



WHERE
IDEAS
CAN
GROW.



MM crosslam

Cross-laminated timber





WHERE IDEAS CAN GROW.

Mayr-Melnhof Holz Holding AG is one of the leading and most important companies in the European timber industry, a market leader in the glulam segment and internationally expanding in the cross-laminated timber sector. 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



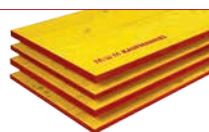
MM blockdeck
Floor and wall beams



MM HBE
Solid timber
construction element



MM crosslam
Cross-laminated timber



K1 yellowplan
Formwork panels



HT 20plus
Formwork beams

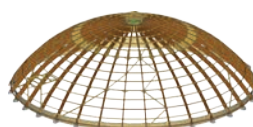


MM sawn timber

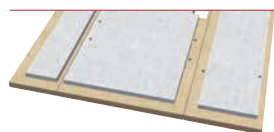


MM royalpellets

Custom elements & engineering solutions



MM complete
Timber engineering & turn-key construction
by **HUTTEMANN**



X-LAM CONCRETE
Timber-concrete composite element
by **MMK**

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Mayr-Melnhof Holz Holding AG

Turm-gasse 67 · 8700 Leoben · Austria

T +43 3842 300 0

holding@mm-holz.com · www.mm-holz.com

MM crosslam

Cross-laminated timber (CLT)

Mass timber construction is future build

MM crosslam from Mayr-Melnhof Holz is large sized format CLT, with excellent structural and physical properties. The crosswise structure and the high-quality bonding of the individual lamellas ensure the best dimensional stability and static performance with a low dead weight. CLT is manufactured to order. It is customized to project requirements and areas of application – from single homes up to high-rise-buildings in mass timber technology.



Benefits

- Free forms and multiple dimensions
- High load-bearing capacity with low dead weight in comparison to its bulk density
- Excellent structural performance
- 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

- **MM crosslam** for walls
- **MM crosslam** for ceilings, floor slabs and roofs
- **MM crosslam** used as beams
- **MM crosslam** as component in timber systems

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



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 quality (NVO)
- Industrial visible quality (IVQ)
- Domestic visible quality (DVO)

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 elements
- Rib elements
- Prefabricated elements on request

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 structural challenges can be executed effortlessly.

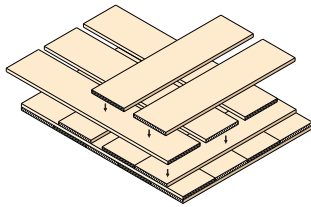
MM crosslam panels are precisely manufactured to the individual project specifications in our plant's own processing facility using modern CNC machines. The high degree of prefabrication and the flexible dimensions of the cross-laminated timber elements enable quick, straightforward and low-dust erection 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.



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/m³ 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

$\lambda = 0.10 \text{ W/mK}$
According to test report no. B12.162.008.450 TU Graz

Specific heat capacity

$c_p = 1.60 \text{ kJ/kgK}$

Vapour permeability

$\mu = 60$ (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 |
|-------------------------|--------------|-------------|
| Top layer (outer layer) | 0.65 mm/min | 0.60 mm/min |
| other layers | 0.76 mm/min* | 0.71 mm/min |

| PUR bonding | Ceiling/roof | Wall |
|-------------------------|--------------|-------------|
| Top layer (outer layer) | 0.65 mm/min | 0.63 mm/min |
| other layers | 1.30 mm/min* | 0.86 mm/min |

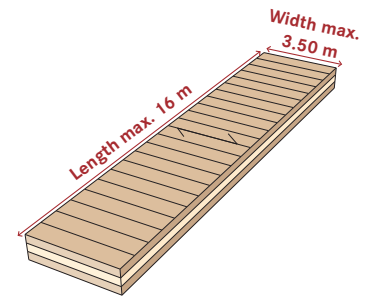
* Until 25 mm of charring. Afterwards the charring rate 0.65 mm/min applies to the next glue line.

Standard panel types

Covering layer in the transvers panel direction

mainly for walls

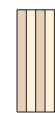
| Panel type | | | Panel build up (NVQ, IVQ, DVQ*) | | | | | | |
|------------|----|----|---------------------------------|----|----|----|----|---|---|
| MMcrosslam | | | [mm] | | | | | | |
| | | | c | l | c | l | c | l | c |
| 60 | 3s | TC | 20 | 20 | 20 | | | | |
| 80 | 3s | TC | 20 | 40 | 20 | | | | |
| 90 | 3s | TC | 30 | 30 | 30 | | | | |
| 100 | 3s | TC | 30 | 40 | 30 | | | | |
| 120 | 3s | TC | 40 | 40 | 40 | | | | |
| 100 | 5s | TC | 20 | 20 | 20 | 20 | 20 | | |
| 120 | 5s | TC | 30 | 20 | 20 | 20 | 30 | | |
| 140 | 5s | TC | 40 | 20 | 20 | 20 | 40 | | |
| 160 | 5s | TC | 40 | 20 | 40 | 20 | 40 | | |



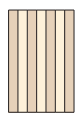
3s TC



5s TC



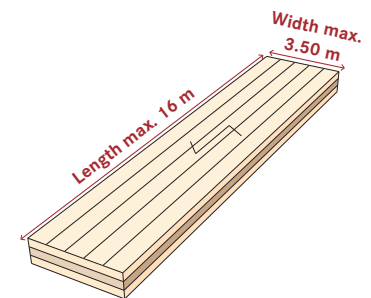
7s TC



Covering layer in the longitudinal panel direction

mainly for ceilings and roofs

| Panel type | | | Panel build up (NVQ, IVQ, DVQ*) | | | | | | |
|------------|-----|----|---------------------------------|----|-------|----|-------|----|----|
| MMcrosslam | | | [mm] | | | | | | |
| | | | l | c | l | c | l | c | l |
| 60 | 3s | TL | 20 | 20 | 20 | | | | |
| 80 | 3s | TL | 20 | 40 | 20 | | | | |
| 90 | 3s | TL | 30 | 30 | 30 | | | | |
| 100 | 3s | TL | 30 | 40 | 30 | | | | |
| 120 | 3s | TL | 40 | 40 | 40 | | | | |
| 100 | 5s | TL | 20 | 20 | 20 | 20 | 20 | | |
| 120 | 5s | TL | 30 | 20 | 20 | 20 | 30 | | |
| 140 | 5s | TL | 40 | 20 | 20 | 20 | 40 | | |
| 160 | 5s | TL | 40 | 20 | 40 | 20 | 40 | | |
| 180 | 5s | TL | 40 | 30 | 40 | 30 | 40 | | |
| 200 | 5s | TL | 40 | 40 | 40 | 40 | 40 | | |
| 200 | 7s | TL | 20 | 40 | 20 | 40 | 20 | 40 | 20 |
| 220 | 7s | TL | 40 | 20 | 40 | 20 | 40 | 20 | 40 |
| 240 | 7s | TL | 40 | 20 | 40 | 40 | 40 | 20 | 40 |
| 200 | 7ss | TL | 20+40 | 20 | 40 | 20 | 40+20 | | |
| 220 | 7ss | TL | 40+40 | 20 | 20 | 20 | 40+40 | | |
| 240 | 7ss | TL | 40+40 | 20 | 40 | 20 | 40+40 | | |
| 260 | 7ss | TL | 40+40 | 30 | 40 | 30 | 40+40 | | |
| 280 | 7ss | TL | 40+40 | 40 | 40 | 40 | 40+40 | | |
| 300 | 8ss | TL | 40+40 | 30 | 40+40 | 30 | 40+40 | | |
| 320 | 8ss | TL | 40+40 | 40 | 40+40 | 40 | 40+40 | | |



3s TL



5s TL



7s TL



7ss TL



8ss TL



* Please note, the panel build up for domestic visible quality can slightly differ. All surfaces can be either one- or both sided.

NVQ = non visible / IVQ = industrial visible / DVQ = domestic visible
 TT = Top-layer transversal / TL = Top-layer longitudinal

Surface qualities

Non-visible quality (NVQ)

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 lamellas are only strength graded and fulfill 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 (IVQ)

MM crosslam 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**.

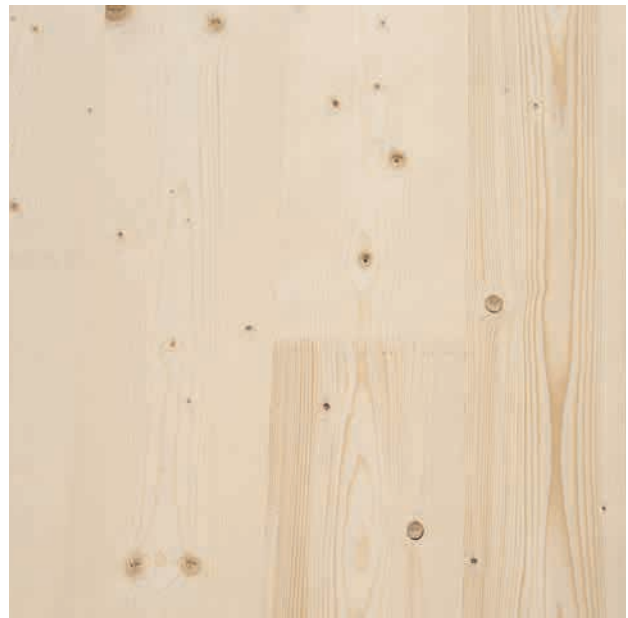
- In addition to the strength grading criteria, higher visual criteria are applied to the cover lamellas.
- Selected cover lamellas with healthy, firmly ingrown knots are used.
- Occasional loose knots and discolouration are possible, flaws and small resin pockets are permissible.
- The surface is sanded.



Symbolic image



Symbolic image



Symbolic image

Domestic visible quality (DVQ)

Domestic 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.



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 | One species; spruce/fir are deemed one wood type | 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 lamellas) 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 lamellas (e.g. due 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: 2.40 x 6.20 m | Maximum format: PUR: 3.5 x 16.0 m MUF: 3.0 x 16.5 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 |

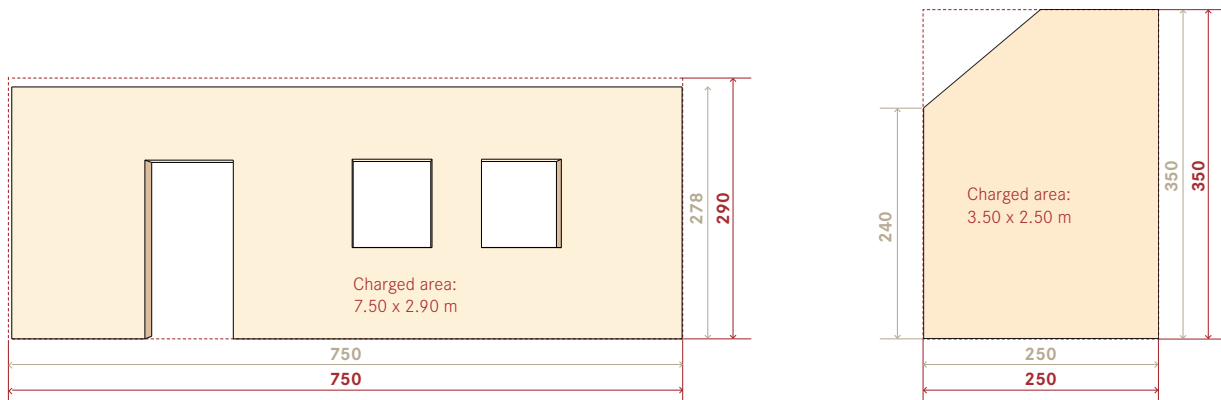
Charged widths

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

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 services can be offered, such as:

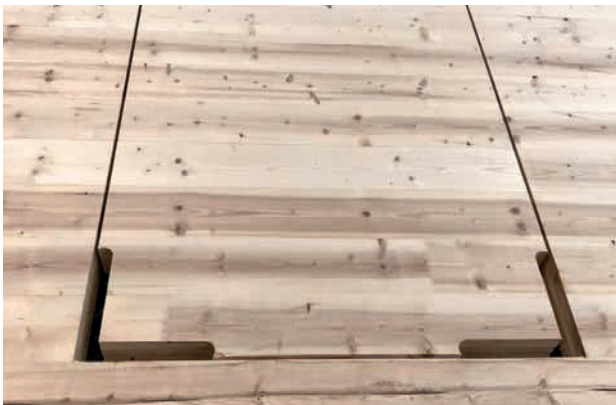
- format and rectangular cuts
- square and round openings e.g. for windows
- bevel cuts, slots and grooves
- standard panel joints (e.g. half-lap joint, rebate board)
- the chamfering and drilling of recesses for the integration of building services, lifting equipment (e.g. mounting loops with blind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



Format cut



Rebate



Cut-out, residual radii removed



Cut-out, residual radii not removed

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.

Tolerances for wall, floor and roof elements

| MM crosslam | Reference moisture measurement | Nominal dimensions | Limit deviations [mm] depending on the 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 | - | - |



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 crosslam** 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, an extensive software package developed and maintained by the holz.bau forschungsbau gmbh Graz competence centre, is available to our customers. It can be downloaded free of charge from our homepage at www.mm-holz.com.



CLTdesigner for preliminary design

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*
- <https://www.proholz.at/publikationen/cross-laminated-timber-structural-design-volume-ii>

Material properties according to ETA-09/0036

| Properties for mechanical actions perpendicular to CLT | Properties for mechanical actions in plane to CLT |
|--|---|
| Strength classes | Strength classes |
| C24/T14 | C24/T14 |
| Modulus of elasticity: <ul style="list-style-type: none"> • Parallel to the grain of the boards $E_{0,mean}$ 12,000 N/mm² • Perpendicular to the grain of the boards $E_{90,mean}$ 370 N/mm² | Modulus of elasticity: <ul style="list-style-type: none"> • Parallel to the grain of the boards $E_{0,mean}$ 12,000 N/mm² |
| Shear modulus: <ul style="list-style-type: none"> • Parallel to the grain of the boards $G_{090,mean}$ 690 N/mm² • Perpendicular to the grain of the boards (rolling shear modulus) $G_{9090,mean}$ 50 N/mm² | Shear modulus: <ul style="list-style-type: none"> • Parallel to the grain of the boards $G_{090,mean}$ 450 N/mm² |
| Bending strength: <ul style="list-style-type: none"> • Parallel to the grain of the boards $f_{m,k}$ 26.4 N/mm² | Bending strength: <ul style="list-style-type: none"> • Parallel to the grain of the boards $f_{m,k}$ 24.0 N/mm² |
| Tensile strength: <ul style="list-style-type: none"> • Perpendicular to the grain of the boards $f_{t,90,k}$ 0.12 N/mm² | Tensile strength: <ul style="list-style-type: none"> • Perpendicular to the grain of the boards $f_{t,0,k}$ 14.5 N/mm² |
| Compressive strength: <ul style="list-style-type: none"> • Perpendicular to the grain of the boards $f_{c,90,k}$ 2.5 N/mm² | Compressive strength: <ul style="list-style-type: none"> • Parallel to the grain of the boards $f_{c,0,k}$ 21.0 N/mm² |
| Shear strength: <ul style="list-style-type: none"> • 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 | Shear Strength: <ul style="list-style-type: none"> • 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 inertia 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

Cross-section values of the panel types

| CLT thickness | Build-up (bold = main load-bearing direction) | A _{gross} | A _{net} | I _{gross} (bxd ³)/12 | I _{eff} (depending on the span 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] | [cm ²] | [cm ²] | [cm ⁴] | [cm ⁴] | [%] | [cm ⁴] | [%] | [cm ⁴] | [%] | [cm ⁴] | [%] | [cm ⁴] | [%] | [cm ⁴] | [%] | [cm ⁴] | [%] | |
| 60 | 3s | 20-20-20 | 600 | 400 | 1800 | 1231 | 68 | 1569 | 87 | 1656 | 92 | 1689 | 94 | 1705 | 95 | 1713 | 95 | 1722 | 96 |
| 80 | 3s | 20-40-20 | 800 | 400 | 4267 | 1982 | 46 | 3634 | 85 | 3926 | 92 | 4041 | 95 | 4096 | 96 | 4127 | 97 | 4159 | 97 |
| 90 | 3s | 30-30-30 | 900 | 600 | 6075 | 3110 | 51 | 4744 | 78 | 5295 | 87 | 5523 | 91 | 5636 | 93 | 5700 | 94 | 5764 | 95 |
| 100 | 3s | 30-40-30 | 1000 | 600 | 8333 | 3546 | 43 | 5921 | 71 | 6827 | 82 | 7219 | 87 | 7417 | 89 | 7530 | 90 | 7646 | 92 |
| 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 | 7s | 20-40-20-40-20-40-20 | 2000 | 800 | 66667 | | | | | 26786 | 40 | 30237 | 45 | 32159 | 48 | 33311 | 50 | 34542 | 52 |
| 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 | 40-40-20-20-40-40 | 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 | 8ss | 40-40-30-40-40-30-40-40 | 3000 | 2400 | 225000 | | | | | | | 155646 | 69 | 170532 | 76 | 179997 | 80 | 190606 | 85 |
| 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

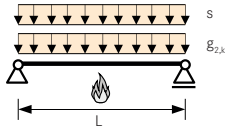
I_{eff} Effective moment of inertia in the direction of the cover layers for single span beams

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



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

Boundary conditions

- Service class 1
- Partial factors: $\gamma_M = 1.25$; $\gamma_G = 1.35$; $\gamma_Q = 1.50$
- Snow load for location < 1,000 m a.s.l.: $\psi_0 = 0.5$; $\psi_2 = 0.0$
- Deflection limits $w_{inst} = L/300$; $w_{net, fin} = L/250$; $w_{fin} = L/150$
- $k_{def} = 0.8$; $k_{mod} = 0.9$

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 $g_{z,k}$ [kN/m ²] | Snow load $s = \mu \cdot s_k$ [kN/m ²] | Span L [m] | | | | | | | | | | | | | |
|---|--|------------|--------|--------|--------|--------|--------|---------|---------|---------|---------|---------|---------|---------|---------|
| | | 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 | 160 5s | 160 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 | 240 7ss | 240 7ss |
| | 3.0 | | | | | | | 180 5s | 180 5s | 200 7ss | 200 7ss | | | | |
| | 4.0 | 90 3s | 90 3s | 120 3s | 120 3s | | | | | 220 7ss | 220 7ss | | | 240 7ss | 240 7ss |
| | 5.0 | | | | | 160 5s | 160 5s | 200 5s | 200 5s | | | | | 260 7ss | 260 7ss |
| | 6.0 | 100 3s | 100 3s | 140 5s | 140 5s | 180 5s | 180 5s | 200 7ss | 200 7ss | 240 7ss | 240 7ss | | | 280 7ss | 280 7ss |
| | 7.0 | 120 3s | 120 3s | | | | | 220 7ss | 220 7ss | | | | | | |
| 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 | 240 7ss | 240 7ss |
| | 2.0 | | | | | | | 180 5s | 180 5s | | | | | | |
| | 3.0 | 90 3s | 90 3s | 120 3s | 120 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 | | | | | 280 7ss | 280 7ss |
| | 6.0 | 120 3s | 120 3s | | | 180 5s | 180 5s | 220 7ss | 220 7ss | 240 7ss | 240 7ss | | | 300 8ss | 300 8ss |
| | 7.0 | | | | | | | | | | | | | | |
| 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 | 240 7ss | 240 7ss |
| | 2.0 | 90 3s | 90 3s | 120 3s | 120 3s | 160 5s | 160 5s | | | | | | | 240 7ss | 240 7ss |
| | 3.0 | | | | | | | 200 5s | 200 5s | 220 7ss | 220 7ss | | | 260 7ss | 260 7ss |
| | 4.0 | 100 3s | 100 3s | 140 5s | 140 5s | 180 5s | 180 5s | 200 7ss | 200 7ss | | | | | 280 7ss | 280 7ss |
| | 5.0 | | | | | | | | | | | | | | |
| | 6.0 | 120 3s | 120 3s | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 220 7ss | 240 7ss | 240 7ss | | | 300 8ss | 300 8ss |
| | 7.0 | | | | | | | | | | | | | | |
| 2.0 | 1.0 | 90 3s | 90 3s | 120 3s | 120 3s | 160 5s | 160 5s | 180 5s | 180 5s | 200 7ss | 200 7ss | 240 7ss | 240 7ss | 240 7ss | 240 7ss |
| | 2.0 | | | | | | | 200 5s | 200 5s | 220 7ss | 220 7ss | | | 260 7ss | 260 7ss |
| | 3.0 | 100 3s | 100 3s | 140 5s | 140 5s | 180 5s | 180 5s | 200 7ss | 200 7ss | | | | | 280 7ss | 280 7ss |
| | 4.0 | | | | | | | | | | | | | | |
| | 5.0 | 120 3s | 120 3s | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 220 7ss | 240 7ss | 240 7ss | | | 300 8ss | 300 8ss |
| | 6.0 | | | | | | | | | | | | | | |
| | 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 | 240 7ss | 240 7ss | 260 7ss | 260 7ss |
| | 2.0 | 100 3s | 100 3s | 140 5s | 140 5s | 180 5s | 180 5s | 200 7ss | 200 7ss | | | | | 280 7ss | 280 7ss |
| | 3.0 | | | | | | | | | | | | | | |
| | 4.0 | 120 3s | 120 3s | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 220 7ss | 240 7ss | 240 7ss | | | 300 8ss | 300 8ss |
| | 5.0 | | | | | | | | | | | | | | |
| | 6.0 | | | | | | | | | | | | | | |
| | 7.0 | | | | | | | | | | | | | | |

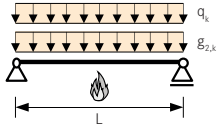
This table is only intended for pre-liminary structural design and does not replace necessary static calculations.

The self-weight of the cross-laminated timber elements is already taken into account in the table as $\rho = 500 \text{ kg/m}^3$.

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: $\gamma_M = 1.25$; $\gamma_G = 1.35$; $\gamma_Q = 1.50$
- Vibration: $b \geq 1.2 L$; four edges supported;
 $f_{1,gr} = 8 \text{ Hz}$; $w_{stat,gr} = 0.25 \text{ mm}$; $\zeta = 4\%$; $a_{rms,gr} = 0.05 \text{ m/s}^2$
- Deflection limits: $w_{inst} = L/300$; $w_{net,fin} = L/250$; $w_{fin} = L/150$
- Imposed load cat. A, B: $\psi_0 = 0.7$; $\psi_2 = 0.3$; $k_{mod} = 0.8$; $k_{def} = 0.8$
- Imposed load cat. C: $\psi_0 = 0.7$; $\psi_2 = 0.6$; $k_{mod} = 0.9$; $k_{def} = 0.8$

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

| | | | | |
|----|-----|-----|-----|------|
| RO | R30 | R60 | R90 | R120 |
|----|-----|-----|-----|------|

| Permanent load $g_{2,k}$ [kN/m ²] | Category [-] | Imposed load q_k [kN/m ²] | Span L [m] | | | | | | | | | | | | | |
|---|-----------------|---|------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--------|--------|
| | | | 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 | 200 7ss | 200 7ss | 260 7ss | 260 7ss | 280 7ss | 280 7ss | | |
| | | 2.0 | | | | | 180 5s | 180 5s | | | | | | | | |
| | | 2.8 | | | | | | | | | | | | | | |
| | B | 3.0 | | | 160 5s | 160 5s | 180 5s | 180 5s | 220 7ss | 220 7ss | 260 7ss | 260 7ss | 300 8ss | 300 8ss | | |
| | | 3.5 | | | | | | | | | | | | | | |
| | | 4.0 | | | | | | | | | | | | | | |
| C | 4.0 | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 220 7ss | 260 7ss | 260 7ss | 300 8ss | 300 8ss | | | | | |
| | 5.0 | | | | | | | | | | | | | | | |
| | 5.0 | | | | | | | | | | | | | | | |
| 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 8ss | 300 8ss | | |
| | | 2.0 | | | | | 180 5s | 180 5s | | | | | | | | |
| | | 2.8 | | | | | | | | | | | | | | |
| | B | 3.0 | | | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 220 7ss | 260 7ss | 260 7ss | 300 8ss | 300 8ss | | |
| | | 3.5 | | | | | | | | | | | | | | |
| | | 4.0 | | | | | | | | | | | | | | |
| C | 4.0 | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 220 7ss | 260 7ss | 260 7ss | 300 8ss | 300 8ss | | | | | |
| | 5.0 | | | | | | | | | | | | | | | |
| | 5.0 | | | | | | | | | | | | | | | |
| 2.0 | A | 1.5 | 140 5s | 140 5s | 160 5s | 160 5s | 180 5s | 180 5s | 220 7ss | 220 7ss | 260 7ss | 260 7ss | 300 8ss | 300 8ss | | |
| | | 2.0 | | | | | 180 5s | 180 5s | | | | | | | | |
| | | 2.8 | | | | | | | | | | | | | | |
| | B | 3.0 | | | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 220 7ss | 260 7ss | 260 7ss | 300 8ss | 300 8ss | | |
| | | 3.5 | | | | | | | | | | | | | | |
| | | 4.0 | | | | | | | | | | | | | | |
| C | 4.0 | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 220 7ss | 260 7ss | 260 7ss | 300 8ss | 300 8ss | | | | | |
| | 5.0 | | | | | | | | | | | | | | | |
| | 5.0 | | | | | | | | | | | | | | | |
| 2.5 | A | 1.5 | 140 5s | 140 5s | 160 5s | 160 5s | 200 5s | 200 5s | 240 7ss | 240 7ss | 260 7ss | 260 7ss | 300 8ss | 300 8ss | | |
| | | 2.0 | | | | | | | | | | | | | 160 5s | 160 5s |
| | | 2.8 | | | | | | | | | | | | | | |
| | B | 3.0 | | | 160 5s | 160 5s | 200 5s | 200 5s | 240 7ss | 240 7ss | 260 7ss | 260 7ss | 300 8ss | 300 8ss | | |
| | | 3.5 | | | | | | | | | | | | | | |
| | | 4.0 | | | | | | | | | | | | | | |
| C | 4.0 | 160 5s | 160 5s | 200 7ss | 200 7ss | 240 7ss | 240 7ss | 260 7ss | 260 7ss | 300 8ss | 300 8ss | | | | | |
| | 5.0 | | | | | | | | | | | | | | | |
| | 5.0 | | | | | | | | | | | | | | | |
| 3.0 | A | 1.5 | 140 5s | 140 5s | 160 5s | 160 5s | 200 7ss | 200 7ss | 240 7ss | 240 7ss | 260 7ss | 260 7ss | 300 8ss | 300 8ss | | |
| | | 2.0 | | | | | | | | | | | | | 160 5s | 160 5s |
| | | 2.8 | | | | | | | | | | | | | | |
| | B | 3.0 | | | 160 5s | 160 5s | 200 7ss | 200 7ss | 240 7ss | 240 7ss | 260 7ss | 260 7ss | 300 8ss | 300 8ss | | |
| | | 3.5 | | | | | | | | | | | | | | |
| | | 4.0 | | | | | | | | | | | | | | |
| C | 4.0 | 160 5s | 160 5s | 200 7ss | 200 7ss | 240 7ss | 240 7ss | 260 7ss | 260 7ss | 300 8ss | 300 8ss | | | | | |
| | 5.0 | | | | | | | | | | | | | | | |
| | 5.0 | | | | | | | | | | | | | | | |

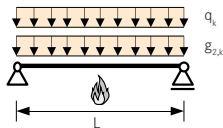
This table is only intended for pre-liminary structural design and does not replace necessary static calculations.

The self-weight of the cross-laminated timber elements is already taken into account in the table as $\rho = 500 \text{ kg/m}^3$.

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: $\gamma_M = 1.25$; $\gamma_G = 1.35$; $\gamma_Q = 1.50$
- Vibration: $b \geq 1.2 L$; four edges supported;
 $f_{1,gr} = 8 \text{ Hz}$; $w_{stat,gr} = 0.25 \text{ mm}$; $\zeta = 4\%$; $a_{rms,gr} = 0.05 \text{ m/s}^2$
- 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: $\psi_0 = 0.7$; $\psi_2 = 0.3$; $k_{mod} = 0.8$; $k_{def} = 0.8$
- Imposed load cat. C: $\psi_0 = 0.7$; $\psi_2 = 0.6$; $k_{mod} = 0.9$; $k_{def} = 0.8$

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 $g_{z,k}$ [kN/m ²] | Category [-] | Imposed load q_k [kN/m ²] | Span L [m] | | | | | | | | | | | |
|---|-----------------|---|------------|--------|--------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| | | | 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 | | | | | 160 5s | 160 5s | | | | | | |
| | | 2.0 | | | | | | | | | | | | |
| | | 2.8 | 100 5s | 100 5s | 140 5s | 140 5s | | | 200 5s | 200 5s | 240 7ss | 240 7ss | 280 7ss | 280 7ss |
| | B | 3.0 | | | | | 160 5s | 160 5s | | | | | | |
| | | 3.5 | | | | | | | | | | | | |
| | | 4.0 | 120 5s | 120 5s | 140 5s | 140 5s | 180 5s | 180 5s | 200 7ss | 200 7ss | | | | |
| C | 5.0 | | | | | | | 220 7ss | 220 7ss | 260 7ss | 260 7ss | 300 8ss | 300 8ss | |
| | | | | | | | | | | | | | | |
| 1.5 | A | 1.5 | | | | | 160 5s | 160 5s | | | | | | |
| | | 2.0 | | | | | | | | | | | | |
| | | 2.8 | 100 5s | 100 5s | 140 5s | 140 5s | | | | | | | | |
| | B | 3.0 | | | | | 180 5s | 180 5s | | | | | | |
| | | 3.5 | | | | | | | | | | | | |
| | | 4.0 | 120 5s | 120 5s | 140 5s | 140 5s | 200 5s | 200 5s | | | | | | |
| C | 5.0 | | | 160 5s | 160 5s | 200 5s | 200 5s | | | | | | | |
| | | | | | | | | | | | | | | |
| 2.0 | A | 1.5 | | | | | 180 5s | 180 5s | | | | | | |
| | | 2.0 | 100 5s | 100 5s | | | | | | | | | | |
| | | 2.8 | | | 140 5s | 140 5s | | | | | | | | |
| | B | 3.0 | | 120 5s | | | | | 220 7ss | 220 7ss | 260 7ss | 260 7ss | 300 8ss | 300 8ss |
| | | 3.5 | | | | | | | | | | | | |
| | | 4.0 | 120 5s | 120 5s | 140 5s | 140 5s | 200 5s | 200 5s | | | | | | |
| C | 5.0 | | | 160 5s | 160 5s | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 2.5 | A | 1.5 | 100 5s | 100 5s | | | | | | | | | | |
| | | 2.0 | | | | | | | | | | | | |
| | | 2.8 | | | 140 5s | 140 5s | | | | | | | | |
| | B | 3.0 | | 120 5s | | | 200 5s | 200 5s | 220 7ss | 220 7ss | 260 7ss | 260 7ss | 300 8ss | 300 8ss |
| | | 3.5 | 120 5s | | 140 5s | 140 5s | | | | | | | | |
| | | 4.0 | | 120 5s | | | | | | | | | | |
| C | 5.0 | | | 160 5s | 160 5s | 200 7ss | 200 7ss | 240 7s | 240 7s | 280 7ss | 280 7ss | 320 8ss | 320 8ss | |
| | | | | | | | | | | | | | | |
| 3.0 | A | 1.5 | 100 5s | 100 5s | | | | | | | | | | |
| | | 2.0 | | | | | | | | | | | | |
| | | 2.8 | | | 140 5s | 140 5s | | | | | 260 7ss | 260 7ss | 300 8ss | 300 8ss |
| | B | 3.0 | | | | | 200 5s | 200 5s | 240 7ss | 240 7ss | | | | |
| | | 3.5 | 120 5s | 120 5s | | | | | | | | | | |
| | | 4.0 | | | 160 5s | 160 5s | | | | | | | | |
| C | 5.0 | | | | | 200 7ss | 200 7ss | | | 280 7ss | 280 7ss | 320 8ss | 320 8ss | |
| | | | | | | | | | | | | | | |

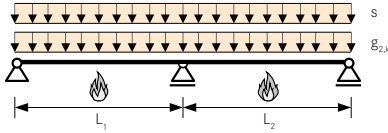
This table is only intended for pre-liminary structural design and does not replace necessary static calculations.

The self-weight of the cross-laminated timber elements is already taken into account in the table as $\rho = 500 \text{ kg/m}^3$.

Preliminary design table

Roof: Two-span beam

Static system



Boundary conditions

- Service class 1
- Partial factors: $\gamma_M = 1.25$; $\gamma_G = 1.35$; $\gamma_D = 1.50$
- Calculated for span ratios: $L_1/L_2 = 1:0.8$ to $1:1$
- Snow loads not fieldwise
for location < 1.000 m a.s.l: $\psi_0 = 0.5$; $\psi_2 = 0.0$
- 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

| | | | | |
|----|-----|-----|-----|------|
| RO | R30 | R60 | R90 | R120 |
|----|-----|-----|-----|------|

| Permanent load $g_{2,k}$ [kN/m ²] | Snow load $s = \mu \cdot s_k$ [kN/m ²] | Span L_1 [m] | | | | | | | | | | | |
|---|--|----------------|-------|--------|--------|--------|--------|---------|---------|---------|---------|---------|---------|
| | | 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 | | | | | 180 5s | 180 5s |
| | 3.0 | | | 90 3s | 90 3s | 120 3s | 120 3s | 140 5s | 140 5s | 160 5s | 160 5s | 200 5s | 200 5s |
| | 4.0 | 80 3s | 80 3s | | | | | | | 180 5s | 180 5s | 200 7ss | 200 7ss |
| | 5.0 | | | 100 3s | 100 3s | 140 5s | 140 5s | 160 5s | 160 5s | 200 5s | 200 5s | | |
| | 6.0 | | | 120 3s | 120 3s | | | 180 5s | 180 5s | 200 7ss | 200 7ss | 220 7ss | 220 7ss |
| | 7.0 | 90 3s | 90 3s | | | | | | | | | | |
| 1.0 | 1.0 | 60 3s | 60 3s | 80 3s | 80 3s | 100 3s | 100 3s | 120 3s | 120 3s | 140 5s | 140 5s | 160 5s | 160 5s |
| | 2.0 | | | 90 3s | 90 3s | 120 3s | 120 3s | 140 5s | 140 5s | 160 5s | 160 5s | 180 5s | 180 5s |
| | 3.0 | | | | | 120 3s | 120 3s | | | 180 5s | 180 5s | 200 5s | 200 5s |
| | 4.0 | 80 3s | 80 3s | 100 3s | 100 3s | | | 160 5s | 160 5s | 200 5s | 200 5s | 200 7ss | 200 7ss |
| | 5.0 | | | | | 140 5s | 140 5s | 160 5s | 160 5s | 200 5s | 200 5s | | |
| | 6.0 | 90 3s | 90 3s | 120 3s | 120 3s | | | 180 5s | 180 5s | 200 7ss | 200 7ss | 220 7ss | 220 7ss |
| | 7.0 | | | | | | | | | | | | |
| 1.5 | 1.0 | 60 3s | 60 3s | 90 3s | 90 3s | 120 3s | 120 3s | 140 5s | 140 5s | 160 5s | 160 5s | 180 5s | 180 5s |
| | 2.0 | | | | | 120 3s | 120 3s | | | 180 5s | 180 5s | 200 5s | 200 5s |
| | 3.0 | 80 3s | 80 3s | 100 3s | 100 3s | | | 160 5s | 160 5s | 200 5s | 200 5s | 200 7ss | 200 7ss |
| | 4.0 | | | | | 140 5s | 140 5s | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 220 7ss |
| | 5.0 | | | 120 3s | 120 3s | 140 5s | 140 5s | 180 5s | 180 5s | 200 7ss | 200 7ss | | |
| | 6.0 | 90 3s | 90 3s | | | | | | | | | 240 7ss | 240 7ss |
| | 7.0 | | | | | | | | | | | | |
| 2.0 | 1.0 | | | 90 3s | 90 3s | 120 3s | 120 3s | 140 5s | 140 5s | 160 5s | 160 5s | 180 5s | 180 5s |
| | 2.0 | | | | | 120 3s | 120 3s | | | 180 5s | 180 5s | 200 5s | 200 5s |
| | 3.0 | 80 3s | 80 3s | 100 3s | 100 3s | | | 160 5s | 160 5s | 200 5s | 200 5s | 200 7ss | 200 7ss |
| | 4.0 | | | | | 140 5s | 140 5s | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 220 7ss |
| | 5.0 | | | 120 3s | 120 3s | | | 180 5s | 180 5s | 200 7ss | 200 7ss | | |
| | 6.0 | 90 3s | 90 3s | | | 160 5s | 160 5s | | | 220 7ss | 220 7ss | 240 7ss | 240 7ss |
| | 7.0 | | | | | | | | | | | | |
| 2.5 | 1.0 | | | 100 3s | 100 3s | 120 3s | 120 3s | 160 5s | 160 5s | 180 5s | 180 5s | 200 7ss | 200 7ss |
| | 2.0 | 80 3s | 80 3s | | | | | 160 5s | 160 5s | 200 5s | 200 5s | | |
| | 3.0 | | | 140 5s | 140 5s | | | | | | | 220 7ss | 220 7ss |
| | 4.0 | | | | | 180 5s | 180 5s | 200 7ss | 200 7ss | | | | |
| | 5.0 | 90 3s | 90 3s | 120 3s | 120 3s | | | | | | | 240 7ss | 240 7ss |
| | 6.0 | | | | | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 220 7ss | | |
| | 7.0 | | | | | | | | | | | | |

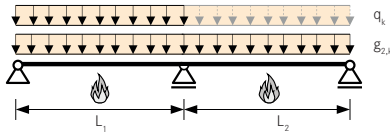
This table is only intended for pre-liminary structural design and does not replace necessary static calculations.

The self-weight of the cross-laminated timber elements is already taken into account in the table as $\rho = 500$ 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: $\gamma_M = 1.25$; $\gamma_G = 1.35$; $\gamma_Q = 1.50$
- Calculated for span ratios: $L_1/L_2 = 1:0.8$ to $1:1$
- Vibration: $b \geq 1.2 L$; four edges supported;
 $f_{1,gr} = 8 \text{ Hz}$; $w_{stat,gr} = 0.25 \text{ mm}$; $\zeta = 4\%$; $a_{rms,gr} = 0.05 \text{ m/s}^2$
- Deflection limits: $w_{inst} = L/300$; $w_{net,fin} = L/250$; $w_{fin} = L/150$
- Imposed load cat. A, B: $\psi_0 = 0.7$; $\psi_2 = 0.3$; $k_{mod} = 0.8$; $k_{def} = 0.8$
- Imposed load cat. C: $\psi_0 = 0.7$; $\psi_2 = 0.6$; $k_{mod} = 0.9$; $k_{def} = 0.8$

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

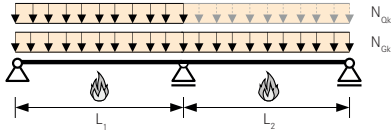
This table is only intended for pre-liminary structural design and does not replace necessary static calculations

The self-weight of the cross-laminated timber elements is already taken into account in the table as $\rho = 500 \text{ kg/m}^3$.

Preliminary design table

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

Static system



Boundary conditions

- Service class 1
- Partial factors: $\gamma_M = 1.25$; $\gamma_G = 1.35$; $\gamma_Q = 1.50$
- 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: $b \geq 1.2 L$; four edges supported;
 $f_{1,gr} = 8 \text{ Hz}$; $w_{stat,gr} = 0.25 \text{ mm}$; $\zeta = 4\%$; $a_{rms,gr} = 0.05 \text{ m/s}^2$
- Deflection limits: $w_{inst} = L/300$; $w_{net,fin} = L/250$; $w_{fin} = L/150$
- Imposed load cat. A, B: $\psi_0 = 0.7$; $\psi_2 = 0.3$; $k_{mod} = 0.8$; $k_{def} = 0.8$
- Imposed load cat. C: $\psi_0 = 0.7$; $\psi_2 = 0.6$; $k_{mod} = 0.9$; $k_{def} = 0.8$

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

| | | | | |
|----|-----|-----|-----|------|
| RO | R30 | R60 | R90 | R120 |
|----|-----|-----|-----|------|

| Permanent load $g_{2,k}$ [kN/m ²] | Category [-] | Imposed load q_k [kN/m ²] | Span L_1 [m] | | | | | | | | | | | | | | | | | | | | | | | |
|---|-----------------|---|----------------|--------|--------|--------|--------|--------|--------|--------|---------|---------|---------|---------|--------|--------|--------|--------|--------|--------|---------|---------|---------|---------|---------|---------|
| | | | 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 5s | 100 5s | 120 5s | 120 5s | 140 5s | 140 5s | 180 5s | 180 5s | 220 7s | 220 7s | 240 7ss | 240 7ss | | | | | | | | | | | | |
| | | 2.0 | | | | | | | | | | | | | 120 5s | 140 5s | 140 5s | 180 5s | 180 5s | 220 7s | 240 7ss | | | | | |
| | | 2.8 | | | | | | | | | | | | | 120 5s | 140 5s | 140 5s | 180 5s | 180 5s | 220 7s | 240 7ss | | | | | |
| | B | 3.0 | | | | | | | | | | | | | 120 5s | 140 5s | 140 5s | 180 5s | 180 5s | 220 7s | 240 7ss | | | | | |
| | | 3.5 | | | | | | | | | | | | | 140 5s | 140 5s | 160 5s | 160 5s | 200 5s | 200 5s | | | | | | |
| | C | 4.0 | | | | | | | | | | | | | 140 5s | 140 5s | 160 5s | 160 5s | 200 5s | 200 5s | | | | | | |
| | | 5.0 | | | | | | | | | | | | | 140 5s | 140 5s | 160 5s | 160 5s | 200 5s | 200 5s | | | | | | |
| 1.5 | A | 1.5 | 100 5s | 100 5s | 120 5s | 120 5s | 140 5s | 140 5s | 200 5s | 200 5s | 220 7ss | 220 7ss | 240 7ss | 240 7ss | | | | | | | | | | | | |
| | | 2.0 | | | | | | | | | | | | | 120 5s | 120 5s | 140 5s | 140 5s | 200 5s | 200 5s | 220 7ss | 240 7ss | | | | |
| | | 2.8 | | | | | | | | | | | | | 120 5s | 120 5s | 140 5s | 140 5s | 200 5s | 200 5s | 220 7ss | 240 7ss | | | | |
| | B | 3.0 | | | | | | | | | | | | | 120 5s | 120 5s | 140 5s | 140 5s | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 220 7ss | 240 7ss | 240 7ss |
| | | 3.5 | | | | | | | | | | | | | 140 5s | 140 5s | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 240 7ss | | | | |
| | C | 4.0 | | | | | | | | | | | | | 140 5s | 140 5s | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 240 7ss | | | | |
| | | 5.0 | | | | | | | | | | | | | 140 5s | 140 5s | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 240 7ss | | | | |
| 2.0 | A | 1.5 | 100 5s | 100 5s | 120 5s | 120 5s | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 220 7ss | 240 7ss | 240 7ss | | | | | | | | | | | | |
| | | 2.0 | | | | | | | | | | | | | 120 5s | 120 5s | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 240 7ss | | | | |
| | | 2.8 | | | | | | | | | | | | | 120 5s | 120 5s | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 240 7ss | | | | |
| | B | 3.0 | | | | | | | | | | | | | 120 5s | 120 5s | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 240 7ss | | | | |
| | | 3.5 | | | | | | | | | | | | | 140 5s | 140 5s | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 240 7ss | | | | |
| | C | 4.0 | | | | | | | | | | | | | 140 5s | 140 5s | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 240 7ss | | | | |
| | | 5.0 | | | | | | | | | | | | | 140 5s | 140 5s | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 240 7ss | | | | |
| 2.5 | A | 1.5 | 100 5s | 100 5s | 120 5s | 120 5s | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 220 7ss | 240 7ss | 240 7ss | | | | | | | | | | | | |
| | | 2.0 | | | | | | | | | | | | | 120 5s | 120 5s | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 240 7ss | | | | |
| | | 2.8 | | | | | | | | | | | | | 120 5s | 120 5s | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 240 7ss | | | | |
| | B | 3.0 | | | | | | | | | | | | | 120 5s | 120 5s | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 240 7ss | | | | |
| | | 3.5 | | | | | | | | | | | | | 140 5s | 140 5s | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 240 7ss | | | | |
| | C | 4.0 | | | | | | | | | | | | | 140 5s | 140 5s | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 240 7ss | | | | |
| | | 5.0 | | | | | | | | | | | | | 140 5s | 140 5s | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 240 7ss | | | | |
| 3.0 | A | 1.5 | 100 5s | 100 5s | 120 5s | 120 5s | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 220 7ss | 240 7ss | 240 7ss | | | | | | | | | | | | |
| | | 2.0 | | | | | | | | | | | | | 120 5s | 120 5s | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 240 7ss | | | | |
| | | 2.8 | | | | | | | | | | | | | 120 5s | 120 5s | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 240 7ss | | | | |
| | B | 3.0 | | | | | | | | | | | | | 120 5s | 120 5s | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 240 7ss | | | | |
| | | 3.5 | | | | | | | | | | | | | 140 5s | 140 5s | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 240 7ss | | | | |
| | C | 4.0 | | | | | | | | | | | | | 140 5s | 140 5s | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 240 7ss | | | | |
| | | 5.0 | | | | | | | | | | | | | 140 5s | 140 5s | 160 5s | 160 5s | 200 5s | 200 5s | 220 7ss | 240 7ss | | | | |

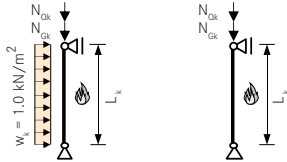
This table is only intended for pre-liminary structural design and does not replace necessary static calculations.

The self-weight of the cross-laminated timber elements is already taken into account in the table as $\rho = 500 \text{ kg/m}^3$.

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: $\gamma_M = 1.25$; $\gamma_G = 1.35$; $\gamma_Q = 1.50$
- Imperfection factor $\beta_c = 0.1$
- Shear deformation taken into account
- Imposed load cat. A, B: $\psi_0 = 0.7$; $\psi_2 = 0.3$; $k_{mod} = 0.8$; $k_{def} = 0.8$
- Wind: $w_k = 1.0 \text{ kN/m}^2$. $\psi_0 = 0.6$; $\psi_2 = 0.0$; $k_{mod} = 0.9$

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

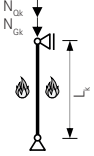
This table is only intended for pre-liminary structural design and does not replace necessary static calculations.

The self-weight of the cross-laminated timber elements is already taken into account in the table as $\rho = 500 \text{ kg/m}^3$.

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: $\gamma_M = 1.25$; $\gamma_G = 1.35$; $\gamma_Q = 1.50$
- Imperfection factor $\beta_c = 0.1$
- Shear deformation taken into account
- Imposed load cat. A, B: $\psi_0 = 0.7$; $\psi_2 = 0.3$; $k_{mod} = 0.8$

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

| | | | | |
|----|-----|-----|-----|------|
| RO | R30 | R60 | R90 | R120 |
|----|-----|-----|-----|------|

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

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

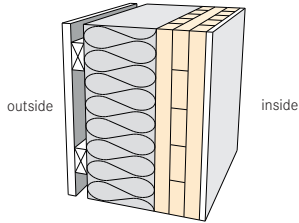
The self-weight of the cross-laminated timber elements is already taken into account in the table as $\rho = 500 \text{ kg/m}^3$



Component catalogue

Exterior wall

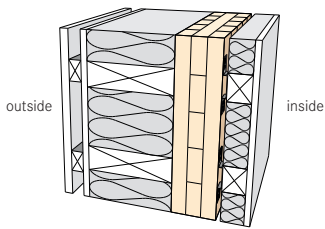
AW 01



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/m ² K |
| Timber batten (spruce) 30/60 | 30.0 | | | | |
| Vapour-permeable membrane SD ≤ 0.3 m | - | | | | |
| Wood fibre insulation board | 160.0 | | | | |
| MMcrosslam 3s or 5s | 100 | | | | |
| GKF** 12.5 mm | 12.5 | | | | |

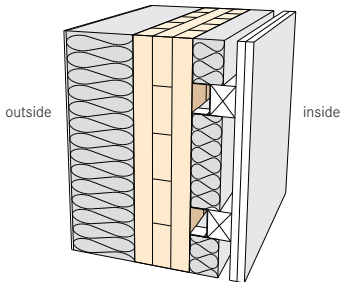
AW 02



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/m ² K |
| 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 | | | | |
| MMcrosslam 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 | | | | |

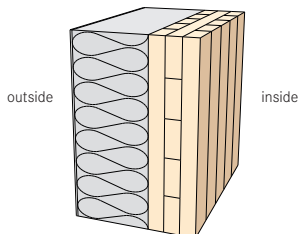
AW 03



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/m ² K |
| Rock wool MW-PT | - | | | | |
| Plaster base board | 120.0 | | | | |
| MMcrosslam 3s or 5s | 100 | | | | |
| Timber batten (spruce) 40/50 on swinging hoop Glass wool [0.040] D = 50 mm | 70.0 | | | | |
| GKF** 2 x 12.5 mm or gypsum fibreboard (2 x 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/m ² K |
| Rock wool MW-PT | 160.0 | | | | |
| Plaster base board | - | | | | |
| MMcrosslam 3s or 5s | 100 | | | | |

Source: www.dataholz.eu, 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

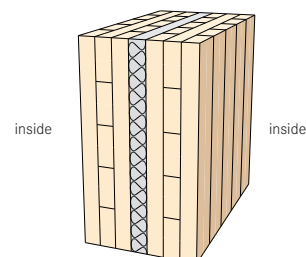
Component catalogue

Compartment wall

Compartment wall / Without installation level

| 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/m ² K |
| Impact sound insulation board MW-T | 30.0 | | | | |
| MM crosslam 3s or 5s | 100 | | | | |

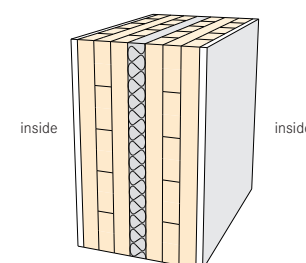
WTW 01



Compartment wall / With installation level

| 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/m ² K |
| 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 | 230 | REI 60* | 48 dB | 0.39 W/m ² K |
| Structure without GKF** | | | | | |

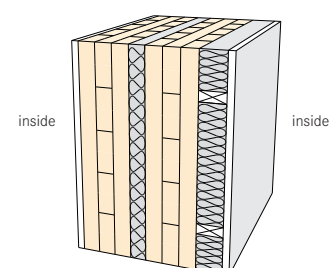
WTW 02



Compartment wall / With installation level

| 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/m ² K |
| 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 | | | | |

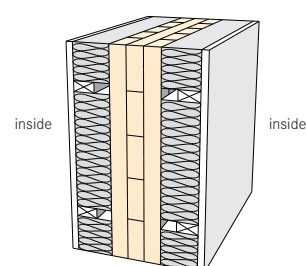
WTW 03



Compartment wall / With installation level

| 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/m ² K |
| 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 | | | | |

WTW 04



Source: www.dataholz.eu, catalog «Bauphysikalisch geprüfter Bauteile für den Holzbau»

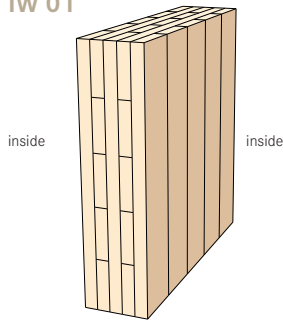
*acc. to Classification report Holz Forschung Austria, EN 13501 -2: REI 30 - REI 120

**GKF = Gypsum plaster fire protection board

Component catalogue

Interior wall and flat roof

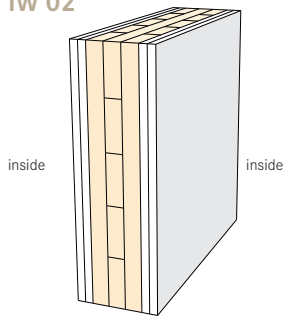
IW 01



Interior wall and flat roof

| System structure from left to right | Thickness [mm] | Component Thickness [mm] | Building physics | | |
|-------------------------------------|----------------|--------------------------|------------------|-------------------------------|-----------------------------------|
| | | | Fire resistance | Sound insulation | Thermal protection |
| MMcrosslam 3s or 5s | 100 | 100 | REI 60* | Airborne sound R_w 33 dB | U-value 1.1 W/m ² K |

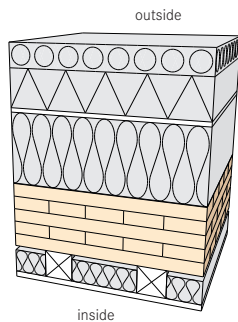
IW 02



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/m ² K |
| MMcrosslam 3s | 80 | | | | |
| Gypsum plaster fire protection board 2 x 12.5 mm | 25.0 | | | | |

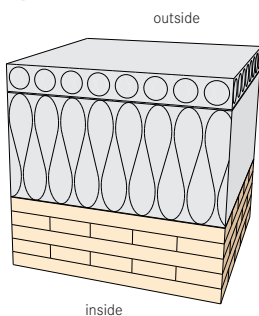
FD 01



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/m ² K |
| Separation fleece [SD ≤ 0.2M] | - | | | | |
| Extruded polystyrene | 80.0 | | | | |
| Bituminized felt | 9.0 | | | | |
| Mineral wool [0.040] | 150.0 | | | | |
| Vapour barrier SD ≥ 1500M | - | | | | |
| MMcrosslam 5s or according to static requirement | 140 | | | | |
| Timber batten (spruce), suspended | 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/m ² K |
| Separation fleece | - | | | | |
| Roof sheeting | 2.0 | | | | |
| Mineral fibreboard (2 x 100 mm) (λ = 0.045) | 200 | | | | |
| Vapour barrier SD ≥ 1,500 m | - | | | | |
| MMcrosslam 5s | 140 | | | | |

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

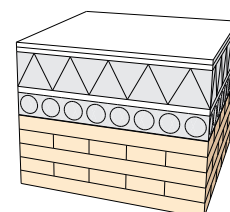
Component catalogue

Floor slab

Floor slab / Dry / Not suspended

| 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_{n1w} 50 dB | U-value 0.38 W/m ² K |
| 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 | | | | |

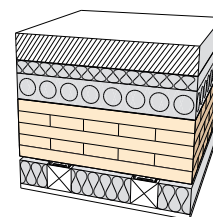
GD 01



Floor slab / Wet / Suspended

| 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_{n1w} 46 dB | U-value 0.25 W/m ² K |
| PE foil (separation layer) | - | | | | |
| Impact sound insulation board TDPS 30 | 30.0 | | | | |
| Fill (grit) unbound (2/4) | 30.0 | | | | |
| PE foil (separation 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 | | | | |

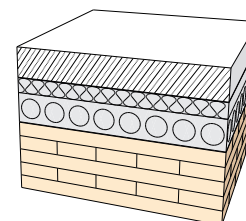
GD 02



Floor slab / Wet / Not suspended

| 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_{n1w} 57 dB | U-value 0.44 W/m ² K |
| PE foil (separation layer) | - | | | | |
| Impact sound insulation board TPS | 30.0 | | | | |
| Fill (grit) unbound (xy 2/4) | 60.0 | | | | |
| PE foil (separation layer) | - | | | | |
| MM crosslam 5s | ≥140 | | | | |

GD 03



Source: www.dataholz.eu, 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

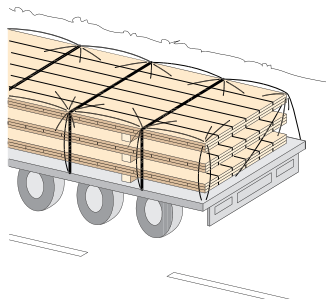
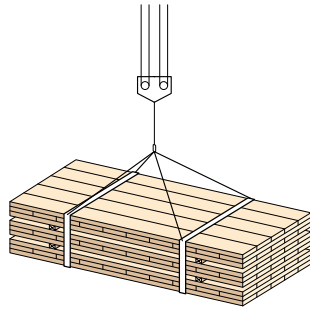
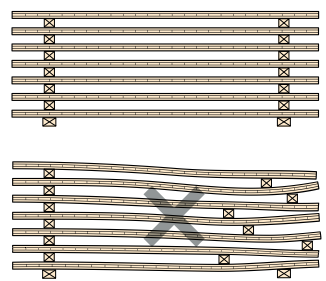
| Transport and delivery | |
|---|---|
|  | <ul style="list-style-type: none"> • The loading sequence should be discussed with the manufacturer if necessary. • During transport, the members must be protected from moisture and dirt. • Keep driveways clear to allow traffic. • If elements are stored on the building site, the ground must be dry and have adequate load-bearing capacity. |
| Fastening and lifting by crane | |
|  | <ul style="list-style-type: none"> • 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 | |
|  | <ul style="list-style-type: none"> • 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.

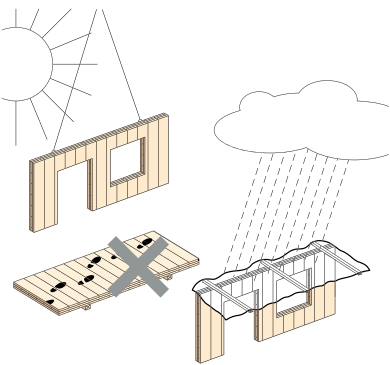
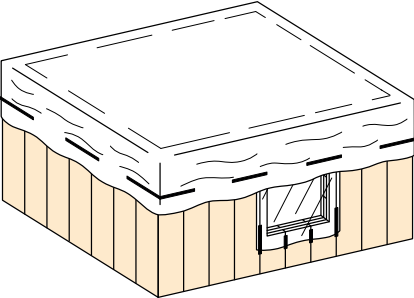
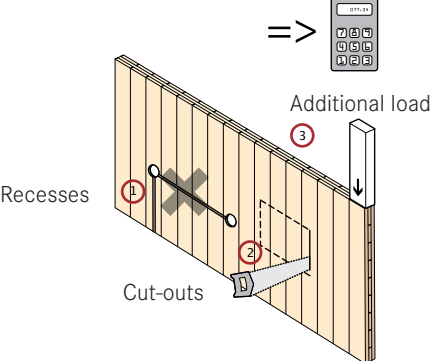
| Components during installation | |
|---|--|
|  | <ul style="list-style-type: none"> • Install in accordance with installation instructions. • Avoid detrimental absorption of moisture. • Keep members covered until the final weather protection is in place. • Prevent soiling and protect members by covering them if necessary. |
| Protection of installed members | |
|  | <ul style="list-style-type: none"> • 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 | |
|  | <ul style="list-style-type: none"> • 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 workplaces

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 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 crosslam** elements is indicated in the production drawings available to the customer and the labelling of the elements 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)

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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!

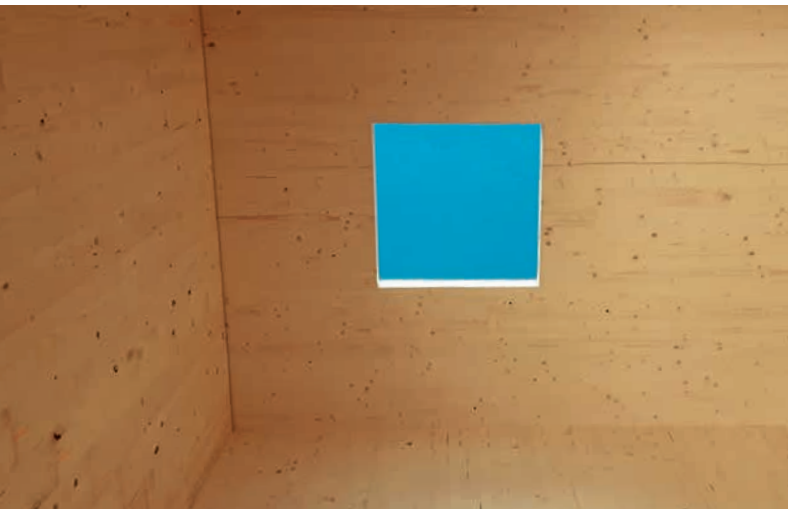
9.1. Installation of wall-type prefabricated elements (mainly vertical installation)

- Supports must be cleaned and checked.
- Ensure the support is levelling.
- Crane ropes must be kept taut after the element has been set down until the element is secure against tipping.
- Any installation safety devices must be observed.
- Establish a connection between the elements before you unhook the component.

- Uncontrolled falling out when removing any residual cross-sections must be avoided.
- Wall openings must be secured against falling out.

9.2. Installation of floor-type prefabricated elements (mainly horizontal installation)

- Supports must be cleaned and checked.
- Ensure that the support is levelling.
- Ensure that the elements have a fully flat support area.
- After setting down, the component must be set up.
- Any installation safety devices must be observed.
- The element must be connected to the structure and then unhinged.
- Lifting loops must be removed or secured against tripping.
- Ceiling openings and edge areas must be secured against falling out or down.



Notes

A large grid of graph paper for taking notes, consisting of 20 columns and 30 rows of small squares.

Our sites



**KAUFMANN
BAUSYSTEME**



Contact details of our second transformation sites:



Mayr-Melnhof Holz Leoben GmbH
Turmgasse 67 · 8700 Leoben · Austria
T +43 3842 300 0 · leoben@mm-holz.com

Mayr-Melnhof Holz Gaihorn GmbH
Nr. 182 · 8783 Gaihorn am See · Austria
T +43 3617 2151 0 · gaihorn@mm-holz.com

Mayr-Melnhof Holz Reuthe GmbH
Vorderreuthe 57 · 6870 Reuthe · Austria
T +43 5574 804 0 · reuthe@mm-holz.com

Mayr-Melnhof Holz Wismar GmbH
Am Torney 14 · 23970 Wismar · Germany
T +49 3841 221 0 · wismar@mm-holz.com

Mayr-Melnhof Holz Olsberg GmbH
Industriestraße · 59939 Olsberg · Germany
T +49 2962 806 0 · olsberg@mm-holz.com

www.mm-holz.com



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