KLH®

MADE FOR BUILDING
BUILT FOR LIVING

CROSS-LAMINATED TIMBER

IMPRINT

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KLH®

CONTENT

01 GENERAL INFORMATION 02
02 ADHESIVES AND LAMINATION PROCESS 03
03 PREFABRICATION OF BUILDING ELEMENTS 04
04 TECHNICAL APPROVALS AND CERTIFICATES 06
05 TECHNICAL DETAILS 07
06 STANDARD PANEL TYPES, DIMENSIONS AND PANEL BUILD UP 08
07 SURFACE QUALITY 10
08 SURFACE APPEARANCE REQUIREMENTS 11
09 AREAS OF APPLICATION 12
10 PRODUCT ADVANTAGES 13

CROSS-LAMINATED TIMBER

PRODUCT DESCRIPTION

The generic terminology for cross-laminated timber varies and may be country-specific. These include, among others, CLT or X-Lam.
KLH® - CLT is a versatile building material characterized by its dimensional stability, its dimensional accuracy and its high level of prefabrication. Therefore, KLH® solid wood superstructure components are used for structural wall, floor slab and roof elements.

The biaxial qualities of the CLT provide multitude opportunities for exciting architectural designs. KLH® elements can be combined with most building materials to generate stimulating interior and exterior design arrangements. Solid timber buildings are typically characterized by slender superstructures, which lead to a gain in net floor area.

KLH® superstructures are installed by expert carpentry firms or construction companies, typically with the support of a mobile crane. An average of 25 minutes is needed for placing each element. However, this depends on the complexity of the superstructure and site conditions. The erection of the superstructure for a detached dwelling house of average size and without complicated installation conditions typically takes approx. 1 – 2 days. The installation teams are usually made up of four site operatives and a crane operator

MAXIMUM DIMENSIONS AND INVOICING WIDTHS

Maximum panel length	16.50 m
Maximum panel width	3.50 m
Maximum panel thickness	0.50 m
Invoicing widths	2.45 | 2.50 | 2.73 | 2.95 | 3.10 | 3.20 | 3.30 | 3.40 | 3.50 m
Minimum production length	8.25 m – in 0.05 m increments

MANUFACTURE

KLH® solid wood elements are made up of at least 3 layers of timber lamellae that are arranged perpendicular to each other and then glued together under high laminating pressure to form large-format structural solid wood panels. Depending on the client's requirements, we can supply PEFC/06-34-110 and FSC® C119602 - certified KLH® elements.
The transverse arrangement of the lamellae increases the load-bearing capacity and dimensional stability of the structural timber elements, whilst the impact of swelling and shrinkage is reduced to an insignificant minimum.

In accordance with the European Technical Assessment, only kiln dried timber with a moisture content of 12% (+/- 2%) is used for KLH® - CLT. Each individual lamella is machine strength graded in the factory. The overall production process is subject to internal and external quality control by authorised 3rd party auditors.

PEFC/06-34-110 or FSC® C119602 - certified lamellae undergo machine strength grading and are sorted according to surface quality

Cross-laminated timber is produced on a just-in-time basis

Formaldehyde-free adhesive is used for laminating the individual layers

State-of-the-art CNC cutting machines facilitate simple and highly complex cutting patterns

ADHESIVES AND LAMINATION PROCESS

Only VOC-free and formaldehyde-free PUR adhesives are used in accordance with EN 15425. The adhesives have been tested and classified as TYPE 1 adhesives and have been approved for the production of load-bearing timber components.

The adhesive is applied automatically over the entire surface at approx. 0.15 kg/m^2 per joint.

The laminating pressure at 0.6 N/mm^2 used during the manufacture of KLH® solid wood panels is 6 times higher when compared with vacuum press technology. The quality of the lamination of KLH® - CLT is therefore of high quality and the load-bearing capacity comparatively higher.

More on adhesives can be found at:
www.henkel-adhesives.de

CNC CUTTING AND TOLERANCES

CLT building elements are prefabricated in the factory using state-of-the-art CNC cutting technology. CNC cutting is based on the approved fabrication drawings provided by the client and/or the construction company.

For elements of a length and width > 1 m the tolerances are +/-2mm, for standard panel types, standard trimming and a wood moisture content of 12%. For technical reasons the minimum element size for standard cutting is defined as 1 m long and 1 m wide.

In addition to the standard cutting process KLH® offer project-specific and optimised cutting services that can be tailored to the requirements of the client or construction company.

STANDARD CUTTING FOR WALL, FLOOR AND ROOF ELEMENTS

Longitudinal cuts at right angles to the panel surface, with some diagonal cuts up to a maximum cutting depth of 260 mm and max. 4 linear meters of milling of circular recesses in plan for floor and roof elements and/or max. 6 linear meters of milling for wall elements respectively.

The internal corners, e.g. for door and window cut-outs or other openings are executed with rounded edges as standard (radius of 20 mm); sharp internal corners can be provided at an additional charge.

Standard cutting for floor and roof elements includes typical panel joints (half lap or rebate board, max. width for milling of the element: 90 mm)

OTHER CUTTING SERVICES

Any cutting services in addition to the standard cuts described above are categorised as “special cuts”. Following the initial verification of the technical feasibility these will be calculated and offered on a project-specific basis. Please note: The machining tolerances for special elements may exceed standard machining tolerances.

Examples of special cuts are:

- Specialist routing
- Drilling into the panel sides/edges
- Elements with special inner and outer contours/shapes
- Half lap joints and recesses on the underside of the panel or located in the centre of the element
- Cut outs for steel I-beams
- Cut outs for rafters and beams
- Cutting of small elements (element width < 1 m)
- Double-sided processing of the elements
- Cut outs for sockets and conduits

Single family house Millstättersee | Architekten + 📷 : DI Sonja Hohengasser, DI Jürgen P. Wirnsberger

TECHNICAL APPROVALS AND CERTIFICATES

EUROPEAN TECHNICAL ASSESSMENT
ETA - 06/0138

UK TECHNICAL ASSESSMENT
UKTA-0836-22/0028

FRENCH APPROVAL
DTA 3.3/20-1016

C#: 5009426

PRODUCT APPROVAL FOR USA & CANADA
ANSI/APA PRG 320

JAPANESE APPROVAL
NTI-301

SEAL OF QUALITY FOR SPAIN
AITIM 31-01

QUALITY MANAGEMENT
In accordance with
ISO EN 9001:2015

ENVIRONMENTAL MANAGEMENT
In accordance with
ISO EN 14001:2015

PEFC/06-34-110

Promoting Sustainable Forest Management

www.pefc.org

PEFC CERTIFICATION

FSC® C119602

The mark of responsible forestry

FSC® CERTIFICATION

THE INTERNATIONAL EPD® SYSTEM

ENVIRONMENTAL PRODUCT DECLARATION (EPD)
In accordance with
ISO 14025 and EN 15804

DOWNLOAD OF CERTIFICATES

All approvals and certificates can be downloaded at www.klh.at.

TECHNICAL DETAILS

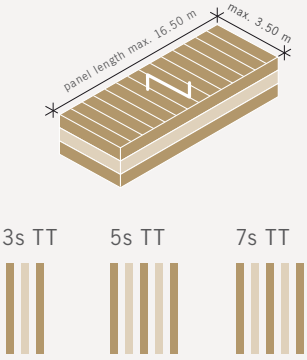
PRODUCT NAME/BRAND	KLH® - CLT
OTHER PRODUCT NAMES	Cross-laminated timber (CLT), X-Lam
APPLICATION	Structural elements for walls, floors and roofs
DURABILITY	Service classes 1 and 2 according to EN 1995-1-1
WOOD SPECIES	Spruce (pine, fir, stone pine and other wood types on request)
PANEL BUILD UP	3, 5, 7 or more layers depending on structural requirements
LAMELLAE	Thickness 20 to 45 mm, technically dried, quality-sorted and finger-jointed
STRENGTH CLASS	C 24 according to EN 338, maximum 10% C 16 permitted (compare ETA-06/0138)
ADHESIVE	Formaldehyde-free PUR adhesive, approved for load-bearing and non-load-bearing components indoors and outdoors according to EN 15425
LAMINATING PRESSURE	At least 0.6 N/mm²
WOOD MOISTURE CONTENT	12% (+/- 2%) on delivery
MAXIMUM ELEMENT DIMENSIONS	Length 16.50 m | width 3.50 m | thickness 0.50 m
INVOICING WIDTHS	2.45 | 2.50 | 2.73 | 2.95 | 3.10 | 3.20 | 3.30 | 3.40 | 3.50 m
SURFACE QUALITY	Non-visual quality (NVQ) | Industrial visual quality (IVQ) Domestic visual quality (DVQ) Special surfaces on request
WEIGHT	5.5 kN/m³ according to ÖNORM B 1991-1-1:2011 for structural analysis 500 kg/m³ for determination of transport weight
MOISTURE MOVEMENT	In panel plane 0.02% per % change in wood moisture content, perpendicular to panel plane (panel thickness direction) 0.24% per % change in wood moisture content
THERMAL CONDUCTIVITY	λ = 0.12 W/(m*K) according to EN ISO 10456
HEAT STORAGE CAPACITY	c_p = 1600 J/(kg*K) according to EN ISO 10456
VAPOUR RESISTANCE	μ = 300 (dry) to 46 (wet) according to EN ISO 12572
AIR TIGHTNESS	KLH® - CLT can generally be used asairtight layers (class 4 acc. to EN 12207). Connections to other components, butt joints, penetrations, etc. must be sealed appropriately.
REACTION TO FIRE	Euro class D-s2, d0
RESISTANCE TO FIRE	Fire analysis parameters according to ETA - 06/0138

KLH® STANDARD PANEL TYPES, DIMENSIONS AND PANEL BUILD UP

FOR THE WALL

Covering layer in the transverse panel direction TT

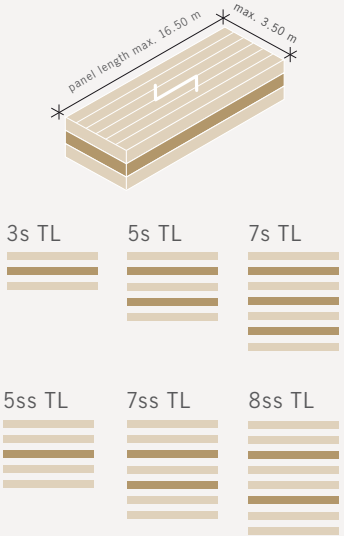
Nominal thickness		Panel | type		Thickness of lamellae in mm						
				T	L	T	L	T	L	T
KLH	60 mm	3s	TT	20	20	20				
KLH	70 mm	3s	TT	20	30	20				
KLH	80 mm	3s	TT	30	20	30				
KLH	90 mm	3s	TT	30	30	30				
KLH	100 mm	3s	TT	30	40	30				
KLH	110 mm	3s	TT	40	30	40				
KLH	120 mm	3s	TT	40	40	40				
KLH	100 mm	5s	TT	20	20	20	20	20		
KLH	110 mm	5s	TT	20	20	30	20	20		
KLH	120 mm	5s	TT	30	20	20	20	30		
KLH	130 mm	5s	TT	30	20	30	20	30		
KLH	140 mm	5s	TT	30	20	40	20	30		
KLH	150 mm	5s	TT	30	30	30	30	30		
KLH	160 mm	5s	TT	40	20	40	20	40		



FOR FLOOR AND ROOF

Covering layer in the longitudinal panel direction TL

				L	T	L	T	L	T	L
KLH	60 mm	3s	TL	20	20	20				
KLH	70 mm	3s	TL	20	30	20				
KLH	80 mm	3s	TL	30	20	30				
KLH	90 mm	3s	TL	30	30	30				
KLH	100 mm	3s	TL	40	20	40				
KLH	110 mm	3s	TL	40	30	40				
KLH	120 mm	3s	TL	40	40	40				
KLH	100 mm	5s	TL	20	20	20	20	20		
KLH	110 mm	5s	TL	20	20	30	20	20		
KLH	120 mm	5s	TL	30	20	20	20	30		
KLH	130 mm	5s	TL	30	20	30	20	30		
KLH	140 mm	5s	TL	40	20	20	20	40		
KLH	150 mm	5s	TL	40	20	30	20	40		
KLH	160 mm	5s	TL	40	20	40	20	40		
KLH	170 mm	5s	TL	40	30	30	30	40		
KLH	180 mm	5s	TL	40	30	40	30	40		
KLH	190 mm	5s	TL	40	40	30	40	40		
KLH	200 mm	5s	TL	40	40	40	40	40		
KLH	160 mm	5ss	TL	30+30	40	30+30				
KLH	180 mm	7s	TL	20	40	20	20	20	40	20
KLH	200 mm	7s	TL	20	40	20	40	20	40	20
KLH	220 mm	7s	TL	30	40	30	20	30	40	30
KLH	240 mm	7s	TL	30	40	30	40	30	40	30
KLH	180 mm	7ss	TL	30+30	20	20	20	30+30		
KLH	200 mm	7ss	TL	30+30	20	40	20	30+30		
KLH	220 mm	7ss	TL	40+40	20	20	20	40+40		
KLH	240 mm	7ss	TL	40+40	20	40	20	40+40		
KLH	260 mm	7ss	TL	40+40	30	40	30	40+40		
KLH	280 mm	7ss	TL	40+40	40	40	40	40+40		
KLH	300 mm	8ss	TL	40+40	30	40+40	30	40+40		
KLH	320 mm	8ss	TL	40+40	40	40+40	40	40+40		



Therme Aqua Dome Längenfeld | : Aqua Dome, www.aqua-dome.at

SURFACE QUALITY

KLH® - CLT is typically produced from spruce lamellae as standard and are available in three different visual surface qualities, which can be combined as required. This applies for all previously illustrated panel types and without restriction.

The minimum requirement criteria for each surface is illustrated in a table at www.klh.at

SUMMARY OF THE INDIVIDUAL SURFACE QUALITIES

	DOMESTIC VISUAL QUALITY (DVQ)	INDUSTRIAL VISUAL QUALITY (IVQ)	NON VISUAL QUALITY (NVQ)
AREA OF APPLICATION	Visible components in residential, school or office constructions, especially suitable for residential areas and surfaces with glazes.	Visible components in industrial and office buildings, not recommended for residential constructions.	Pure structural components with subsequent panelling.
SURFACE QUALITY GRADE	high demand	medium demand	no demand
MACHINED EDGES	chamfer on TL panels (in the panel width joint)	chamfer on TL panels (in the panel width joint)	no chamfer
SURFACE FINISH EX-FACTORY	fully sanded (one- or double sided, sanding in grain direction or across the grain)	fully sanded (one- or double sided, sanding in grain direction or across the grain, individual small rough areas permitted)	equalised (planed or sanded)
SURFACE TREATMENT AT FACTORY	protective coatings & surface refinement on request	protective coatings on request, not recommended for surface refinement	protective coatings on request, surface refinement not available

SURFACE TREATMENT AND SPECIAL SURFACES

Both the industrial visual quality and the domestic visual quality panels are supplied fully sanded.

Should you require UV protection, varnished elements or any other surface treatment, please contact us. The same applies to surfaces in other types of wood, which we can offer depending on customer requirements and the availability of raw materials.

IMPORTANT NOTE
Visual quality components require special care during loading, as well as during and after installation.

SURFACE APPEARANCE REQUIREMENTS

Criteria	Domestic visual (DVQ)	Industrial visual (IVQ)	Non visual (NVQ)
Surface finish	sanded	sanded, individual small rough areas permitted	equalised (planed or sanded)
Wood species	one single species	predominantly one single species spruce / fir (≤ 10 %) are regarded as one type of wood	addition of other timber species possible
Colour and texture	mostly balanced	generally balanced	no requirements
Blue and brown stains, red tinge	slight discolouration permitted (≤ 3 %)	slight discolouration permitted (≤ 5 %)	no restrictions
Knots, tightly intergrown	permitted	permitted	no restrictions
Knots, black	permitted ≤ 25 mm Ø	permitted ≤ 35 mm Ø	no restrictions
Loose knots, knot holes	permitted ≤ 12 mm Ø	permitted ≤ 15 mm Ø	no restrictions
Resin pockets	to some extent permitted ≤ 3 x 50 mm	to some extent permitted ≤ 5 x 70 mm	no restrictions
Piths	to some extent permitted length ≤ 800 mm	to some extent permitted length ≤ 1000 mm	no restrictions
Bark ingrowth	not permitted	not permitted	no restrictions
Wane	not permitted	not permitted	permitted
Compression wood	to some extent permitted	to some extent permitted	no restrictions
Boreholes from inactive insect attack	not permitted	not permitted	to some extent permitted
Wood moisture content during production	≤ 12 %	≤ 12 %	≤ 14 %
Cracks and joints (at a reference moisture measurement of 12%)	to some extent permitted ≤ 1,5 mm	to some extent permitted ≤ 2 mm	to some extent permitted ≤ 6 mm
Surface defects	to some extent permitted ≤ 12 mm Ø	to some extent permitted ≤ 15 mm Ø	no restrictions
Surface re-treatment (Filling and plugging of branch holes, strips, etc.)	permitted	permitted	no restrictions
Defects on panel/lamellae edges	to some extent permitted	to some extent permitted	no restrictions
Making good of element edges manually, using sand paper	yes	yes	no
Chamfer on TL panels (in the panel width joint)	yes	yes	no
Range of validity	The given surface qualities valid: - at the time of delivery - only for the covering layer, not for the narrow sides - for one-sided visible surfaces - for narrow sides and CNC-treated surfaces, the criteria for NVQ surface quality apply - for double-sided visible surfaces, a small amount of on-site reworking is to be expected		
Crack formation	Like all solid wood products, the above stated qualities are subject to crack and joint formation as a result of drying to their future compensation moisture balance when installed due to the product characteristics. This cannot be prevented.		

NOTE
Wood is a natural product. Minor deviations from the table values are natural and are no reason for complaint.

AREAS OF APPLICATION

Due to the structural properties KLH® - CLT is used for stability as well as for load-bearing and non-load-bearing building components.

Cross laminated timber can also be used to create cantilevering elements, point-loaded constructions, prefabricated pods and modules.

KLH® have to date supplied cross laminated timber for more than 35,000 projects worldwide. They were completed in the following categories:

- Detached residential dwelling houses
- Multi story residential apartment buildings
- Terraced houses
- Student housing
- Retirement homes
- Schools and kindergartens
- Hotels
- Civic and Public buildings
- Event halls
- Industrial and commercial buildings
- Refurbishment & Extensions
- Special buildings
- .....

Single family house Ammersee | Dirk Wilhelmy, www.wilhelmy-fotografie.de

Multi story residential building Mühlweg | KLH®

Hotel mama thresl Leogang | Christian Schöch / Hotel mama thresl

Student hostel Mineroom | ©J. Konstantinov

BUILDING WITH KLH® HAS MANY ADVANTAGES

- Ecologically sustainable
- Renewable resource
- Positive ecobalance
- A healthy and comfortable room climate
- Lasting value
- Individuality in architecture and design
- Flexible room design without a grid pattern
- More net floor space
- Technically approved and CE-certified building product
- Quality controlled and ISO-certified production procedures
- CNC cutting and high accuracy of fit
- Lighter than conventional building materials
- Short construction period and dry construction method
- Suitable for earthquake regions
- Easy assembly and installation
- Less noise on site
- Smaller crews- safer sites
- Less vehicle movements for deliveries
- No requirement for curing times
- Easy to fix into

FLUCTUATIONS IN THE ROOM CLIMATE

Wood is a natural, non-homogeneous building material which has a compensating effect on the room climate.

Extreme variations of relative humidity and temperature may lead to cracks and fissures on the surfaces of the timber elements.
We therefore recommend that extreme temperature variations are avoided, specifically during the construction phase of the building.
For visual grade applications the ideal relative humidity of the environment is controlled to range between 40-60%

THERE'S MORE TO KLH® CROSS-LAMINATED TIMBER

KLH® is not only a manufacturer of building elements, but a valuable project partner. We therefore offer a range of specialist professional services in addition to the manufacture of CLT components.

Whether you require assistance relating to building physics or construction details, our highly qualified team of specialists will be happy to help. We can also offer support in the preparation of working and fabrication drawings.

ONLINE SUPPORT

Please visit our website to download our design software for KLH® solid wood panels or to use the online version of the KLHdesigner. For all of you who would like to design with KLH® ‚on the go', please download our mobile version of the KLH® designer app

QR code for KLHdesigner

QR code for website

Ely Boathouse | © Koen Van Damme

NOTES

NOTES

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For love of nature

Printed on ecologically friendly paper