamellas

100% C24/T14 in the cover layer
Max. 30% C16/T11 permissible in the inner layers according to ETA-09/0036

Weight

Approx. 480 kg/m^3 for the determination of the transport weight

Moisture content

12% (± 2%) upon leaving factory

Dimensional stability

Panel length and width: 0,01 % per 1% change in moisture content
Thickness: 0,20 % per 1% change in moisture content

Thermal conductivity

λ = 0.10 W/mK
According to test report no. B12.162.008.450 TU Graz

Specific heat capacity

c_p = 1.60 kJ/kgK

Vapour permeability

μ = 60 (at 12% wood moisture content)

Air tightness

From 80 mm 3s RVI or NVI air-tight according to test report no B11.162.001.100 TU Graz or short report no. 575/2016-BB HFA.

Sound insulation

Excellent sound insulation due to solid construction. The values depend on the respective wall or ceiling structures - tested sample wall structures are available on request.

Fire behaviour

Euro class D-s2, d0 according to EN 13501

Fire resistance and charring rate

Examples with specified fire resistance are given in ETA-09/0036. Charring rates depend on the bonding system used (MUF, PUR) and are given in ETA-09/0036 for:

MUF bonding	Ceiling/roof	Wall
Cover layer	0.65 mm/min	0.60 mm/min
other layers	0.76 mm/min*	0.71 mm/min

PUR bonding	Ceiling/roof	Wall
Cover layer	0.65 mm/min	0.63 mm/min
other layers	1.30 mm/min*	0.86 mm/min

* Until 25 mm of charring. Afterwards the charring rate 0.65 mm/min applies to the next glue line.

Range of panel types and dimensions

Description		Layers	Build-up (NVI, IVI)*									Thickness	Weight	Standard widths	Length
MM crosslam			[mm]									[mm]	[kg/m²]	[m]	[m]
60***	3s	3				**20**	20	**20**				60***	29	2.40 2.50 2.65 2.75 2.90 3.00 3.20** 3.50**	max. 16.50 (MUF) max. 16.00 (PUR)
80	3s	3				**30**	20	**30**				80	38		
90	3s	3				**30**	30	**30**				90	43		
100	3s	3				**40**	20	**40**				100	48		
120	3s	3				**40**	40	**40**				120	58		
100	5s	5			**20**	20	**20**	20	**20**			100	48		
120	5s	5			**30**	20	**20**	20	**30**			120	58		
140	5s	5			**40**	20	**20**	20	**40**			140	67		
160	5s	5			**40**	20	**40**	20	**40**			160	77		
180	5s	5			**40**	30	**40**	30	**40**			180	86		
200	5s	5			**40**	40	**40**	40	**40**			200	96		
200	7ss	7		**20**	**40**	20	**40**	20	**40**	**20**		200	96		
220	7s	7		**40**	20	**40**	20	**40**	20	**40**		220	106		
220	7ss	7		**40**	**40**	20	**20**	20	**40**	**40**		220	106		
240	7s	7		**40**	20	**40**	40	**40**	20	**40**		240	115		
240	7ss	7		**40**	**40**	20	**40**	20	**40**	**40**		240	115		
260	7ss	7		**40**	**40**	30	**40**	30	**40**	**40**		260	125		
280	7ss	7		**40**	**40**	40	**40**	40	**40**	**40**		280	134		
300	9ss	9	**40**	**40**	20	**40**	20	**40**	20	**40**	**40**	300	144		
320**	8ss	8	**40**	**40**	40	**40-40**			40	**40**	**40**	320**	154		

Values in bold represent the main load-bearing direction of the panel. The main load-bearing direction may be in the longitudinal or transverse direction of the panel.
* In the case of RVI, the build-up may differ in individual cases.
** Can only be produced with PUR bonding.
*** Only pairwise production possible

Surface qualities

Non-visible quality (NVI)

Non-visible surfaces only meet the requirements for loadbearing capacity, serviceability and building physics. No visual requirements are specified for these surfaces. Therefore **subsequent cladding is recommended**.

- The top lamellae are only strength graded and fullfill the requirements on strength classes C24/T14 according to EN 338.
- Colour differences between individual lamellas (e.g., blue stains) as well as loose knots, bark ingrowth, and resin pockets are possible.
- Individual joints in the cover layer, glue penetration and individual pressure marks and contamination may occur.
- The surfaces of the cover layers are planed, not patched.

Symbolic image

Symbolic image

Symbolic image

Industrial-visible quality (IVI)

MMcrosslam with industrial quality surfaces is suitable for use in industrial areas, where the surface should remain visible and the client wants the natural appearance of wood. The surface is adapted for the **use in commercial and industrial settings**.

- In addition to the strength grading criteria, higher visual criteria are applied to the cover lamellas.
- Selected cover lamellas with healthy, firmly ingrown knots are used.
- Occasional loose knots and discolouration are possible, flaws and small resin pockets are permissible.
- The surface is sanded.

Symbolic image

Symbolic image

Symbolic image

Residential visible quality (RVI)

Residential visible quality is used for all surfaces that should remain visible and that have to meet special requirements in terms of homogeneous surface structure and lamella quality. This surface quality is particularly used in residential construction, school construction and office construction, where the client wants a homogeneous appearance with the natural material wood.

- Only raw material of the highest visual grades is used for this quality.
- The lamellas have a maximum thickness of 20 mm to ensure minimum gap widths in the cover layers.
- The surface is sanded. To avoid shrinkage cracks, narrow-sided structural bonding of lamellae is not being done.

Symbolic image

Symbolic image

Symbolic image

Quality definitions

Criteria	Non-visible (NVI)	Industrial-visible (IVI)	Residential visible (RVI)
Gap width*	Up to 4 mm	Up to 4 mm	Up to 2 mm
Surface finish	Planed, without further surface treatment	Sanded	Sanded
Wood species	Addition of other species possible	Addition of other species possible	One species; spruce/fir are deemed one wood type
Firmly ingrown knots	Permitted	Permitted	Permitted
Black, loose knots	No restrictions	Permitted in ind. cases	Permitted in ind. cases
Pitch pockets*	Permitted	Permitted up to 10 x 90 mm	Permitted up to 5 x 50 mm
Ingrown bark	Permitted	Permitted in ind. cases	Not permitted
Dry cracks*	Permitted	Permitted	Permitted in ind. cases
Wane	Permitted	Permitted in ind. cases	Not permitted
Voids	No requirements	Admissible in ind. cases, patches with wood	Admissible in ind. cases, patches with wood
Insect attack	2 mm holes admissible in ind. cases	Not permitted	Not permitted
Discolouration (e.g. blue stains)*	Permitted	Permitted in ind. cases	Not permitted
Compression wood, red stripes	Permitted	Permitted	Permitted in ind. cases

* Condition at time of delivery

Important notes

The defined surface qualities refer exclusively to the visible side (cover layer of solid wood lamellae) of the cross-laminated timber at a moisture content of 12%. Please note that **MM crosslam** is a natural product which may vary in appearance (colour, surface, etc.). Even with the most careful selection of the raw material, deviations in the wood structure, especially the surface texture, can occur. The appearance is determined by the visible panel surface of the cover layer. Over time, gaps may appear between the individual lamellae (e.g. due to to variations of ambient climate conditions). The outlined gap widths refer to the condition at the time of delivery. Surface cracks are product-specific and also possible in isolated cases as a result of conditioning to the equilibrium moisture content when in use.

Cut-outs and section cuts are partly produced with rotating milling tools.Depending on the direction of rotation of the tool, cracks may appear on the surface, especially when milling transverse to the grain direction. The client may incur additional costs for rework of visible surfaces due to improper installation, handling or storage at the construction site. **The surface qualities refer to one side** and can be combined in different ways. The following **quality criteria do not apply to narrow/end faces**. Please note that cross-laminated timber is a semi-finished product and further surface treatment on site is recommended.

Charged dimensions

Charging is performed on the basis of the following standard and charging widths and lengths. **The smallest rectangle circumscribed in each case is charged**, the minimum length is 6.2 m and the minimum width is 2.4 m.

Minimum format:	Maximum format:
2.40 x 6.20 m	3.50 x 16.50 m

Cut-outs and sections are ignored. The maximum charged length depends on the production line and refers to the bonding system used for surface bonding.

Limit dimensions

Maximum format PUR	3.5 m x 16.0 m
Maximum format MUF	3.0 m x 16.5 m
Minimum width	2.4 m
Minimum length	6.2 m

Charged widths

2.40 m / 2.50 m / 2.65 m / 2.75 m
2.90 m / 3.00 m / 3.20 m / 3.50 m

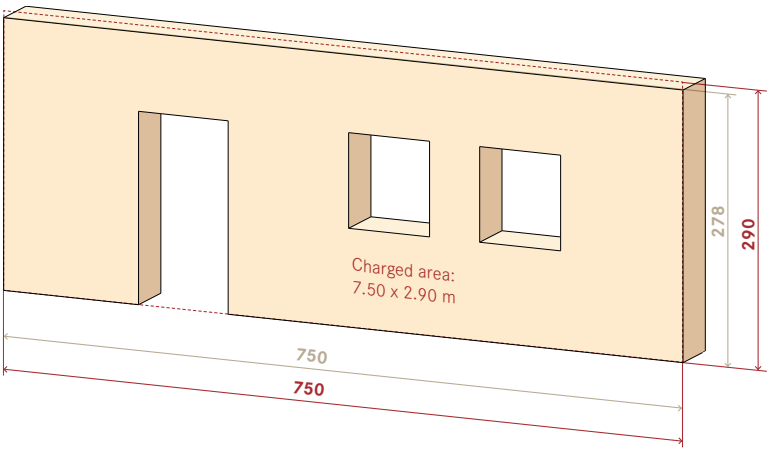
Charged lengths

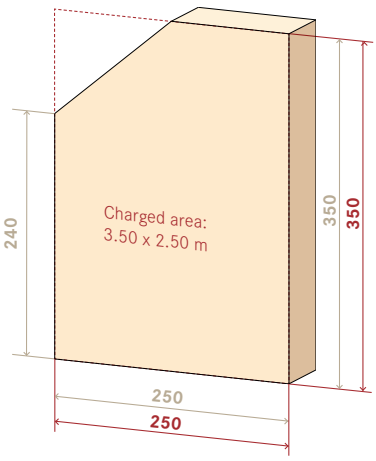
- PUR bonding: from 6.2 m to max. 16.0 m
- MUF bonding: from 6.2 m to max. 16.5 m

Bonding

Standard bonding by means of MUF.
PUR bonding at customer's request.

Charging example: Wall





Panel cutting & CNC machining services

The processing of the raw panel is automated using the most modern CNC (Computer Numerical controlled) router systems. The available drilling, milling and circular saw units allow all-round machining of **MM crosslam**.

Machining options

A wide range of cutting and trimming operations can be offered, for example:

- rectangular panel cuts,
- square and round openings and cut-outs for e.g. windows and doors.
- bevel cuts, slots and grooves,
- standard panel joints (e.g. half-lap joint, rebate board),
- the chamfering and drilling of recesses for the integration of building services, lifting equipment (e.g. mounting loops with blind holes and rod dowels) and fasteners.

Important notes

Cut-outs and section cuts e.g. for door or windows are made with rounded edges as standard with **residual radii of up to 4 cm in inner corners**. The removal of residual radii is not standard and can be carried out at customer's request. Slight cracks may occur in the machined area due to cutting and/or milling. Customer-provided element plans are to be submitted in dxf, dwg, sat or ifc format and require mandatory information on panel thickness, dimensions, build-up, cover layer orientation and surface quality as well as complete illustrations for CNC milling and cutting. The production plans drawn up by Mayr-Melnhof Holz must be checked and approved by an authorised expert.

Tolerances

Depending on the panel build-up as well as the thickness, length and width of the element, the following dimension tolerances are permitted.

Format cut

Rebate

Cut-out, residual radii removed

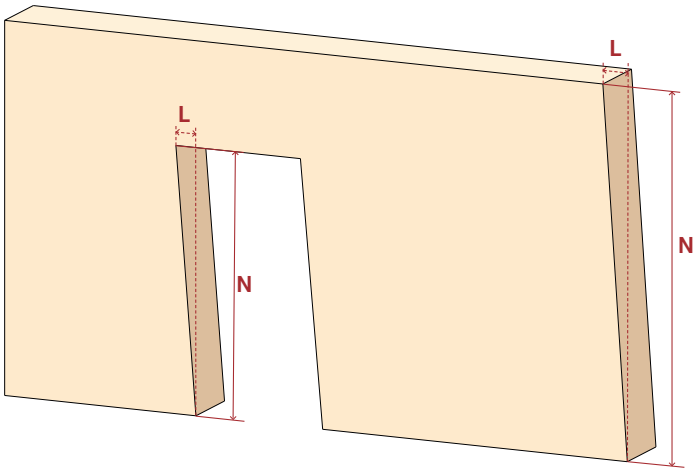
Cut-out, residual radii not removed

Tolerances

Tolerances for wall, floor and roof elements

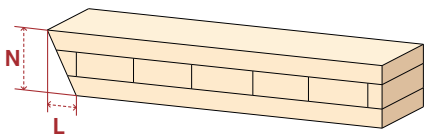
MM crosslam	Reference moisture measurement		Limit deviations [mm] depending on the nominal dimensions			
		Nominal dimensions	Thickness < 121 mm	Thickness > 121 mm	Width/height < 100 cm	Width/height > 100 cm
Width, height (edge length) and openings	12% moisture content	Limit deviations	–	–	± 2 mm	± 0.2% of the Nominal dimension and max ± 5 mm
Thickness			± 2 mm	+ 3 mm - 2 mm	–	–

Angular deviation in length and width for MM crosslam



Legend
L = Limit deviation
N = Nominal dimension

Angular deviation in thickness for MM crosslam



Legend
L = Limit deviation
N = Nominal dimension

Mechanical properties and structural design

General

MM crosslam is a planar engineered wood product that is used as a load-bearing structural component, mostly for roof, floor or wall assemblies. Structural design of **MM cross**lam may be made in accordance with EN 1995-1-1 and EN 1995-1-2, taking into account ETA-09/0036.

For the structural design, the material parameters can be taken from the following table. The design of cross-laminated timber members shall be carried out under the responsibility of an engineer familiar with massive timber construction. In addition to the following information, CLTdesigner, a extensive software package developed and maintained by the holz.bau forschungs gmbh Graz competence centre, is available to our customers. It can be downloaded free of charge from our homepage at www.mm-holz.com.

Further information on the design of cross-laminated timber can be found in:

- *Augustin, M.; Blaß, H.; Bogensperger, T.; Ebner; Ferk, Heinz J.; Fontana, M.; Frangi, Hamm, P.; Jöbstl, R.; Moosbrugger, T.; Richter, K.; Schickhofer, G.; Thiel, A.; Traetta, G.; Uibel, T.: BSPhandbuch. Holz-Massivbauweise in Brettsperrholz, edited edition, 2010*
- *Wallner-Novak, M.; Koppelhuber, J. und Pock, K.: Cross-Laminated Timber Structural Design, Basic design and engineering principles according to Eurocode. proHolz Austria, Vienna, Austria, 2014, ISBN 978-3-902926-03-6*
- *Wallner-Novak, M.; Augustin, M., Koppelhuber, J. und Pock, K.: Brettsperrholz Bemessung – Band II: Anwendungsfälle. proHolz Austria, Vienna, Austria, 2019, ISBN 978-3-902320-96-4*

CLTdesigner for preliminary design

Material properties according to ETA-09/0036

Properties for mechanical actions perpendicular to CLT	
Strength classes	**C24/T14**
Modulus of elasticity:	
• Parallel to the grain of the boards	
$E_{0,mean}$	11.600 N/mm²
• Perpendicular to the grain of the boards	
$E_{90,mean}$	370 N/mm²
Shear modulus:	
• Parallel to the grain of the boards	
$G_{090,mean}$	650 N/mm²
• Perpendicular to the grain of the boards (rolling shear modulus)	
$G_{9090,mean}$	50 N/mm²
Bending strength:	
• Parallel to the grain of the boards	
$f_{m,k}$	26.4 N/mm²
Tensile strength:	
• Perpendicular to the grain of the boards	
$f_{t,90,k}$	0.12 N/mm²
Compressive strength:	
• Perpendicular to the grain of the boards	
$f_{c,90,k}$	2.5 N/mm²
Shear strength:	
• Parallel to the grain of the boards	
$f_{v,090,k}$	4.0 N/mm²
• Perpendicular to the grain of the boards (rolling shear strength)	
$f_{v,9090,k}$	1.1 N/mm²

Properties for mechanical actions in plane to CLT	
Strength classes	**C24/T14**
Modulus of elasticity:	
• Parallel to the grain of the boards	
$E_{0,mean}$	11.600 N/mm²
Shear modulus:	
• Parallel to the grain of the boards	
$G_{090,mean}$	250 N/mm²
Bending strength:	
• Parallel to the grain of the boards	
$f_{m,k}$	24.0 N/mm²
Tensile strength:	
• Perpendicular to the grain of the boards	
$f_{t,0,k}$	14.5 N/mm²
Compressive strength:	
• Parallel to the grain of the boards	
$f_{c,0,k}$	21.0 N/mm²
Shear Strength:	
• Parallel to the grain of the boards	
$f_{v,090,k}$	5.0 N/mm²

Cross-section values

The cross-section values given below can be used for the static calculation of deformation and stress states according to the so-called **γ-method (gamma method)**.
This calculation method is frequently used in building practice for the design of cross-laminated timber and is anchored in EN 1995-1-1 and included in ETA-09/0036.

The result achieved by the γ-Method applies exactly only to single-span beams with sinusoidal uniformly distributed load. A more accurate calculation method must be used for highly concentrated loads and very short beam lengths, in particular. For cantilever CLT slabs, it is suggested that the span length used to select the effective moment of intertia be equal to two times the cantilever length. The internal force and deformation calculation however must be calculated with the actual span lengths, cantilever lengths, respectively.

For the calculation in a conventional framework programm an actual height of the gross cross-section and an effective width maybe used.

The effective width is obtained by multiplying the ratio of the effective moment of inertia to the moment of inertia of the gross cross-section by the actual width.

Examples for the structural design analysis are given in:
Wallner-Novak, M.; Koppelhuber, J. und Pock, K.: Cross-Laminated Timber Structural Design, Basic design and engineering principles according to Eurocode. proHolz Austria, Vienna, Austria, 2014, ISBN 978-3-902926-03-6

CLT thickness		**Build-up** (**bold** = main load-bearing direction)	A_{gross}	A_{net}	I_{gross} (bxd³)/12	I_{eff} (depending on the support width for single-span)													
						1 m		2 m		3 m		4 m		5 m		6 m		8 m	
						I_{eff}	I_{eff}/I_{gross}	I_{eff}	I_{eff}/I_{gross}	I_{eff}	I_{eff}/I_{gross}	I_{eff}	I_{eff}/I_{gross}	I_{eff}	I_{eff}/I_{gross}	I_{eff}	I_{eff}/I_{gross}	I_{eff}	I_{eff}/I_{gross}
[mm]		[mm]	[cm²]	[cm²]	[cm⁴]	[cm⁴]	[%]	[cm⁴]	[%]	[cm⁴]	[%]	[cm⁴]	[%]	[cm⁴]	[%]	[cm⁴]	[%]	[cm⁴]	[%]
60	3s	**20**-20-**20**	600	400	1800	1231	68	1569	87	1656	92	1689	94	1705	95	1713	95	1722	96
80	3s	**30**-20-**30**	800	600	4267	2673	63	3650	86	3934	92	4046	95	4100	96	4130	97	4160	98
90	3s	**30**-30-**30**	900	600	6075	3110	51	4744	78	5295	87	5523	91	5636	93	5700	94	5764	95
100	3s	**40**-20-**40**	1000	800	8333	4825	58	6925	83	7602	91	7877	95	8012	96	8088	97	8165	98
100	5s	**20**-20-**20**-20-**20**	1000	600	8333	3540	42	5408	65	6009	72	6253	75	6374	76	6441	77	6510	78
120	3s	**40**-40-**40**	1200	800	14400	5587	39	9846	68	11702	81	12552	87	12993	90	13247	92	13511	94
120	5s	**30**-20-**20**-20-**30**	1200	800	14400	5635	39	9560	66	11058	77	11706	81	12034	84	12220	85	12411	86
140	5s	**40**-20-**20**-20-**40**	1400	1000	22867	8196	36	14851	65	17751	78	19079	83	19768	86	20165	88	20577	90
160	5s	**40**-20-**40**-20-**40**	1600	1200	34133	11770	34	21354	63	25530	75	27441	80	28434	83	29006	85	29599	87
180	5s	**40**-30-**40**-30-**40**	1800	1200	48600			24838	51	31631	65	35055	72	36918	76	38020	78	39186	81
200	5s	**40**-40-**40**-40-**40**	2000	1200	66667			28324	42	37988	57	43261	65	46256	69	48071	72	50028	75
200	7ss	**20**-**40**-20-**40**-20-**40**-**20**	2000	1600	66667					49180	74	54315	81	57111	86	58764	88	60513	91
220	7s	**40**-20-**40**-20-**40**-20-**40**	2200	1600	88733					55640	63	62410	70	66161	75	68403	77	70793	80
220	7ss	**40**-**40**-20-**20**-20-**40**-**40**	2200	1800	88733					64319	72	72393	82	76979	87	79758	90	82755	93
240	7s	**40**-20-**40**-40-**40**-20-**40**	2400	1600	115200							74052	64	80365	70	84295	73	88626	77
240	7ss	**40**-**40**-20-**40**-20-**40**-**40**	2400	2000	115200							92388	80	98379	85	102008	89	105922	92
260	7ss	**40**-**40**-30-**40**-30-**40**-**40**	2600	2000	146467							105534	72	115312	79	121503	83	128418	88
280	7ss	**40**-**40**-40-**40**-40-**40**-**40**	2800	2000	182933							118810	65	132802	73	142009	78	152630	83
300	9ss	**40**-**40**-20-**40**-20-**40**-20-**40**-**40**	3000	2000	225000							156939	70	172544	77	182499	81	193686	86
320	8ss	**40**-**40**-40-**40**-**40**-40-**40**-**40**	3200	2400	273067							170830	63	190978	70	204236	75	219532	80

All data refer to a 1 m wide panel strip

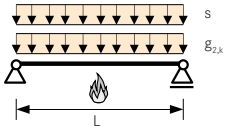
A_{gross} Area of the gross cross section
A_{net} Area of the net cross-section (value for the verification of compressive stresses in the direction of the cover layers)
I_{gross} Moment of inertia of the gross cross-section - as a reference value

I_{eff} Effective moment of inertia in the direction of the cover layers for single span beams
I_{eff}/I_{gross} Ratio value indicating the extent to which the transverse layers change the moment of inertia of the gross cross-section

Preliminary design table

Roof: Single-span beam

Static system



Boundary conditions

- Service class 1
- Partial factors: γ_M = 1.25; γ_G = 1.35; γ_Q = 1.50
- Snow load for location < 1,000 m a.s.l: ψ_0 = 0.5; ψ_2 = 0.0
- Deflection limits w_{inst} = L/300; $w_{net,fin}$ = L/250; w_{fin} = L/150
- k_{def} = 0.8; k_{mod} = 0.9

Basics for the determination of the required panel type

- ETA-09/0036
- ÖN EN 1995-1-1:2019, ÖN B 1995-1-1:2019
- ÖN EN 1995-1-2:2011, ÖN B 1995-1-2:2019

Structural fire design

- Single-sided exposure to fire
- Charring rates according to ETA-09/0036
- 3 mm minimum thickness of the residual load bearing layer

Fire resistance class

R0	R30	R60	R90	R120

Permanent load	Snow load	Span L [m]											
$g_{z,k}$ [kN/m²]	$s = \mu \cdot s_k$ [kN/m²]	3.0		4.0		5.0		6.0		7.0		8.0	
		PUR	MUF	PUR	MUF	PUR	MUF	PUR	MUF	PUR	MUF	PUR	MUF
0.5	1.0	80 3s	80 3s	90 3s	90 3s	120 3s	120 3s	140 5s	140 5s	180 5s	180 5s	200 7ss	200 7ss
	2.0			100 3s	100 3s	140 5s	140 5s	160 5s	160 5s	200 5s	200 5s	220 7ss	220 7ss
	3.0			120 3s	120 3s			180 5s	180 5s	200 7ss	200 7ss	240 7ss	240 7ss
	4.0	90 3s	90 3s			160 5s	160 5s	200 5s	200 5s	220 7ss	220 7ss		
	5.0	100 3s	100 3s	140 5s	140 5s							260 7ss	260 7ss
	6.0					180 5s	180 5s	200 7ss	200 7ss	240 7ss	240 7ss	280 7ss	280 7ss
	7.0							220 7ss	220 7ss			300 9ss	300 9ss
1.0	1.0	80 3s	80 3s	100 3s	100 3s	140 5s	140 5s	160 5s	160 5s	200 5s	200 5s	220 7ss	220 7ss
	2.0			120 3s	120 3s			180 5s	180 5s	200 7ss	200 7ss		
	3.0	90 3s	90 3s			160 5s	160 5s	200 5s	200 5s	220 7ss	220 7ss	240 7ss	240 7ss
	4.0											260 7ss	260 7ss
	5.0	100 3s	100 3s	140 5s	140 5s	180 5s	180 5s	200 7ss	200 7ss	240 7ss	240 7ss	280 7ss	280 7ss
	6.0												
	7.0	120 3s	120 3s			200 5s	200 5s	220 7ss	220 7ss	260 7ss	260 7ss	300 9ss	300 9ss
1.5	1.0	80 3s	80 3s	120 3s	120 3s	140 5s	140 5s	180 5s	180 5s	200 7s	200 7s	220 7ss	220 7ss
	2.0	90 3s	90 3s			160 5s	160 5s	200 5s	200 5s	220 7ss	220 7ss	240 7ss	240 7ss
	3.0											260 7ss	260 7ss
	4.0	100 3s	100 3s	140 5s	140 5s	180 5s	180 5s	200 7ss	200 7ss	240 7ss	240 7ss	280 7ss	280 7ss
	5.0												
	6.0							220 7ss	220 7ss			300 9ss	300 9ss
	7.0	120 3s	120 3s	160 5s	160 5s	200 5s	200 5s			260 7ss	260 7ss		
2.0	1.0	90 3s	90 3s	120 3s	120 3s	160 5s	160 5s	180 5s	180 5s	220 7ss	220 7ss	240 7ss	240 7ss
	2.0							200 5s	200 5s			260 7ss	260 7ss
	3.0	100 3s	100 3s	140 5s	140 5s			200 7ss	200 7ss	240 7ss	240 7ss		
	4.0					180 5s	180 5s					280 7ss	280 7ss
	5.0							220 7ss	220 7ss			300 9ss	300 9ss
	6.0	120 3s	120 3s	160 5s	160 5s	200 5s	200 5s			260 7ss	260 7ss		
	7.0												
2.5	1.0	90 3s	90 3s	120 3s	120 3s	160 5s	160 5s	200 5s	200 5s	220 7ss	220 7ss	260 7ss	260 7ss
	2.0	100 3s	100 3s	140 5s	140 5s			200 7ss	200 7ss				
	3.0					180 5s	180 5s			240 7ss	240 7ss	280 7ss	280 7ss
	4.0							220 7ss	220 7ss			300 9ss	300 9ss
	5.0	120 3s	120 3s	160 5s	160 5s	200 5s	200 5s			260 7ss	260 7ss		
	6.0												
	7.0					200 7ss	200 7ss	240 7ss	240 7ss	280 7ss	280 7ss	320 9ss	320 9ss

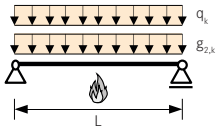
This table is only intended for pre-liminary structural design and does not replace necessary static calculations.

The self-weight of the cross-laminated timber elements is already taken into account in the table as ρ = 500 kg/m³.

Preliminary design table

Floor: Single-span beam, vibration requirement for floor slab class 1, without screed

Static system



Boundary conditions

- Service class 1
- Partial factors: γ_M = 1.25; γ_G = 1.35; γ_Q = 1.50
- Vibration: b ≥ 1.2 L; four edges supported;
  $f_{1,gr}$ = 8 Hz; $w_{stat,gr}$ = 0.25 mm; ζ = 4 %; $a_{rms,gr}$ = 0.05 m/s²
- Deflection limits: w_{inst} = L/300; $w_{net,fin}$ = L/250; w_{fin} = L/150
- Imposed load cat. A, B: ψ_0 = 0.7; ψ_2 = 0.3; k_{mod} = 0.8; k_{def} = 0.8
- Imposed load cat. C: ψ_0 = 0.7; ψ_2 = 0.6; k_{mod} = 0.9; k_{def} = 0.8

Basics for the determination of the required panel type

- ETA-09/0036
- ÖN EN 1995-1-1:2019, ÖN B 1995-1-1:2019
- ÖN EN 1995-1-2:2011, ÖN B 1995-1-2:2019

Structural fire design

- Single-sided exposure to fire
- Charring rates according to ETA-09/0036
- 3 mm minimum thickness of the residual load bearing layer

Fire resistance class

R0	R30	R60	R90	R120

Permanent load	Category [-]	Load capacity	Span L [m]											
$g_{2,k}$ [kN/m²]		q_k [kN/m²]	3.0		4.0		5.0		6.0		7.0		8.0	
			PUR	MUF	PUR	MUF	PUR	MUF	PUR	MUF	PUR	MUF	PUR	MUF
1.0	A	1.5	140 5s	140 5s	160 5s	160 5s	180 5s	180 5s	220 7s	220 7s	260 7ss	260 7ss	300 9ss	300 9ss
		2.0												
		2.8												
	B	3.0					180 5s	180 5s						
		3.5												
	C	4.0			160 5s	160 5s								
		5.0					200 5s	200 5s	220 7ss	220 7ss				
1.5	A	1.5	140 5s	140 5s	160 5s	160 5s	180 5s	180 5s	220 7ss	220 7ss	260 7ss	260 7ss	300 9ss	300 9ss
		2.0												
		2.8												
	B	3.0												
		3.5												
	C	4.0			160 5s	160 5s								
		5.0					200 5s	200 5s						
2.0	A	1.5	140 5s	140 5s	160 5s	160 5s	200 5s	200 5s	240 7s	240 7s	260 7ss	260 7ss	300 9ss	300 9ss
		2.0												
		2.8												
	B	3.0												
		3.5												
	C	4.0			160 5s	160 5s								
		5.0									280 7ss	280 7ss	320 9ss	320 9ss
2.5	A	1.5	140 5s	140 5s	160 5s	160 5s	200 5s	200 5s	240 7ss	240 7ss	280 7ss	280 7ss	300 9ss	300 9ss
		2.0												
		2.8			160 5s	160 5s								
	B	3.0												
		3.5												
	C	4.0												
		5.0					200 7ss	200 7ss					320 9ss	320 9ss
3.0	A	1.5	140 5s	140 5s	160 5s	160 5s	200 7ss	200 7ss	240 7s	240 7s	280 7ss	280 7ss	300 9ss	300 9ss
		2.0												
		2.8												
	B	3.0												
		3.5												
	C	4.0					200 7ss	200 7ss					320 9ss	320 9ss
		5.0												

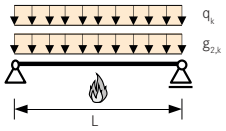
This table is only intended for pre-liminary structural design and does not replace necessary static calculations.

The self-weight of the cross-laminated timber elements is already taken into account in the table as ρ = 500 kg/m³.

Preliminary design table

Floor: Single-span beam, vibration requirement for floor slab class 1, with screed

Static system



Boundary conditions

- Service class 1
- Partial factors: γ_M = 1.25; γ_G = 1.35; γ_Q = 1.50
- Vibration: b ≥ 1.2 L; four edges supported;
  $f_{1,gr}$ = 8 Hz; $w_{stat,gr}$ = 0.25 mm; ζ = 4 %; $a_{rms,gr}$ = 0.05 m/s²
- Screed thickness 6 cm, floating screed and heavy floor structure
- Deflection limits: w_{inst} = L/300; $w_{net,fin}$ = L/250; w_{fin} = L/150
- Imposed load cat. A, B: ψ_0 = 0.7; ψ_2 = 0.3; k_{mod} = 0.8; k_{def} = 0.8
- Imposed load cat. C: ψ_0 = 0.7; ψ_2 = 0.6; k_{mod} = 0.9; k_{def} = 0.8

Basics for the determination of the required panel type

- ETA-09/0036
- ÖN EN 1995-1-1:2019, ÖN B 1995-1-1:2019
- ÖN EN 1995-1-2:2011, ÖN B 1995-1-2:2019

Structural fire design

- Single-sided exposure to fire
- Charring rates according to ETA-09/0036
- 3 mm minimum thickness of the residual load bearing layer

Fire resistance class

R0	R30	R60	R90	R120

Permanent load	Category [-]	Load capacity	Span L [m]											
$g_{2,k}$ [kN/m²]		q_k [kN/m²]	3.0		4.0		5.0		6.0		7.0		8.0	
			PUR	MUF	PUR	MUF	PUR	MUF	PUR	MUF	PUR	MUF	PUR	MUF
1.0	A	1.5	100 3s	100 3s	140 5s	140 5s	160 5s	160 5s	200 5s	200 5s	240 7ss	240 7ss	280 7ss	280 7ss
		2.0												
		2.8					160 5s	160 5s						
	B	3.0												
		3.5												
	C	4.0			140 5s	140 5s	180 5s	180 5s	200 7ss	200 7ss				
		5.0	120 3s	120 3s			200 5s	200 5s	220 7ss	220 7ss	260 7ss	260 7ss	300 9ss	300 9ss
1.5	A	1.5	100 3s	100 3s	140 5s	140 5s	160 5s	160 5s	220 7ss	220 7ss	260 7ss	260 7ss	300 9ss	300 9ss
		2.0												
		2.8												
	B	3.0												
		3.5					180 5s	180 5s						
	C	4.0			140 5s	140 5s								
		5.0	120 3s	120 3s	160 5s	160 5s	200 5s	200 5s						
2.0	A	1.5	100 3s	100 3s	140 5s	140 5s	180 5s	180 5s	220 7ss	220 7ss	260 7ss	260 7ss	300 9ss	300 9ss
		2.0												
		2.8												
	B	3.0												
		3.5												
	C	4.0	120 3s	120 3s	160 5s	160 5s	200 5s	200 5s						
		5.0									280 7ss	280 7ss	320 9ss	320 9ss
2.5	A	1.5	100 3s	100 3s	140 5s	140 5s	200 5s	200 5s	240 7ss	240 7ss	260 7ss	260 7ss	300 9ss	300 9ss
		2.0												
		2.8												
	B	3.0			140 5s	140 5s								
		3.5												
	C	4.0	120 3s	120 3s	160 5s	160 5s								
		5.0					200 7ss	200 7ss			280 7ss	280 7ss	320 9ss	320 9ss
3.0	A	1.5	100 3s	100 3s	140 5s	140 5s	200 5s	200 5s	240 7ss	240 7ss	260 7ss	260 7ss	300 9ss	300 9ss
		2.0												
		2.8												
	B	3.0												
		3.5	120 3s	120 3s	160 5s	160 5s								
	C	4.0									280 7ss	280 7ss	320 9ss	320 9ss
		5.0					200 7ss	200 7ss						

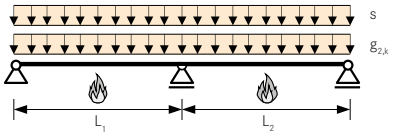
This table is only intended for pre-liminary structural design and does not replace necessary static calculations.

The self-weight of the cross-laminated timber elements is already taken into account in the table as ρ = 500 kg/m³.

Preliminary design table

Roof: Two-span beam

Static system



Boundary conditions

- Service class 1
- Partial factors: γ_M = 1.25; γ_G = 1.35; γ_Q = 1.50
- Calculated for span ratios: L_1/L_2 = 1:0.8 bis 1:1
- Snow loads not fieldwise
  for location < 1.000 m a.s.l: ψ_0 = 0.5; ψ_2 = 0.0
- Deflection limits: w_{inst} = L/300; $w_{net,fin}$ = L/250; w_{fin} = L/150
- k_{def} = 0.8; k_{mod} = 0.9

Basics for the determination of the required panel type

- ETA-09/0036
- ÖN EN 1995-1-1:2019, ÖN B 1995-1-1:2019
- ÖN EN 1995-1-2:2011, ÖN B 1995-1-2:2019

Structural fire design

- Single-sided exposure to fire
- Charring rates according to ETA-09/0036
- 3 mm minimum thickness of the residual load bearing layer

Fire resistance class

R0	R30	R60	R90	R120

Permanent load	Snow load	Span L_1 [m]											
$g_{z,k}$ [kN/m²]	s = μ · s_k [kN/m²]	3.0		4.0		5.0		6.0		7.0		8.0	
		PUR	MUF	PUR	MUF	PUR	MUF	PUR	MUF	PUR	MUF	PUR	MUF
0.5	1.0	60 3s	60 3s	80 3s	80 3s	90 3s	90 3s	120 3s	120 3s	140 5s	140 5s	160 5s	160 5s
	2.0					100 3s	100 3s			160 5s	160 5s	180 5s	180 5s
	3.0	80 3s	80 3s	90 3s	90 3s	120 3s	120 3s	140 5s	140 5s			200 5s	200 5s
	4.0			100 3s	100 3s					180 5s	180 5s	200 7ss	200 7ss
	5.0					140 5s	140 5s	160 5s	160 5s				
	6.0			120 3s	120 3s					200 5s	200 5s	220 7ss	220 7ss
	7.0							180 5s	180 5s	200 7ss	200 7ss		
1.0	1.0	60 3s	60 3s	80 3s	80 3s	100 3s	100 3s	120 3s	120 3s	140 5s	140 5s	180 5s	180 5s
	2.0	80 3s	80 3s	90 3s	90 3s	120 3s	120 3s	140 5s	140 5s	160 5s	160 5s	200 5s	200 5s
	3.0									180 5s	180 5s		
	4.0			100 3s	100 3s			160 5s	160 5s			200 7ss	200 7ss
	5.0					140 5s	140 5s			200 5s	200 5s	220 7ss	220 7ss
	6.0			120 3s	120 3s			180 5s	180 5s				
	7.0	90 3s	90 3s							200 7ss	200 7ss		
1.5	1.0	80 3s	80 3s	90 3s	90 3s	120 3s	120 3s	140 5s	140 5s	160 5s	160 5s	200 5s	200 5s
	2.0									180 5s	180 5s		
	3.0			100 3s	100 3s			160 5s	160 5s			200 7ss	200 7ss
	4.0					140 5s	140 5s			200 5s	200 5s	220 7ss	220 7ss
	5.0			120 3s	120 3s								
	6.0							180 5s	180 5s	200 7ss	200 7ss		
	7.0	90 3s	90 3s			160 5s	160 5s					240 7ss	240 7ss
2.0	1.0	80 3s	80 3s	90 3s	90 3s	120 3s	120 3s	140 5s	140 5s	180 5s	180 5s	200 5s	200 5s
	2.0			100 3s	100 3s			160 5s	160 5s			200 7ss	200 7ss
	3.0					140 5s	140 5s			200 5s	200 5s	220 7ss	220 7ss
	4.0			120 3s	120 3s								
	5.0							180 5s	180 5s	200 7ss	200 7ss		
	6.0	90 3s	90 3s			160 5s	160 5s					240 7ss	240 7ss
	7.0							200 5s	200 5s	220 7ss			
2.5	1.0	80 3s	80 3s	100 3s	100 3s	120 3s	120 3s	160 5s	160 5s	180 5s	180 5s	200 7ss	200 7ss
	2.0					140 5s	140 5s			200 5s	200 5s	220 7ss	220 7ss
	3.0												
	4.0			120 3s	120 3s			180 5s	180 5s	200 7ss	200 7ss		
	5.0												
	6.0	90 3s	90 3s			160 5s	160 5s	200 5s	200 5s	220 7ss	220 7ss	240 7ss	240 7ss
	7.0												

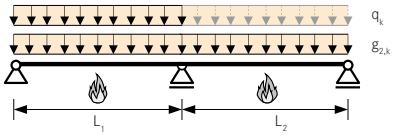
This table is only intended for pre-liminary structural design and does not replace necessary static calculations.

The self-weight of the cross-laminated timber elements is already taken into account in the table as ρ = 500 kg/m³.

Preliminary design table

Floor: Two-span beam, vibration requirement for floor slab class 1, without screed

Static system



Boundary conditions

- Service class 1
- Partial factors: γ_M = 1.25; γ_G = 1.35; γ_Q = 1.50
- Calculated for span ratios: L_1/L_2 = 1:0.8 bis 1:1
- Vibration: b ≥ 1.2 L; four edges supported;
  $f_{1,gr}$ = 8 Hz; $w_{stat,gr}$ = 0.25 mm; ζ = 4 %; $a_{rms,gr}$ = 0.05 m/s²
- Deflection limits: w_{inst} = L/300; $w_{net,fin}$ = L/250; w_{fin} = L/150
- Imposed load cat. A, B: ψ_0 = 0.7; ψ_2 = 0.3; k_{mod} = 0.8; k_{def} = 0.8
- Imposed load cat. C: ψ_0 = 0.7; ψ_2 = 0.6; k_{mod} = 0.9; k_{def} = 0.8

Basics for the determination of the required panel type

- ETA-09/0036
- ÖN EN 1995-1-1:2019, ÖN B 1995-1-1:2019
- ÖN EN 1995-1-2:2011, ÖN B 1995-1-2:2019

Structural fire design

- Single-sided exposure to fire
- Charring rates according to ETA-09/0036
- 3 mm minimum thickness of the residual load bearing layer

Fire resistance class

R0	R30	R60	R90	R120

Permanent load	Category [-]	Imposed load	Span L_1 [m]											
			3.0		4.0		5.0		6.0		7.0		8.0	
$g_{2,k}$ [kN/m²]		q_k [kN/m²]	PUR	MUF	PUR	MUF	PUR	MUF	PUR	MUF	PUR	MUF	PUR	MUF
1.0	A	1.5	120 5s	120 5s	140 5s	140 5s	160 5s	160 5s	200 5s	200 5s	220 7s	220 7s	240 7ss	240 7ss
		2.0												
		2.8												
	B	3.0					160 5s	160 5s						
		3.5												
	C	4.0			140 5s	140 5s								
		5.0	120 5s	120 5s			160 5s	160 5s			220 7ss	220 7ss		
1.5	A	1.5	120 5s	120 5s	140 5s	140 5s	160 5s	160 5s	200 5s	200 5s	220 7ss	220 7ss	240 7ss	240 7ss
		2.0												
		2.8												
	B	3.0												
		3.5												
	C	4.0	120 5s	120 5s	140 5s	140 5s	160 5s	160 5s						
		5.0							200 5s	200 5s			260 7ss	260 7ss
2.0	A	1.5	120 5s	120 5s	140 5s	140 5s	180 5s	180 5s	200 7ss	200 7ss	220 7ss	220 7ss	240 7ss	240 7ss
		2.0												
		2.8												
	B	3.0												
		3.5												
	C	4.0	120 5s	120 5s	140 5s	140 5s			200 7ss	200 7ss				
		5.0											260 7ss	260 7ss
2.5	A	1.5	120 5s	120 5s	140 5s	140 5s	180 5s	180 5s	200 7ss	200 7ss	220 7ss	220 7ss	260 7ss	260 7ss
		2.0												
		2.8												
	B	3.0			140 5s	140 5s			200 7ss	200 7ss				
		3.5	120 5s	120 5s										
	C	4.0												
		5.0									240 7ss	240 7ss		
3.0	A	1.5	120 5s	120 5s	140 5s	140 5s	180 5s	180 5s	200 7ss	200 7ss	220 7ss	220 7ss	260 7ss	260 7ss
		2.0	120 5s	120 5s										
		2.8												
	B	3.0												
		3.5												
	C	4.0												
		5.0									240 7ss	240 7ss	280 7ss	280 7ss

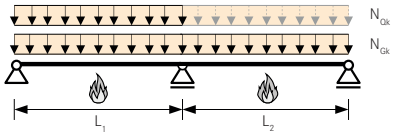
This table is only intended for pre-liminary structural design and does not replace necessary static calculations

The self-weight of the cross-laminated timber elements is already taken into account in the table as ρ = 500 kg/m³.

Preliminary design table

Floor: Two-span beam, vibration requirement for floor slab class 1, without screed

Static system



Boundary conditions

- Service class 1
- Partial factors: γ_M = 1.25; γ_G = 1.35; γ_Q = 1.50
- Calculated for span width ratios: L_1/L_2 = 1:0.8 bis 1:1
- Screed thickness 6 cm, floating screed and heavy floor structure
- Vibration: b ≥ 1.2 L; four edges supported;
  $f_{1,gr}$ = 8 Hz; $w_{stat,gr}$ = 0.25 mm; ζ = 4 %; $a_{rms,gr}$ = 0.05 m/s²
- Deflection limits: w_{inst} = L/300; $w_{net,fin}$ = L/250; w_{fin} = L/150
- Imposed load cat. A, B: ψ_0 = 0.7; ψ_2 = 0.3; k_{mod} = 0.8; k_{def} = 0.8
- Imposed load cat. C: ψ_0 = 0.7; ψ_2 = 0.6; k_{mod} = 0.9; k_{def} = 0.8

Basics for the determination of the required panel type

- ETA-09/0036
- ÖN EN 1995-1-1:2019, ÖN B 1995-1-1:2019
- ÖN EN 1995-1-2:2011, ÖN B 1995-1-2:2019

Structural fire design

- Single-sided exposure to fire
- Charring rates according to ETA-09/0036
- 3 mm minimum thickness of the residual load bearing layer

Fire resistance class

R0	R30	R60	R90	R120

Permanent load	Category [-]	Imposed load	Span L_1 [m]											
			3.0		4.0		5.0		6.0		7.0		8.0	
$g_{2,k}$ [kN/m²]		q_k [kN/m²]	PUR	MUF	PUR	MUF	PUR	MUF	PUR	MUF	PUR	MUF	PUR	MUF
1.0	A	1.5	80 3s	80 3s	120 3s	120 3s	140 5s	140 5s	180 5s	180 5s	220 7s	220 7s	240 7ss	240 7ss
		2.0												
		2.8												
	B	3.0												
		3.5					140 5s	140 5s						
	C	4.0	90 3s	90 3s			160 5s	160 5s						
		5.0	90 3s	90 3s	120 3s	120 3s		160 5s	200 5s	200 5s	220 7ss	220 7ss		
1.5	A	1.5	80 3s	80 3s	120 3s	120 3s	160 5s	160 5s	200 5s	200 5s	220 7ss	220 7ss	240 7ss	240 7ss
		2.0												
		2.8												
	B	3.0												
		3.5												
	C	4.0	90 3s	90 3s	120 3s	120 3s		160 5s						
		5.0	100 3s	100 3s	140 5s	140 5s			200 5s	200 5s			260 7ss	260 7ss
2.0	A	1.5	80 3s	80 3s	120 3s	120 3s	160 5s	160 5s	200 5s	200 5s	220 7ss	220 7ss	240 7ss	240 7ss
		2.0												
		2.8												
	B	3.0												
		3.5	90 3s	90 3s										
	C	4.0	90 3s	90 3s	120 3s	120 3s		160 5s						
		5.0	100 3s	100 3s	140 5s	140 5s			200 7ss	200 7ss			260 7ss	260 7ss
2.5	A	1.5	80 3s	80 3s	120 3s	120 3s	160 5s	160 5s	200 5s	200 5s	220 7ss	220 7ss	240 7ss	240 7ss
		2.0												
		2.8												
	B	3.0	90 3s	90 3s										
		3.5			120 3s	120 3s								
	C	4.0	100 3s	100 3s	140 5s	140 5s		160 5s	200 5s	200 5s			260 7ss	260 7ss
		5.0					180 5s	180 5s	200 7ss	200 7ss	240 7ss	240 7ss		
3.0	A	1.5	80 3s	80 3s	140 5s	140 5s	180 5s	180 5s	200 7ss	200 7ss	220 7ss	220 7ss	260 7ss	260 7ss
		2.0												
		2.8												
	B	3.0	90 3s	90 3s										
		3.5												
	C	4.0	100 3s	100 3s										
		5.0									240 7ss	240 7ss	280 7ss	280 7ss

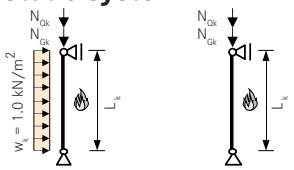
This table is only intended for pre-liminary structural design and does not replace necessary static calculations.

The self-weight of the cross-laminated timber elements is already taken into account in the table as ρ = 500 kg/m³.

Preliminary design table

Exterior wall and interior wall without cladding

Static system



Boundary conditions

- Cover layers of the wall vertical
- Service class 1
- Partial factors: I γ_M = 1.25; γ_G = 1.35; γ_Q = 1.50
- Imperfection factor β_c = 0.1
- Shear deformation taken into account
- Imposed load cat. A, B: ψ_0 = 0.7; ψ_2 = 0.3; k_{mod} = 0.8; k_{def} = 0.8
- Wind: w_k = 1.0 kN/m². ψ_0 = 0.6; ψ_2 = 0.0; k_{mod} = 0.9

Basics for the determination of the required panel type

- ETA-09/0036
- ÖN EN 1995-1-1:2019, ÖN B 1995-1-1:2019
- ÖN EN 1995-1-2:2011, ÖN B 1995-1-1:2019

Structural fire design

- Single-sided exposure to fire
- Without cladding
- Charring rates according to ETA-09/0036
- 3 mm minimum thickness of the residual load bearing layer

Fire resistance class

R0	R30	R60	R90	R120

Permanent load	Imposed load	Wall height [m] (corresponds to the assumed buckling length L_k)															
N_{Gk} [kN/m]	N_{Qk} [kN/m]	2.7								3.0							
		PUR	MUF	PUR	MUF	PUR	MUF	PUR	MUF	PUR	MUF	PUR	MUF	PUR	MUF	PUR	MUF
10	10	60 3s	60 3s	80 3s	80 3s	90 3s	80 3s	120 3s	120 3s	60 3s	60 3s	80 3s	80 3s	90 3s	80 3s	120 3s	120 3s
	20																
	30																
	40																
	50																
	60													100 3s	100 3s		
20	10	60 3s	60 3s	80 3s	80 3s	90 3s	80 3s	120 3s	120 3s	60 3s	60 3s	80 3s	80 3s	90 3s	80 3s	120 3s	120 3s
	20																
	30													100 3s	100 3s		
	40																
	50					100 3s	100 3s										
	60									80 3s	80 3s						
30	10	60 3s	60 3s	80 3s	80 3s	100 3s	100 3s	120 3s	120 3s	60 3s	60 3s	80 3s	80 3s	100 3s	100 3s	120 3s	120 3s
	20																
	30																
	40																
	50									80 3s	80 3s						
	60	80 3s	80 3s														
40	10	60 3s	60 3s	80 3s	80 3s	100 3s	100 3s	120 3s	120 3s	60 3s	60 3s	80 3s	80 3s	100 3s	100 3s	120 3s	120 3s
	20																
	30																
	40																
	50	80 3s	80 3s							80 3s	80 3s						
	60																
50	10	60 3s	60 3s	80 3s	80 3s	100 3s	100 3s	120 3s	120 3s	60 3s	60 3s	80 3s	80 3s	100 3s	100 3s	120 3s	120 3s
	20																
	30																
	40									80 3s	80 3s			100 5s	100 5s	140 5s	120 5s
	50	80 3s	80 3s														
	60																
60	10	60 3s	60 3s	80 3s	80 3s	100 3s	100 3s	120 3s	120 3s	60 3s	60 3s	80 3s	80 3s	100 5s	100 5s	140 5s	120 5s
	20																
	30																
	40									80 3s	80 3s						
	50	80 3s	80 3s														
	60					100 5s	100 5s	140 5s	120 5s								

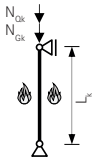
This table is only intended for pre-liminary structural design and does not replace necessary static calculations.

The self-weight of the cross-laminated timber elements is already taken into account in the table as ρ = 500 kg/m³.

Preliminary design table

Interior wall, fire exposure on both sides without cladding

Static system



Boundary conditions

- Cover layers of the wall vertical
- Service class 1
- Partial factors: γ_M = 1.25; γ_G = 1.35; γ_Q = 1.50
- Imperfection factor β_c = 0.1
- Shear deformation taken into account
- Imposed load cat. A, B: ψ_0 = 0.7; ψ_2 = 0.3; k_{mod} = 0.8

Basics for the determination of the required panel type

- ETA-09/0036
- ÖN EN 1995-1-1:2019, ÖN B 1995-1-1:2019
- ÖN EN 1995-1-2:2011, ÖN B 1995-1-2:2019

Structural fire design

- Double-sided exposure to fire
- Without cladding
- Charring rates according to ETA-09/0036
- 3 mm minimum thickness of the residual load bearing layer

Fire resistance class

R0	R30	R60	R90	R120

Permanent load	**Imposed load**	**Wall height [m]** (corresponds to the assumed buckling length L_k)															
N_{Gk} [kN/m]	N_{Qk} [kN/m]	2.7								3.0							
		PUR	MUF	PUR	MUF	PUR	MUF	PUR	MUF	PUR	MUF	PUR	MUF	PUR	MUF	PUR	MUF
10	10	60 3s	60 3s	80 3s	80 3s	160 5s	160 5s	200 5s	180 5s	60 3s	60 3s	90 3s	80 3s	160 5s	160 5s	200 5s	180 5s
	20																
	30			90 3s	90 3s								90 3s				
	40																
	50																
	60											100 3s					
20	10	60 3s	60 3s	90 3s	90 3s	160 5s	160 5s	200 5s	180 5s	60 3s	60 3s	90 3s	90 3s	160 5s	160 5s	200 5s	180 5s
	20																
	30											100 3s					
	40												100 3s				
	50			100 3s													
	60									80 3s	80 3s						
30	10	60 3s	60 3s	100 3s	90 3s	160 5s	160 5s	200 5s	180 5s	60 3s	60 3s	100 3s	90 3s	160 5s	160 5s	200 5s	180 5s
	20																
	30												100 3s				
	40																
	50				100 3s					80 3s	80 3s						
	60	80 3s	80 3s														
40	10	60 3s	60 3s	100 3s	100 3s	160 5s	160 5s	200 5s	180 5s	60 3s	60 3s	100 3s	100 3s	160 5s	160 5s	200 5s	180 5s
	20																
	30																
	40									80 3s	80 3s						
	50	80 3s	80 3s														
	60																
50	10	60 3s	60 3s	100 3s	100 3s	160 5s	160 5s	200 5s	180 5s	60 3s	60 3s	100 3s	100 3s	160 5s	160 5s	200 5s	180 5s
	20																
	30									80 3s	80 3s			200 7ss	200 7ss	220 7s	220 7s
	40																
	50	80 3s	80 3s														
	60																
60	10	60 3s	60 3s	100 3s	100 3s	160 5s	160 5s	200 5s	180 5s	60 3s	60 3s	100 3s	100 3s	200 7ss	200 7ss	220 7s	220 7s
	20																
	30									80 3s	80 3s						
	40	80 3s	80 3s					220 7s									
	50					200 7ss	200 7ss		220 7s								
	60																

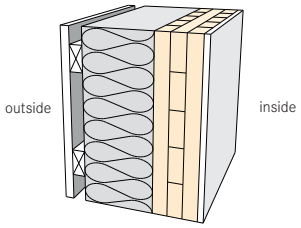
This table is only intended for pre-liminary structural design and does not replace necessary static calculations.

The self-weight of the cross-laminated timber elements is already taken into account in the table as ρ = 500 kg/m³

Component catalogue

Exterior wall

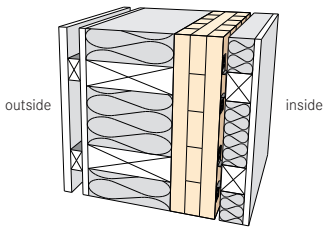
AW 01



Exterior wall / With wooden facade / Not ventilated / Without installation level

System structure from the outside to the inside	Thickness [mm]	Component Thickness [mm]	Building physics		
			Fire resistance	Sound insulation	Thermal protection
Larch wood exterior wall cladding	20.0	323	**REI 90***	Airborne sound R_w > 42 dB	U-value 0.21 W/m²K
Timber batten (spruce) 30/60	30.0				
Vapour-permeable membrane SD ≤ 0.3 m	–				
Wood fibre insulation board	160.0				
MM crosslam 3s or 5s	**100**				
GKF** 12.5 mm	12.5				

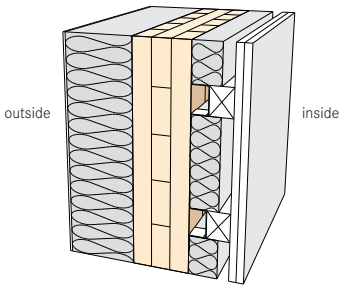
AW 02



Exterior wall / With wooden facade / Not ventilated / With installation level

System structure from the outside to the inside	Thickness [mm]	Component Thickness [mm]	Building physics		
			Fire resistance	Sound insulation	Thermal protection
Exterior wall cladding	20.0	448	**REI 90***	Airborne sound R_w 53 dB	U-value 0.19 W/m²K
Timber batten (spruce) 30/50	30.0				
Vapour-permeable membrane SD ≤ 0.3 M	–				
poss. gypsum fibreboard	15.0				
Wood fiber insulation [0.039] Construction timber 60/200	200.0				
MM crosslam 3s or 5s	**100**				
Timber batten (spruce) 60/60 on swinging hoop Mineral wool 50	70.0				
GKF** 12.5 mm or gypsum fibreboard	12.5				

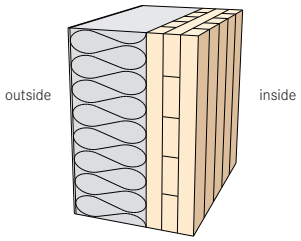
AW 03



Exterior wall / With plaster facade / Not ventilated / With installation level

System structure from the outside to the inside	Thickness [mm]	Component Thickness [mm]	Building physics		
			Fire resistance	Sound insulation	Thermal protection
Plaster	4.0	319	**REI 120***	Airborne sound R_w 53 dB	U-value 0.20 W/m²K
Rock wool MW-PT	–				
Plaster base board	120.0				
MM crosslam 3s or 5s	**100**				
Timber batten (spruce) 40/50 on swinging hoop Glass wool [0.040] D = 50 mm	70.0				
GKF** 2 × 12.5 mm or gypsum fibreboard (2 × 10 mm)	25.0				

AW 04



Exterior wall / With plaster facade / Not ventilated / Without installation level

System structure from the outside to the inside	Thickness [mm]	Component Thickness [mm]	Building physics		
			Fire resistance	Sound insulation	Thermal protection
Plaster	4.0	264	**REI 60***	Airborne sound R_w > 38 dB	U-value 0.20 W/m²K
Rock wool MW-PT Plaster base board	160.0				
MM crosslam 3s or 5s	**100**				

Source: www.dataholz.com, catalog «Bauphysikalisch geprüfter Bauteile für den Holzbau»
*acc. to Classification report Holz Forschung Austria, EN 13501 -2: REI 30 - REI 120
**GKF = Gypsum plaster fire protection board

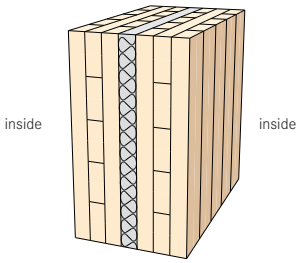
Component catalogue

Compartment wall

Compartment wall / Without installation level

WTW 01

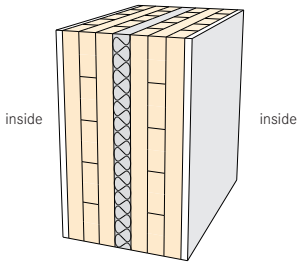
System structure from left to right	Thickness [mm]	Component Thickness [mm]	Building physics		
			Fire resistance	Sound insulation	Thermal protection
MM crosslam 3s or 5s	**100**	230	**REI 60***	Airborne sound R_w 48 dB	U-value 0.39 W/m²K
Impact sound insulation board MW-T	30.0				
MM crosslam 3s or 5s	**100**				



Compartment wall / With installation level

WTW 02

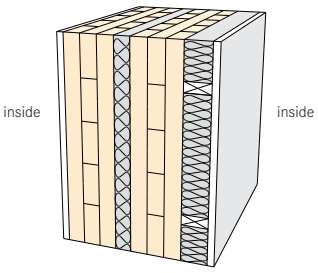
System structure from left to right	Thickness [mm]	Component Thickness [mm]	Building physics		
			Fire resistance	Sound insulation	Thermal protection
GKF** 12.5 mm	12.5	255	**REI 90***	Airborne sound R_w 56 dB	U-value 0.38 W/m²K
MM crosslam 3s or 5s	**100**				
Impact sound insulation board MW-T	30.0				
MM crosslam 3s or 5s	**100**				
GKF** 12.5 mm	12.5				
Structure without GKF**		230	REI 60*	48 dB	0.39 W/m²K



Compartment wall / With installation level

WTW 03

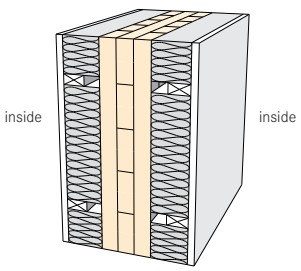
System structure from left to right	Thickness [mm]	Component Thickness [mm]	Building physics		
			Fire resistance	Sound insulation	Thermal protection
GKF** 12.5 mm	12.5	305	**REI 90***	Airborne sound R_w 62 dB	U-value 0.27 W/m²K
MM crosslam 3s or 5s	**100**				
Impact sound insulation board MW-T	30.0				
MM crosslam 3s or 5s	**100**				
Timber batten (spruce) 40/50 on swinging hoop Glass wool [0.040] D = 50 mm	50.0				
GKF** 12.5 mm	12.5				



Compartment wall / With installation level

WTW 04

System structure from left to right	Thickness [mm]	Component Thickness [mm]	Building physics		
			Fire resistance	Sound insulation	Thermal protection
GKF** 12.5 mm	12.5	265	**REI 90***	Airborne sound R_w 58 dB	U-value 0.25 W/m²K
Rock wool [0.04; R = 27] D = 60 mm Timber batten (spruce) 40/50 on swinging hoop	70.0				
MM crosslam 3s or 5s	**100**				
Timber batten (spruce) 40/50 on swinging hoop Glass wool [0.04] D = 60 mm	70.0				
GKF** 12.5 mm	12.5				

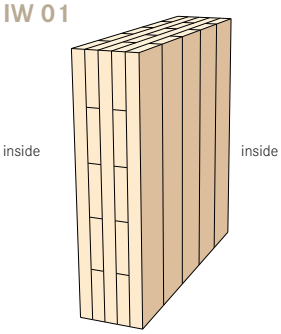


Source: www.dataholz.com, catalog «Bauphysikalisch geprüfter Bauteile für den Holzbau»
*acc. to Classification report Holz Forschung Austria, EN 13501 -2: REI 30 - REI 120
**GKF = Gypsum plaster fire protection board

Component catalogue

Interior wall and flat roof

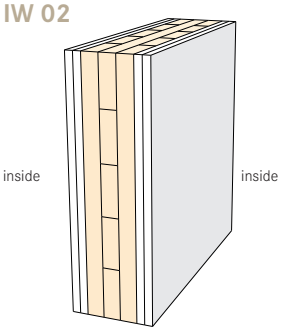
IW 01



Interior wall and flat roof

System structure from left to right	Thickness [mm]	Component Thickness [mm]	Building physics		
			Fire resistance	Sound insulation	Thermal protection
MM crosslam 3s or 5s	**100**	100	**REI 60***	Airborne sound R_w 33 dB	U-value 1.1 W/m²K

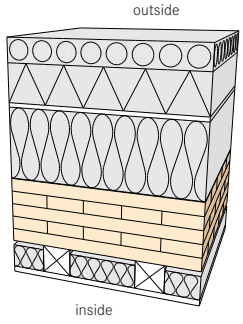
IW 02



Interior wall / Without installation level

System structure from left to right	Thickness [mm]	Component Thickness [mm]	Building physics		
			Fire resistance	Sound insulation	Thermal protection
Gypsum plaster fire protection board 2 x 12.5 mm	25.0	130	**REI 60***	Airborne sound R_w 38 dB	U-value 0.87 W/m²K
MM crosslam 3s	**80**				
Gypsum plaster fire protection board 2 x 12.5 mm	25.0				

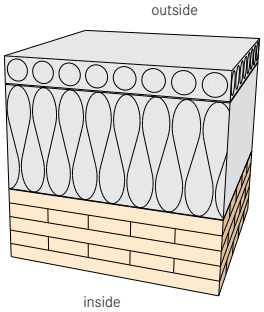
FD 01



Flat roof / Suspended / Without ventilation

System structure from the outside to the inside	Thickness [mm]	Component Thickness [mm]	Building physics		
			Fire resistance	Sound insulation	Thermal protection
Fill (gravel)	50.0	512	**REI 90***	Airborne sound R_w 47 dB	U-value 0.12 W/m²K
Seperation fleece [SD ≤ 0.2M]	-				
Extruded polystyrene	80.0				
Bituminized felt	9.0				
Mineral wool [0.040]	150.0				
Vapour barrier SD ≥ I500M	-				
MM crosslam 5s or according to static requirement	**140**				
Timber batten (spruce), suspended Glass wool [0.040] D = 50 mm	70.0				
Gypsum plaster fire protection board board	12.5				

FD 02



Flat roof / Suspended / Without ventilation

System structure from the outside to the inside	Thickness [mm]	Component Thickness [mm]	Building physics		
			Fire resistance	Sound insulation	Thermal protection
Fill (gravel) 16/32	50.0	392	**REI 60***	Airborne sound R_w 44 dB	U-value 0.18 W/m²K
Seperation fleece	-				
Roof sheeting	2.0				
Mineral fibreboard (2 x 100 mm) (λ = 0.045)	200				
Vapour barrier SD ≥ 1,500 m	-				
MM crosslam 5s	**140**				

Source: www.dataholz.com, catalog «Bauphysikalisch geprüfter Bauteile für den Holzbau»
*acc. to Classification report Holz Forschung Austria, EN 13501 -2: REI 30 - REI 120

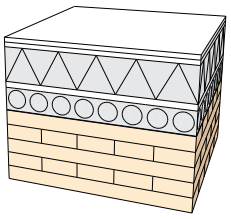
Component catalogue

Floor slab

Floor slab / Dry / Not suspended

GD 01

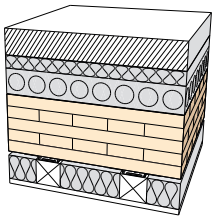
System structure from top to bottom	Thickness [mm]	Component Thickness [mm]	Building physics		
			Fire resistance	Sound insulation	Thermal protection
Gypsum fibreboard	10.0	318	REI 90*	Airborne sound R_w 65 dB Impact sound L_{nTw} 50 dB	U-value 0.38 W/m²K
Heraklith floor (gypsum fibreboard)	10.0				
Heraklith floor (wood wool composite board)	75.0				
Heralan TPS 15/13 Impact sound insulation	13.0				
Fill (grit)	50.0				
Trickle protection	–				
MM crosslam 5s or according to static requirement	**160**				



Floor slab / Wet / Suspended

GD 02

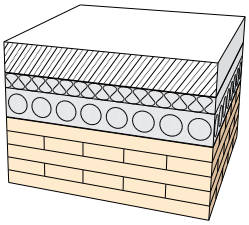
System structure from top to bottom	Thickness [mm]	Component Thickness [mm]	Building physics		
			Fire resistance	Sound insulation	Thermal protection
Cement screed	60.0	373	REI 90*	Airborne sound R_w 62 dB Impact sound L_{nTw} 46 dB	U-value 0.25 W/m²K
PE foil (seperation layer)	–				
Impact sound insulation board TDPS 30	30.0				
Fill (grit) unbound (2/4)	30.0				
PE foil (seperation layer)	-				
MM crosslam 5s	**≥140**				
Suspended ceiling CD profile 60 x 27 Air gap 10 mm MW 60 mm	70.0				
gypsum plaster fire protection board	12.5				



Floor slab / Wet / Not suspended

GD 03

System structure from top to bottom	Thickness [mm]	Component Thickness [mm]	Building physics		
			Fire resistance	Sound insulation	Thermal protection
Cement screed	60.0	290	REI 60*	Airborne sound R_w 60 dB Impact sound L_{nTw} 57 dB	U-value 0.44 W/m²K
PE foil (seperation layer)	–				
Impact sound insulation board TPS	30.0				
Fill (grit) unbound (xy 2/4)	60.0				
PE foil (seperation layer)	-				
MM crosslam 5s	**≥140**				

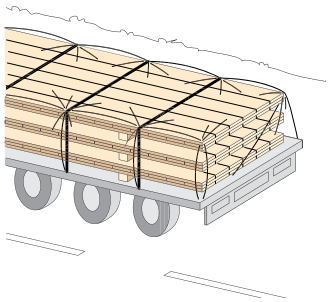


Source: www.dataholz.com, catalog «Bauphysikalisch geprüfter Bauteile für den Holzbau»
*acc. to Classification report Holz Forschung Austria, EN 13501 -2: REI 30 - REI 120

Information sheet

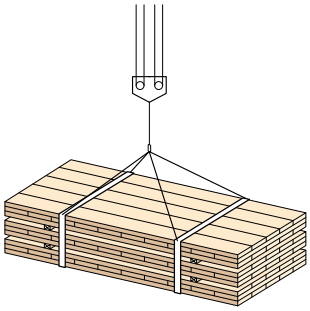
Important notes for working with cross-laminated timber

Transport and delivery



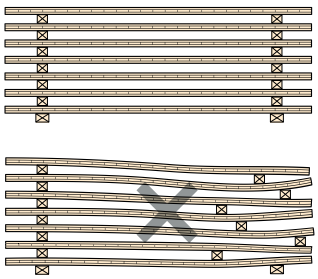
- The loading sequence should be discussed with the manufacturer if necessary.
- During transport, the members must be protectet from moisture and dirt.
- Keep driveways clear to allow traffic.
- If elements are stored on the building site, the ground must be dry and have adequate load-bearing capacity.

Fastening and lifting by crane



- Operation only by trained staff.
- Heed accident prevention regulations.
- Use suitably dimensioned lifting gear and slings according to the installation instructions.
- Before use, check lifting gear, slings, and attachment points for damage.

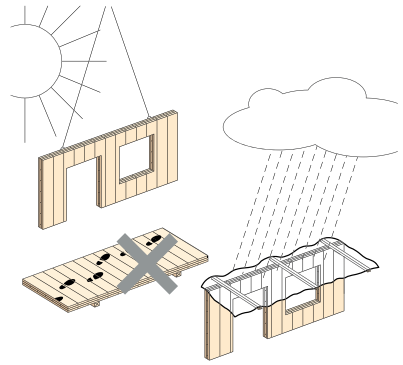
Storage at building site



- Use timber spacers.
- When stacking members horizontally, align timber spacers vertically.
- Secure stored members against toppling.
- Remove packaging to prevent condensation.
- Provide adequate ground clearance and tarpaulins to protect members from rain, water spray, and rising damp.
- For extended storage, use additional timber spacers to prevent creep deformations.

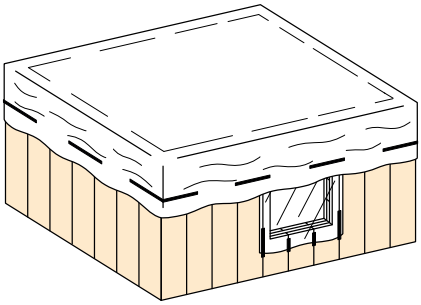
Image and text source: Bulletin Cross-laminated timber August 2021, Studiengemeinschaft Holzleimbau e.V., pages 9/10.

Components during installation



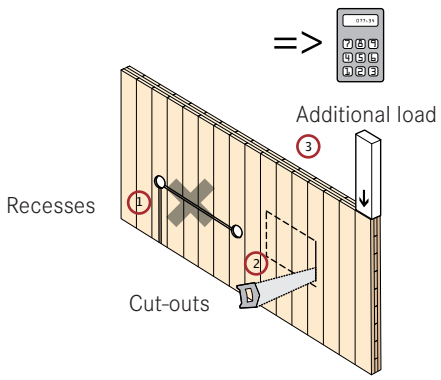
- Install in accordance with installation instructions.
- Avoid detrimental absorption of moisture.
- Keep members covered until the final weather protection is in place.
- Prevent soiling and protect members by covering them if necessary.

Protection of installed members



- Avoid staining by covering visible surfaces.
- Ensure adequate ventilation to prevent discolouration due to moisture absorption during construction (e.g. due to screeding or rendering).
- Dry components which have absorbed moisture as soon as possible, but very carefully.
- Tarpaulins should be attached in a way that prevents water accumulation and limits capillary absorption of water in gaps.
- Heed accident prevention regulations.

Modifications on site



- **Notches (1), holes (2), and additional loads (3)**
  The effect of opening holes and recessing on-site on load-carrying capacities must be discussed in advance with the site engineer
- The capacity for carrying additional static loads must be verified.

Image and text source: Bulletin Cross-laminated timber August 2021, Studiengemeinschaft Holzleimbau e.V., pages 9/10

Installation instructions
General

Foreword

The relevant accident prevention regulations must be observed by all employees. In the event of ambiguities or inconsistencies, the accident prevention regulations as amended shall apply.

The following installation instructions for building with prefabricated elements are based on the Austrian Construction Workers' Protection Ordinance (in the applicable version), in particular Section 10 §§ 85 and 86.

In addition, any legal requirements in other countries must be observed and complied with by the client.

In the following, unless explicitly stated otherwise, Mayr-Melnhof Holz Gaishorn GmbH is referred to as the manufacturer.

1. Personnel

1.1. Qualification

Work such as the design, management and installation of cross-laminated timber elements may only be carried out by persons with appropriate / sufficient qualifications in this field. The supervision of the installation work is the responsibility of a suitable supervisor (installation manager, foreman or similar).

1.2. Suitability of employees

Installation work may only be carried out by persons who are familiar with this work, who are physically and technically suitable and who have been specially instructed (see item 1.3).

1.3. Briefing and instructions

Before starting work for the first time, installation employees must be instructed on the hazards that may arise during their activities and on the measures to be taken to prevent such hazards by suitable persons. This instruction must be repeated regularly. The basis for this are all accident prevention regulations as well as these installation instructions.

1.4. Personal protective equipment

Employees are obliged to use the personal protective equipment necessary for work with prefabricated parts, such as hardhats, safety gloves, safety belts, safety glasses, etc.

1.5. Reporting of defects

If an employee discovers that a piece of equipment, a work process or a work material is unsafe, they must report this to their supervisor without delay unless they can correct the defect themselves in an orderly manner.

2. Traffic routes and workplacese

2.1. General

Workplaces and their accesses as well as other traffic routes must be set up properly or must be designed in such a way that safe working is possible. Adequate protection against falling objects (e.g. by means of covers, scaffolding, catch grids, etc.) must be ensured.

Installation work may not be carried out simultaneously at sites located on top of one another if that the workplaces and traffic routes underneath are not protected against falling, sliding or rolling objects (see item 2.1 first paragraph) During installation work, screws, nails and other small parts must be stored safely to prevent them from falling.

Do not enter hazardous areas where persons cannot be protected from falling, sliding or rolling objects. They must be marked accordingly and, if necessary, cordoned off or secured by sentinels that are not allowed to be engaged in other work.

In general, fall protection is required at all workplaces and traffic routes. In general, however, suitable fall protection must be installed for work involving a fall height of 2.0 m or more. The responsible supervisor on the construction site must ensure that this is done properly.

Attention must be paid to any overhead electrical lines that may be present and the required safety distance must be maintained.

Rated voltage	Safety distance from live parts without protection against direct contact
Up to 1,000 V	1.0 m
From 1 to 110 kV	3.0 m
From 110 to 220 kV	4.0 m
From 220 to 380 kV	5.0 m
Unknown	5.0 m

Table 1: Safety distances adjusted to the nominal voltage during construction work and other non-electronic work in the vicinity of live parts.

2.2. Traffic routes

Traffic routes to reach the workplaces during the installation of components must be safe to walk on.
Stairways or gangways must be used for access to workplaces.
If gangways are used as traffic routes, they must be at least 0.5 m wide.

Ladders may only be used when,

- the height difference to be considered does not exceed 5.00 m,
- ascent is needed only for short-term work,
- they are located in scaffolds that do not connect more than two scaffolding layers or are not higher than 5.0 m above sufficiently wide and load-bearing surfaces.

Traffic routes at the edges of ceilings and roofs must be secured with side guards or firmly cordoned off at a distance of at least 2.0 m from the edges.

2.3. Workplaces

If special safety measures are required during installation or if knowledge of special safety-related information is required for installation, written installation instructions and drawings must be prepared by a competent person. The following are required for the performance of the installation work. Determine required standing positions, fall protection, protective equipment and fastening devices for personal protective equipment (safety harness).

Standing positions on frames, rungs, profiles of lattice towers are permitted if the employee is secured with suitable fastening devices (e.g. with safety harness).
If all of the following special conditions are met, suitable elements may be used for loosening and fastening slings and for fixing components as access and standing points without the need to provide fall protection:

- If the installation of the fall protection is more dangerous than the actual activity.
- If the installation of the fall protection is technically impossible.
- If favourable weather conditions are present.
- If the workers are instructed, experienced and physically fit.
- If the components are anchored, and sufficiently wide (20 cm) or provided with means of retention.

Workplaces must be sufficiently illuminated and, in the event of darkness, escape routes must be secured by means of independent emergency lighting.

2.4. Cut-outs

In the case of stair, wall and floor openings, edges, recesses and non-penetration-proof covers located in the work or traffic area, appropriate devices must be installed to prevent people from stepping in, falling in or falling off.

3. Delivery

Prefabricated elements must be checked before installation for quantity, items and possible damage, especially with regard to load-bearing capacity (e.g. cracks, atypical deformations, visible damage, etc.).

In case of damage in the area of the lifting devices or damage to the elements, which may affect the load-bearing capacity, unloading may only be carried out after consultation with the installation supervisor.

The transport routes on the construction site must have sufficient load-bearing capacity and be safe to drive on.

4.Handling

4.1. Hoists

When selecting the location for lifting equipment on installation sites, it is important to ensure that the ground has sufficient load-bearing capacity and that the existing supports are used. The load-bearing capacity of the ground may be reduced, for example, in the area of filled working spaces and in the case of cavities.

Furthermore, a hoist designed according to the weight of the elements to be moved must be used for handling on the construction site.

4.2. Selecting the right suspension gear
The elements (walls, ceilings, etc.) must be moved and installed only with the use of compensating suspension gear.

4.3. Attaching prefabricated elements to lifting equipment
Loads may only be attached by persons who have been specially instructed for this purpose by the site manager or the person responsible on the construction site.

The weights of the prefabricated elements are listed on the parts list, the delivery note or the drawing or written on the element or to be obtained from the site manager/installation supervisor. Prefabricated parts may only be attached if they are marked and their weight is known.

Furthermore, the following should be noted:

- Never attach two load hooks to one lifting loop, use load hooks only with load hook safety device.
- The manufacturer's application instructions for load handling equipment must be observed.
- Parts that do not offer a safe attachment possibility may not be attached or may only be attached after appropriate instruction by the site manager/installation supervisor.
- The rope slings must not be damaged or kinked.
- Do not pass rope slings directly over the crane hook.
- Slings must be undamaged and are to be used only for the one-time installation process on the construction site.
- Large and long prefabricated parts must be handled with guiding ropes, if these parts can bump objects or get stuck while being pulled up.

Unless otherwise specified, the manufacturer shall install the required installation aids (CE-certified transport anchors and disposable lifting slings). The position/location as well as the number is stated on the production drawings and is thus available to the customer for checking. On the special request of the customer, the installation aids can be can also be omitted. The client or another suitable person authorised by them is responsible for unloading and moving as well as installing the elements.

5. Unloading

When unloading, special attention must be paid to securing the prefabricated parts remaining on the vehicle, e.g. mind the vehicle becoming lighter on one side and the associated risk of tipping. When lifting off, avoid diagonal pull, vehicles must be supported if necessary.

6. Storage

6.1. General
Materials and equipment must be stored in such a way that workers are not endangered by them falling, slipping, falling over or rolling away.

Prefabricated parts must be stored, transported and installed in such a way that their location cannot change unintentionally.

Stored goods must be protected against external influences in such a way that no dangerous chemical or physical changes occur in the stored goods.

Goods may only be stacked up to a height where their stability can still be ensured. Only materials of low weight may be stacked more than 2.00 m high.

Stacks may only be erected on firm, level ground or on sufficiently strong supports, well-connected and appropriate. Erection and removal of stacks as well as manipulation of stacks shall be performed from safe standing positions. Stored goods must not be pulled out of the lower layers of a stack, nor must material be removed from the storage goods.

6.2. Horizontal storage

If prefabricated elements are stored horizontally above one another, this requires suitable, load-bearing and non-slip intermediate storage units, which must be arranged vertically above one another. When storing dissimilar parts, consider the order of later removal for installation to eliminate the need for restacking.

6.3. Vertical storage

Vertically supported prefabricated elements (upright support on the element narrow side) must be secured against tipping over. This requires that they be secured at at least two points on their footprint and additionally at at least one point above their centre of gravity. For storey-high elements with unusual lengths (l:b >2), further securing measures are required.

6.4. Inclined storage

When prefabricated elements are stored at an incline, slip protection must be provided at the lower support points. When using A-frames, make sure that they are loaded approximately equally from both sides by the leaned prefabricated elements and that they are not overloaded. When storing dissimilar parts, consider the order of later removal for installation to eliminate the need for moving.

6.5. Storage on and around structures

If the prefabricated elements are to be stored on existing structural elements, their load-bearing capacity must be checked beforehand. Overloads should be avoided, and components should be strengthened by additional supports if necessary. Under no circumstances may prefabricated elements be leaned against building structures that are not yet sufficiently stable due to their installation condition.

7. Installation

7.1. General

When carrying out installation work, the load-bearing capacity and stability of the structure must be ensured during the individual installation stages.

7.2. Auxiliary structures required for installation

The client is responsible for the installation of the auxiliary structures required for the installation of the prefabricated elements. It is paramount that the stability of the building or individual elements is ensured when using auxiliary structures. If necessary, a proof of stability by a competent person is required. Supports placed on unpaved ground must be placed on further supports, such as squared lumber or posts, so that they cannot move. Brick piles or the like are not permitted.

7.3. Ensuring stability

In order to ensure the load-bearing capacity and stability of the structure and the prefabricated parts (also during the individual installation stages), the client shall provide the necessary proofs of stability and load-bearing capacity (also in the installed state). They can do this themselves (if authorised) or they have to have it done by a designated structural engineer.

To verify the stability and load-bearing capacity, various failure mechanisms must be calculated individually.

8. Additional information from the manufacturer

Information required for installation instructions is provided and documented by the manufacturer as follows:

The weight of the prefabricated elements

The weight (incl. geometry) of the **MM cross**lam elements is indicated in the production drawings available to the customer and in the element designation (adhesive label) required by CE certification, which is applied directly during loading.

Storing prefabricated parts

In order to maintain the quality of the delivered goods, the customer is obliged to store them properly at a storage place provided by them. The manufacturer recommends the use of wooden supports and tarpaulins for short storage periods if stored without a roof. Furthermore, the instructions given under item 6 Storage must be observed.

Transport and transport position of the prefabricated elements to be observed during transport

In general, if not changed by the customer via loading instructions, the manufacturer suggests economical transport and a stable transport position of individual elements. The loading instructions are sent by the manufacturer to the customer in advance together with the production drawings to be checked. The load must be secured against falling down, toppling over, slipping, etc. The manufacturer performs a visual inspection of the prefabricated elements before loading in order to minimise risks related to safety as far as possible.

The client or a suitable supervisor authorised by them is exclusively responsible for the following points:

- Measures for the creation of workplaces and access to them (see item 2),
- Measures to prevent people from falling during installation (see item 2),
- Measures against falling objects (see item 2) and
- Inspection of the finished parts for visible damage, deformation and cracks that may affect safety (see item 3).

Special notes (object-dependent)

9. Installation instructions for cross-laminated timber elements

Trimming tool (e.g.: beam hoist, cordless screwdriver, sledge hammer, circular saw, chain saw, router, rebate plane, spirit level, installation support, etc.) should be available on the site to facilitate installation and allow for possible reworking of the details. Please observe the product tolerances!

9.1. Installation of wall-type prefabricated elements (mainly vertical installation)

- Clean and check cushions
- Establish flatness of the cushion - levelling
- Make sure that the elements have a fully flat contact surface
- After the component has been set down, the crane ropes must remain tensioned until the component's tilt resistance is established
- Check alignment - align the component
- Observe any installation safety devices
- Establish a connection between the components and then unhook the component
- Uncontrolled falling out when removing any residual cross sections must be avoided as far as possible
- Wall openings must be secured against falling if necessary

9.2. Installation of wall-type prefabricated elements (mainly vertical installation condition)

- Clean and check cushion surfaces
- Establish flatness of the cushion - levelling
- Make sure that the elements have a fully flat contact surface
- After putting down, align the component
- Observe any installation safety devices
- Connect the prefabricated element to the structure and then unhinge the prefabricated element
- Lifting loops must be removed or secured against tripping
- Ceiling breakthroughs and edge areas must be secured against falling

Notes

Notes

Locations

Sweden

Bergkvist Siljan Insjön
Sawmill

Bergkvist Siljan Blyberg
Sawmill

Bergkvist Siljan Mora
Sawmill

Bergkvist Siljan Skog
Log procurement

Mayr-Melnhof Holz Wismar
Timber processing plant

Germany

Czech Republic

Austria

Mayr-Melnhof Holz Paskov
Sawmill, Pellet production

Mayr-Melnhof Holz Olsberg
Timber processing plant

Mayr-Melnhof Holz Leoben
Sawmill, Pellet production

Mayr-Melnhof Holz Reuthe
Timber processing plant

KAUFMANN BAUSYSTEME

Mayr-Melnhof Holz Gaishorn am See
Timber processing plant

MMK

Contacts timber processing locations:

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