

The KLH logo consists of the letters "KLH" in a bold, white, sans-serif font, positioned centrally within a solid red rectangular background.

KLH[®]

MADE FOR BUILDING
BUILT FOR LIVING

CROSS-LAMINATED TIMBER

A large, semi-transparent circular seal is located in the bottom right corner. The word "ORIGINAL" is written in a curved path along the top and bottom inner edges of the seal. A diagonal banner across the center of the seal contains the text "100% KLH" followed by a registered trademark symbol.

ORIGINAL
100% KLH[®]
ORIGINAL

IMPRINT

Version: Cross-Laminated Timber, 07/2021

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GENERAL INFORMATION

CROSS-LAMINATED TIMBER



PRODUCT DESCRIPTION

KLH® - CLT is a versatile building material characterized by its dimensional stability and accuracy, and its high level of prefabrication. KLH® solid wood panels are used for wall, floor slab, and roof elements.

The biaxial qualities of CLT provide a multitude of opportunities for exciting architectural designs. KLH® elements can be combined with most building materials and structural systems to produce exciting and innovative design arrangements. By utilizing CLT in a bearing wall system, the thicknesses of floor and wall elements can be minimized to achieve an increase in building volume over traditional framed bearing wall and dropped-ceiling systems.

KLH® superstructures are erected by knowledgeable construction companies, typically using a mobile crane. An average of 25 minutes is required to place each element, depending on the complexity of the structure and site conditions. Erection of CLT for a detached residential dwelling of average size and complexity typically takes approximately 1-2 days. Erection crews are usually made up of four workers and a crane operator, and typical panel-to-panel connections are made with long wood screws and simple tools.

MAXIMUM DIMENSIONS AND INVOICING WIDTHS

Maximum panel length	54'-2"
Maximum panel width	9'-8"
Maximum panel thickness	1'-8"

Invoicing widths	7'-10" / 8'-2" / 8'-11" / 9'-8"
Minimum production length	27'-1" – in 2" increments

MANUFACTURE

KLH® solid wood elements are made up of a least 3 layers of lumber boards that are arranged perpendicular to each other and glued together under high pressure. Depending on the project requirements, we can supply PEFC/06-34-110 and FSC® C119602 -certified panels on request.

By cross-laminating the lumber boards, swelling and shrinkage are restrained, providing excellent dimensional stability of the finished product. In accordance with ANSI/ APA PRG 320, only kiln dried lumber with a moisture content of 12% (+/- 2%) is used in KLH® - CLT.

The fabrication process is subject to internal and external quality control by authorized third party auditors.

ADHESIVES AND LAMINATION PROCESS



PEFC/06-34-110 or FSC® C119602 - certified lumber stock is graded and sorted according to grade and 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 both simple and highly complex patterns according to project requirements.

ADHESIVES AND LAMINATION PROCESS

Only VOC-free and formaldehyde-free PUR adhesives are used in accordance with ANSI 405 and CSA 0112.10.

Adhesive is applied automatically over the entire surface at approximately 0.03 lbs/ft² per joint. Combined with a laminating pressure of 87 psi, KLH® - CLT is manufactured to consistently high standards of strength and quality.

Furthermore, production takes place in a highly controlled manufacturing environment where temperature and humidity are continuously monitored and consistently maintained, ensuring the specified moisture content of both lumber stock and finished product.

More information about the adhesives used may be found at www.henkel-adhesives.de.

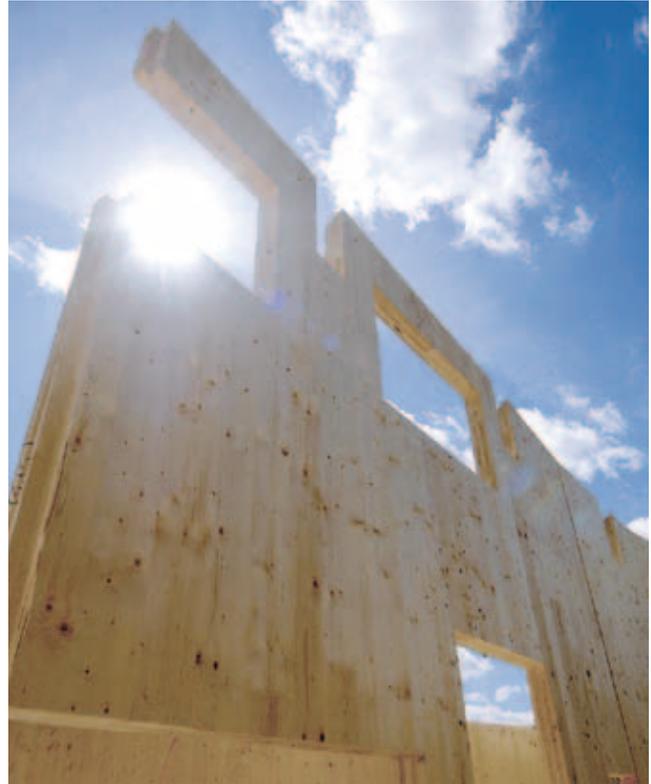
PREFABRICATION OF BUILDING ELEMENTS

CNC CUTTING AND TOLERANCES

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

For elements of a length and width greater than 10.7 ft.², the tolerances are +/- 1/8", for standard panel types, standard trimming and a wood moisture content of 12%. The minimum element size for standard cutting is 3 ft. x 3 ft.

In addition to standard cutting, KLH® offers project-specific cutting services, including penetrations and routing, tailored to specific project requirements.



STANDARD CUTTING FOR WALL, FLOOR AND ROOF ELEMENTS

Cuts at right angles to the panel edges and panel surface, with diagonal cuts into the panel surface up to a maximum cutting depth of 10-1/4". Circular cuts into panel surfaces may be a maximum of 13' 1-1/2" long for floor and roof elements, and a maximum of 19' 8-7/32" long for wall elements.

Internal corners, e.g. for door and window cut-outs or other openings, are executed with rounded edges with a radius of 25/32". Sharp corners can be provided at an additional charge.

Standard cutting for floor and roof elements includes typical panel joints such as half-lap or spline board connections. Maximum width for milling of the joint is 3-17/32" in each adjoining element.

OTHER CUTTING SERVICES

Any cutting not considered standard is categorized as special cuts. Following initial verification of technical feasibility, special cuts can be executed on a project-specific basis. For special machining services increased tolerances might occur compared to standard machining services.

Examples of special cuts are:

- Specialist routing
- Drilling into the panel sides or edges
- Elements with special inner and outer contours/shapes
- Half-lap joints and recesses on the underside of the panel or located in the center of the element
- Cut-outs for structural members such as steel W-shapes
- Cut-outs for rafters and beams
- Cutting of small elements (element width < 3 ft)
- Double-sided processing of elements
- Cut-outs for sockets and conduits.



TECHNICAL APPROVALS AND CERTIFICATES



EUROPEAN TECHNICAL
ASSESSMENT
ETA - 06/0138



UK TECHNICAL ASSESSMENT
UKTA-0836-22/0028



DOCUMENT
TECHNIQUE
D'APPLICATION

Panneaux KLH®
n°3.320-1016_v1

FRENCH APPROVAL
DTA 3.3/20-1016_v1



Intertek
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



Promoting
Sustainable Forest
Management
www.pefc.org

PEFC CERTIFICATION



FSC® CERTIFICATION



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



For healthier building
products we underwent
certification by Declare

DOWNLOAD OF CERTIFICATES

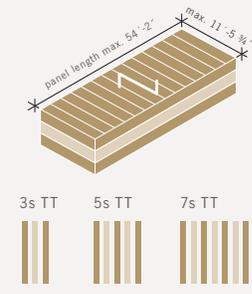
All approvals and certificates can be downloaded at www.klhusa.com

TECHNICAL DETAILS

PRODUCT	Solid wood panels with crosswise glued laminations
PRODUCT NAME	KLH® Cross-Laminated Timber
USES	Structural elements for walls, floors, and roofs
WOOD TYPE	Austrian spruce (other wood species on request)
PANEL BUILD-UPS	3-, 5-, 7-, and 8-laminations
LAMINATIONS	Lamination thicknesses 0.79" - 1.57" Sorted for quality and finger-jointed
PANEL GRADE	CV3M1
GLUE	Formaldehyde-free PUR adhesive
LAMINATION PRESSURE	12,500 psf, minimum
MOISTURE CONTENT	12% (+/- 2%) at delivery
MAXIMUM DIMENSIONS	Length 54'-2" / width 9'-8" / thickness 1'-8"
AVAILABLE WIDTHS	7'-10" / 8'-2" / 8'-11" / 9'-8"
SURFACE QUALITIES	Non-visible (NVQ) / Industrial visible (IVQ) / Domestic visible (DVQ)
WEIGHT	For structural calculations, 35 pcf Shipping weight, 31 pcf
DIMENSIONAL CHANGE WITH MOISTURE CONTENT	In-plane: 0.02% per 1% change in moisture content Out-of-plane: 0.24% per 1% change in moisture content
NOMINAL CHAR RATE	1.5 in./hr.
EFFECTIVE CHAR DEPTH	1.9 in. after 1 hour All lamination thicknesses = 1- ³ / ₈ "
FIRE DESIGN	According to NDS 2015 and CLT Handbook, US Ed.
FLAME SPREAD INDEX	Classification B
CERTIFICATION	ANSI/APA PRG 320-2018

KLH® STANDARD PANEL TYPES, DIMENSIONS AND PANEL BUILD UP

	Panel Type	Thickness (in.)	Lamination Thickness in CLT Layup				(in.)	(in.)	(in.)	(in.)
			(in.)	(in.)	(in.)	(in.)				
Covering layer in the transverse panel direction TT	60 3s TT	2.36	0.79	0.79	0.79					
	70 3s TT	2.76	0.79	1.18	0.79					
	80 3s TT	3.15	1.18	0.79	1.18					
	80 3s TT (V2)	3.15	0.79	1.57	0.79					
	90 3s TT	3.54	1.18	1.18	1.18					
	100 3s TT	3.94	1.18	1.57	1.18					
	100 3s TT (V2)	3.94	1.57	0.79	1.57					
	105 3s TT	4.13	1.38	1.38	1.38					
	110 3s TT	4.33	1.57	1.18	1.57					
	120 3s TT	4.72	1.57	1.57	1.57					
	100 5s TT	3.94	0.79	0.79	0.79	0.79	0.79			
	110 5s TT	4.33	0.79	0.79	1.18	0.79	0.79			
	120 5s TT	4.72	1.18	0.79	0.79	0.79	1.18			
	120 5s TT (V2)	4.72	0.79	1.18	0.79	1.18	0.79			
130 5s TT	5.12	1.18	0.79	1.18	0.79	1.18				
140 5s TT	5.51	1.18	0.79	1.57	0.79	1.18				
140 5s TT (V2)	5.51	0.79	1.57	0.79	1.57	0.79				
140 5s TT (V3)	5.51	1.57	0.79	0.79	0.79	1.57				
150 5s TT	5.91	1.18	1.18	1.18	1.18	1.18				
150 5s TT (V2)	5.91	1.57	0.79	1.18	0.79	1.57				
160 5s TT	6.30	1.57	0.79	1.57	0.79	1.57				
175 5s TT	6.89	1.38	1.38	1.38	1.38	1.38				
180 5s TT	7.09	1.57	1.18	1.57	1.18	1.57				
200 5s TT	7.87	1.57	1.57	1.57	1.57	1.57				
180 7s TT	7.09	1.18	0.79	1.18	0.79	1.18	0.79	1.18		
Covering layer in the longitudinal panel direction TL	60 3s TL	2.36	0.79	0.79	0.79					
	70 3s TL	2.76	0.79	1.18	0.79					
	80 3s TL	3.15	1.18	0.79	1.18					
	80 3s TL (V2)	3.15	0.79	1.57	0.79					
	90 3s TL	3.54	1.18	1.18	1.18					
	100 3s TL	3.94	1.57	0.79	1.57					
	100 3s TL (V2)	3.94	1.18	1.57	1.18					
	105 3s TL	4.13	1.38	1.38	1.38					
	110 3s TL	4.33	1.57	1.18	1.57					
	120 3s TL	4.72	1.57	1.57	1.57					



* not available in DVQ

KLH® STANDARD PANEL TYPES, DIMENSIONS AND PANEL BUILD UP

	Panel Type		Thickness (in.)	Lamination Thickness in CLT Layup					
				(in.)	(in.)	(in.)	(in.)	(in.)	(in.)
Covering layer in the longitudinal panel direction TL	100	5s TL	3.94	0.79	0.79	0.79	0.79	0.79	0.79
	110	5s TL	4.33	0.79	0.79	1.18	0.79	0.79	
	120	5s TL	4.72	1.18	0.79	0.79	0.79	1.18	
	120	5s TL (V2)	4.72	0.79	1.18	0.79	1.18	0.79	
	130	5s TL	5.12	1.18	0.79	1.18	0.79	1.18	
	130	5s TL (V2)	5.12	0.79	1.18	1.18	1.18	0.79	
	140	5s TL	5.51	1.57	0.79	0.79	0.79	1.57	
	140	5s TL (V2)	5.51	0.79	1.57	0.79	1.57	0.79	
	150	5s TL	5.91	1.57	0.79	1.18	0.79	1.57	
	150	5s TL (V2)	5.91	1.18	1.18	1.18	1.18	1.18	
	150	5s TL (V3)	5.91	0.79	1.57	1.18	1.57	0.79	
	160	5s TL	6.30	1.57	0.79	1.57	0.79	1.57	
	160	5s TL (V2)	6.30	0.79	1.57	1.57	1.57	0.79	
	170	5s TL	6.69	1.57	1.18	1.18	1.18	1.57	
	170	5s TL (V2)	6.69	1.18	1.57	1.18	1.57	1.18	
	175	5s TL	6.89	1.38	1.38	1.38	1.38	1.38	
	180	5s TL	7.09	1.57	1.18	1.57	1.18	1.57	
	180	5s TL (V2)	7.09	1.18	1.57	1.57	1.57	1.18	
	190	5s TL	7.48	1.57	1.57	1.18	1.57	1.57	
	200	5s TL	7.87	1.57	1.57	1.57	1.57	1.57	
	160	5ss TL	6.30	1.18+1.18	1.57	1.18+1.18			
	140	7s TL	5.51	0.79	0.79	0.79	0.79	0.79	0.79
	160	7s TL	6.30	0.79	1.18	0.79	0.79	0.79	1.18
	180	7s TL	7.09	0.79	1.57	0.79	0.79	0.79	1.57
	180	7s TL (V2)	7.09	1.18	0.79	1.18	0.79	1.18	0.79
	200	7s TL	7.87	0.79	1.57	0.79	1.57	0.79	1.57
	210	7s TL	8.27	1.18	1.18	1.18	1.18	1.18	1.18
	220	7s TL	8.66	1.18	1.57	1.18	0.79	1.18	1.57
	220	7s TL (V2)	8.66	1.57	0.79	1.57	0.79	1.57	0.79
	230	7s TL	9.06	1.18	1.57	1.18	1.18	1.18	1.57
	240	7s TL	9.45	1.18	1.57	1.18	1.57	1.18	1.57
	245	7s TL	9.65	1.38	1.38	1.38	1.38	1.38	1.38
260	7s TL	10.24	1.57	1.57	1.18	1.57	1.18	1.57	
180	7ss TL	7.09	1.18+1.18	0.79	0.79	0.79	1.18+1.18		
200	7ss TL	7.87	1.18+1.18	0.79	1.57	0.79	1.18+1.18		
210	7ss TL	8.27	1.18+1.18	1.18	1.18	1.18	1.18+1.18		
220	7ss TL	8.66	1.57+1.57	0.79	0.79	0.79	1.57+1.57		
220	7ss TL (V2)	8.66	1.18+1.18	1.18	1.57	1.18	1.18+1.18		
230	7ss TL	9.06	1.57+1.57	0.79	1.18	0.79	1.57+1.57		
240	7ss TL	9.45	1.57+1.57	0.79	1.57	0.79	1.57+1.57		
250	7ss TL	9.84	1.57+1.57	1.18	1.18	1.18	1.57+1.57		
260	7ss TL	10.24	1.57+1.57	1.18	1.57	1.18	1.57+1.57		
280	7ss TL	11.02	1.57+1.57	1.57	1.57	1.57	1.57+1.57		
300	8ss TL	11.81	1.57+1.57	1.18	1.57+1.57	1.18	1.57+1.57		
320	8ss TL	12.60	1.57+1.57	1.57	1.57+1.57	1.57	1.57+1.57		

SURFACE QUALITY

SURFACE QUALITY

KLH® solid wood panels are typically produced from spruce laminations 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 SURFACE QUALITIES

	DOMESTIC VISUAL QUALITY (DVQ)	INDUSTRIAL VISUAL QUALITY (IVQ)	NON VISUAL QUALITY (NVQ)
AREA OF APPLICATION	Visual grade components for domestic applications	Visual grade components for industrial applications	Non visual grade components - structural and non-structural elements to be lined and not left exposed
SURFACE QUALITY GRADE	high	medium	no requirement
MACHINED EDGES	chamfer on the long side of the panel	chamfer on the long side of the panel	no chamfered joints
SURFACE FINISH EX-FACTORY	fully sanded (single or double sided) or brushed (single sided)	fully sanded (single or double sided)	planed only
SURFACE TREATMENT AT FACTORY	on request	on request	protective coating on request, finishing 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	planed
Wood species	one single species	predominantly one single species spruce / fir ($\leq 10\%$) 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 ($\leq 3\%$)	slight discolouration permitted ($\leq 5\%$)	no restrictions
Knots, tightly intergrown	permitted	permitted	no restrictions
Knots, black	permitted $\leq 1'' \varnothing$	permitted $\leq 1.5'' \varnothing$	no restrictions
Loose knots, knot holes	permitted $\leq 0.5'' \varnothing$	permitted $\leq 5/8'' \varnothing$	no restrictions
Resin pockets	to some extent permitted $\leq 0.1'' \times 2''$	to some extent permitted $\leq 0.2'' \times 3''$	no restrictions
Piths	to some extent permitted length $\leq 2.5'$	to some extent permitted length $\leq 3.5'$	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	$\leq 12\%$	$\leq 12\%$	$\leq 14\%$
Cracks and joints (at a reference moisture measurement of 12%)	to some extent permitted $\leq 0.05''$	to some extent permitted $\leq 0.1''$	to some extent permitted $\leq 0.25''$
Surface defects	to some extent permitted $\leq 0.5'' \varnothing$	to some extent permitted $\leq 5/8'' \varnothing$	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

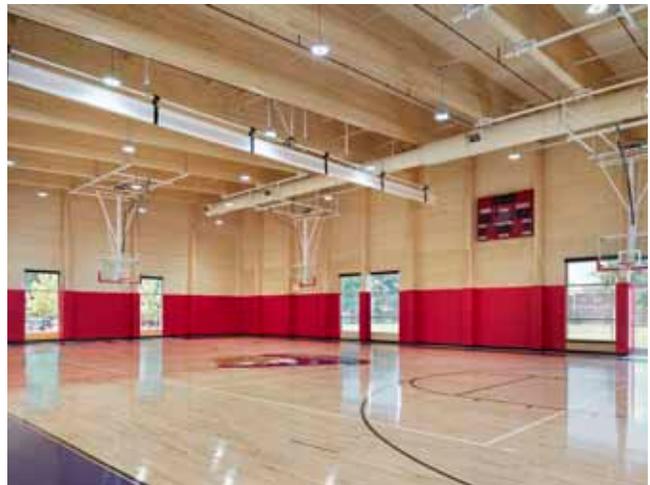
AREAS OF APPLICATION

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® has 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
-



Washington Latin - Gym |  Copyright Sarah Mechling. Courtesy Perkins Eastman

PRODUCT ADVANTAGES

BUILDING WITH KLH® HAS MANY ADVANTAGES

- Ecologically sustainable
- Renewable resource
- Carbon neutral
- 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 ANSI/APA PRG 320 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
- Manage tight construction sites

FLUCTUATIONS IN 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 and humidity variations are avoided, especially 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 those of you who would like to design “on the go”, please download the mobile version of the KLH® designer app.



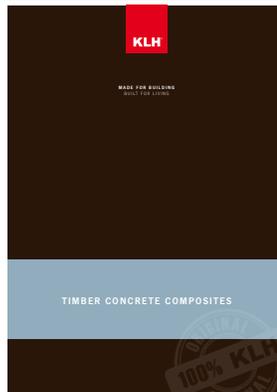
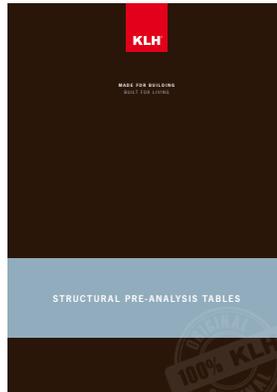
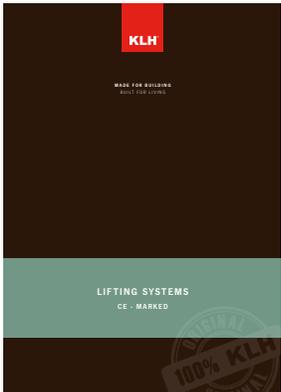
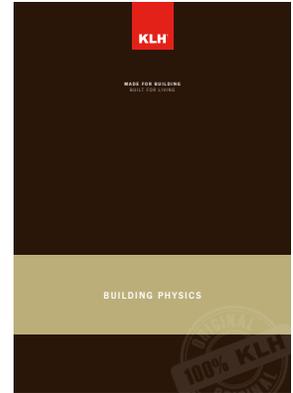
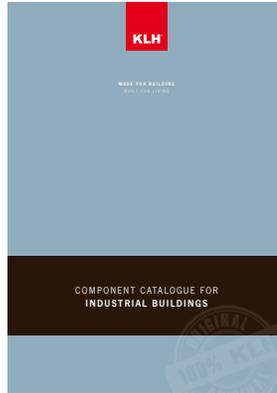
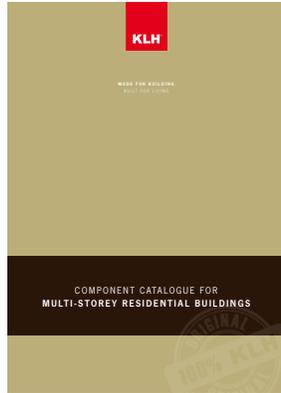
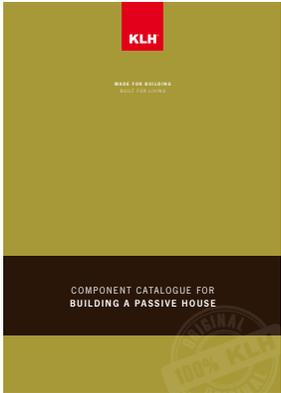
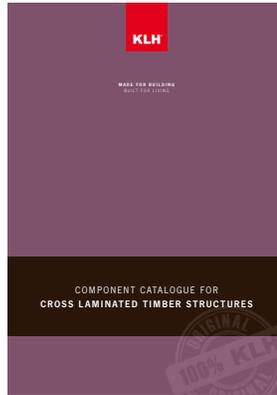
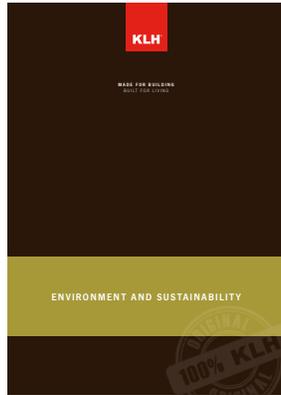
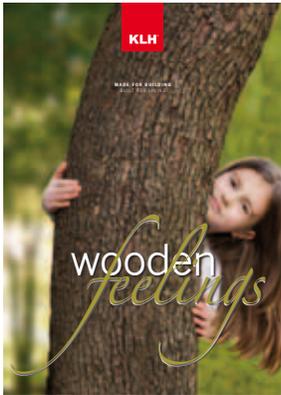
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