Competence and Innovation

SCHILLIGER HOLZ

CROSS LAMINATED TIMBER CLT

BIG IN SHAPE

CLT panels – an innovative solution in modern timber construction.

YOUR PRODUCT

– Extremely stable thanks to continuous edge gluing
– Available in dimensions up to 3’450 x 16’000 mm and thicknesses up to 500 mm
– Automated production with large capacity and high accuracy
– Individual surface treatment on both sides
– Cutting to size
– Wide range of construction solutions
– Delivered directly to the construction site

YOUR ADVANTAGES

– Versatile use – for example as ceiling, wall and floor elements in visible quality
– Further processing according to your requirements
– Optimized delivery times even for large projects
– Minimum construction time
– Personal advice from our sales team
– Modern tools for structural analysis
– Technical information via www.clt-tech.com
– Personal technical support as an additional offer

AND ABOVE ALL ...

– CLT, glulam, solid wood, planed timber, wood fiber insulation boards – all from one sourcee

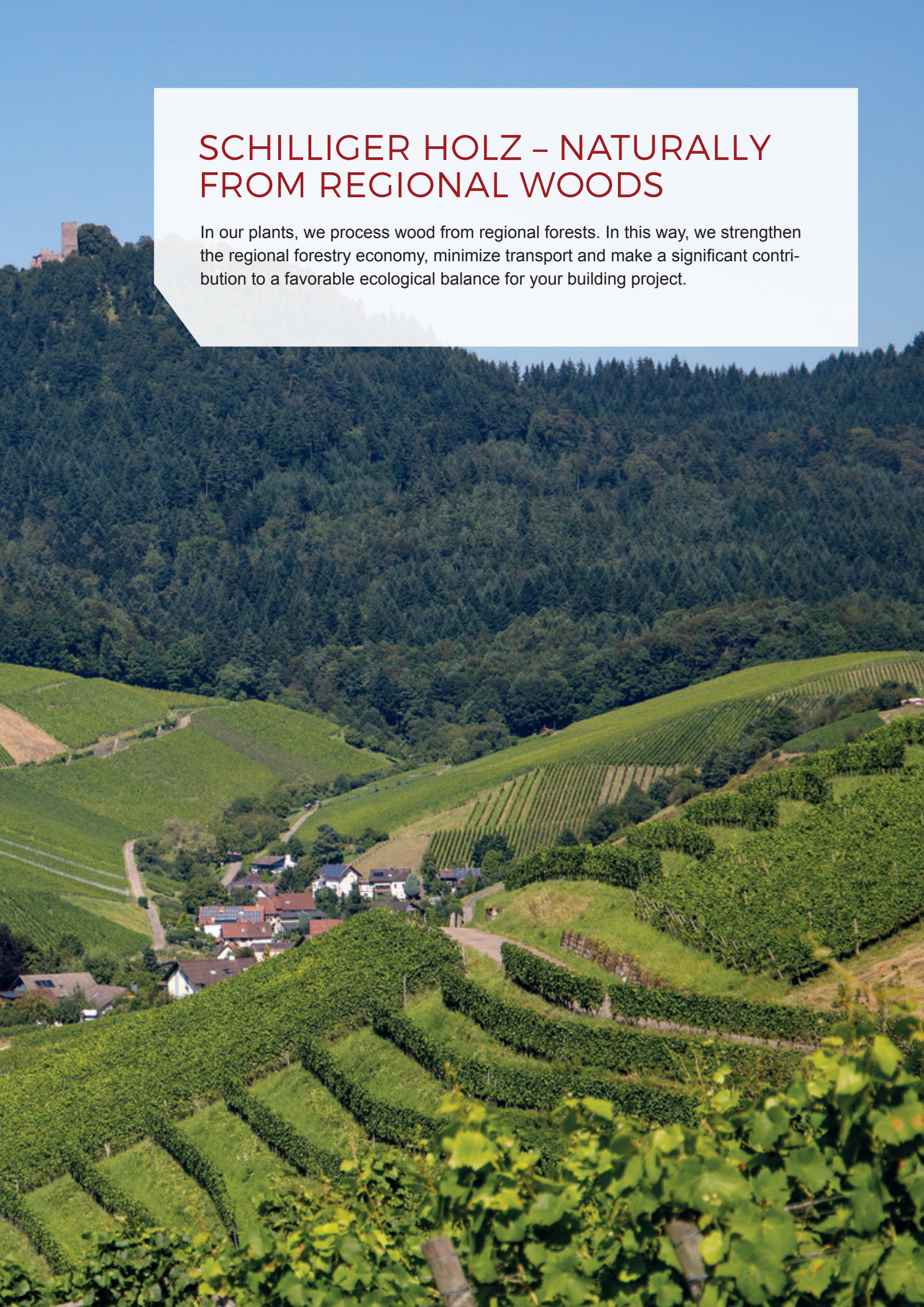
Wood type	Spruce/fir. Douglas fir on request.	
Appearance classification	B (visible): C (industrial): D (non visible):	for visible constructions for lower aesthetic demands for non-visible constructions
Structure	Multi-layer: layer thicknesses depending on construction	
Panel thicknesses	27 - 320 mm, up to 500 mm on request	
Fiber orientation	Longitudinal grain, from 60 mm onwards transversal grain possible	
Panel size	• Length: from 8.00 m to 16.00 m (every 100 mm) • Standard widths: 2.15 m / 2.45 m / 2.75 m / 2.95 m / 3.25 m / 3.45 m	
Moisture content	10% ± 2%	
Physical properties (for panel structure 10-10-10)	Thermal conductivity Water vapor permeability Water vapor diffusion resistance factor Specific heat capacity	λ= 0.13 W/(m · K) δ= 0.7576 mg/(m · h · Pa) μ= 50* C_p= 1600 J/(kg · K)
Reaction to fire	D-s2,d0 (EN 13501-1)	
Gluing	• Polyurethane (PUR), Type I EN 15425 • Solvent free, (free of formaldehyde) • Colorless glue joint	

* Based on tests at ETH Zürich, int. report ETHZ / ifP-HP NR. 23.

< View of the modern hall for CLT production in Haltikon. All production steps are combined under one roof – from caps and finger joints of the slats to drying, gluing and intermediate storage to grinding and cutting.

SCHILLIGER HOLZ – NATURALLY FROM REGIONAL WOODS

In our plants, we process wood from regional forests. In this way, we strengthen the regional forestry economy, minimize transport and make a significant contribution to a favorable ecological balance for your building project.



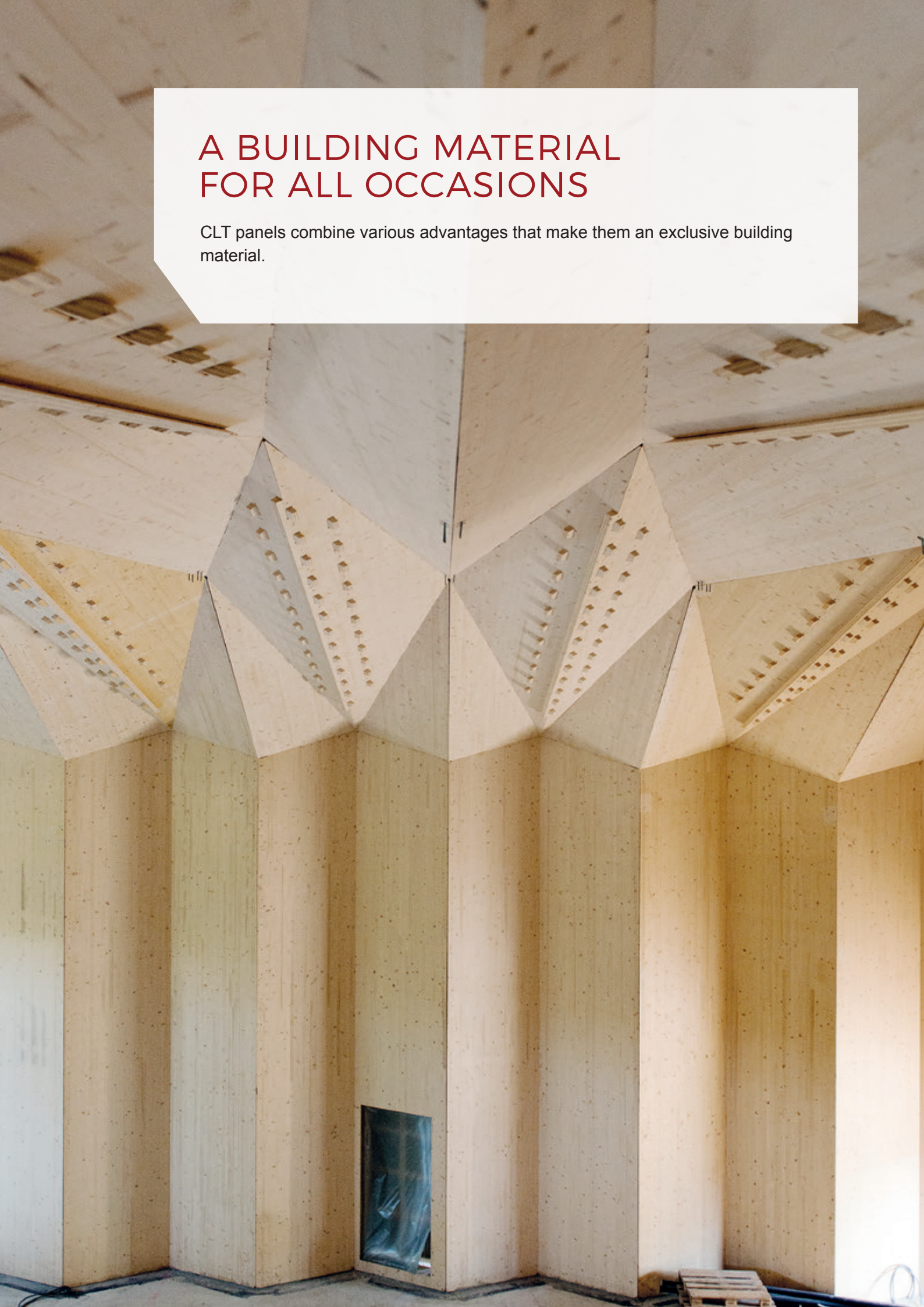
CLT QUALITY CRITERIA

Each panel is characterized by the quality of its two main sides. All combinations are possible. Different surface qualities are offered:
B-quality: Visible surface for in the living area, sanded, defects repaired with wooden patches
C-quality: Industrial surface, sanded, defects filled with synthetic materials
D-quality: Non-visible surface, without aesthetic corrections

PROPERTIES	QUALITY B	QUALITY C	QUALITY D
Application	For visible constructions	For constructions with lower aesthetic requirements	For non-visible constructions or constructions without aesthetic requirements
Wood species	Possible combinations: Spruce/Fir	Possible combinations: Spruce/Fir	Possible combinations: Softwoods (Spruce/Fir/Pine/ Douglas fir/Larch)
Appearance, color & texture	Color and texture largely balanced, coarse texture to be tolerated	No requirements	No requirements
Knots			
– healthy, intergrown knots	Permitted	Permitted	Permitted
– other knots (black knots)	Up to a visible diameter of 15 mm permitted	Permitted	Permitted
– Knotholes	Up to a visible diameter of 15 mm permitted	Up to a visible diameter of 20 mm permitted	Permitted
Pitch pockets	Up to 5 x 50 mm permitted, no clusters	Permitted	Permitted
Bark pockets	Permitted in isolated cases	Permitted	Permitted
Piths	Permitted	Permitted	Permitted
Compression wood	Permitted	Permitted	Permitted
Discoloration (Blue stain/ brown stain/red strips)	Slight discoloration (max. 5%) of the visible surface permitted	Permitted	Permitted
Decay	Not permitted	Not permitted	Not permitted
Insect infestation	Not permitted	Small holes (max. 2 mm) of inactive infestations permitted	Inactive infestations permitted
Cracks	Isolated surface and end cracks permitted	Permitted	Permitted
Lamella widths	Lamella widths ≤ 130 mm; only one type of lamella widths is used in the top layer	Lamella widths < 250 mm; different lamella widths may be used in the the top layer	Lamella widths < 250 mm; different lamella widths may be used in the top layer
Quality of Panel's edges	All layers edge glued	All layers edge glued, open joints up to 100 mm/m permitted	All layers edge glued, open joints are locally permitted
Surface	Sanded* (min. 60 grain), small isolated defects permitted, Finer sanding on request; Finger-jointed lamellas	Sanded* (min. 60 grain), small isolated defects permitted Finger-jointed lamellas	Calibrated*, no requirements Finger-jointed lamellas
Average moisture content	10% ± 2%	10% ± 2%	10% ± 2%
Wooden patches	Permitted	Permitted	Not required
Synthetic Patches	Occasionally permitted	Permitted	Not required

The specified quality characteristics only apply to the top layer, not to the middle layers and not to the edges of the panels. The specified quality characteristics are met upon delivery. As with all solid wood products, cracks/gaps may form during use, especially under extreme climatic conditions. The use of the product in special climatic conditions should be communicated accordingly. Unless otherwise stated on the order confirmation, the panels are manufactured for use in service classes 1 and 2.

*depending on panel size and orientation of the outer layer, the direction of the sanding may be transverse to the grain due to the production process



A BUILDING MATERIAL FOR ALL OCCASIONS

CLT panels combine various advantages that make them an exclusive building material.

STRONG IN STATICS

Thanks to the crosswise glued boards, CLT panels warp only slightly and the loads can be distributed in two directions. This leads to an enormous static load capacity and has a stiffening effect. This is why CLT panels are used as load-bearing wall elements, but also in floors, ceilings, as canopy panels and as wall-like beams. The very good mechanical properties also make CLT panels an excellent structural element for superstructures and balconies with significant cantilevers.

A SAFE BET

CLT is not only suitable for the construction of single-family houses, office buildings or warehouses, but also for multi-storey wooden buildings. This is because buildings with CLT panels are very resistant to earthquakes and have good behavior in case of fire.

LIGHTWEIGHT

Thanks to the low dead weight of wood as a building material, CLT panels are also the first choice for building in existing structures and in densification, as well as for complex extension buildings.

NOTHING IS IMPOSSIBLE

CLT panels are very flexible and easy to work with. This makes CLT attractive for complicated and innovative building projects.

See for yourself and check out our references!

< Insight into the Vidy theatre (CH)

TABLE CLT COMPOSITIONS

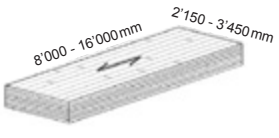
Panel type	Nominal thickness (mm)	Number of layers	Layer thicknesses (mm)							
			1	2	3	4	5	6	7	8
CLT-3L	27	3	9	9	9					
	30	3	10	10	10					
	35	3	10	15	10					
	40	3	10	20	10					
	45	3	15	15	15					
	50	3	15	20	15					
	60	3	20	20	20					
	70	3	20	30	20					
	80	3	30	20	30					
	90	3	30	30	30					
	100	3	30	40	30					
	110	3	40	30	40					
	120	3	40	40	40					
CLT-5L	100	5	20	20	20	20	20			
	110	5	20	20	30	20	20			
	120	5	20	30	20	30	20			
	130	5	30	20	30	20	30			
	140	5	40	20	20	20	40			
	150	5	30	30	30	30	30			
	160	5	40	20	40	20	40			
	170	5	30	40	30	40	30			
	180	5	40	30	40	30	40			
	200	5	40	40	40	40	40			
CLT-5DL	160	5DL	30+30		40	30+30				
	170	5DL	40+30		30	30+40				
	180	5DL	40+40		20	40+40				
	200	5DL	40+40		40	40+40				
CLT-7L	200	7	20	40	20	40	20	40	20	
	220	7	40	20	40	20	40	20	40	
	240	7	30	40	30	40	30	40	30	
CLT-7DL	220	7DL	40+40		20	20	20	40+40		
	240	7DL	40+40		20	40	20	40+40		
	260	7DL	40+40		30	40	30	40+40		
	280	7DL	40+40		40	40	40	40+40		
CLT-8DL	300	8DL	40+40		30	40+40		30	40+40	
	320	8DL	40+40		40	40+40		40	40+40	

Other thicknesses and compositions are available on request.

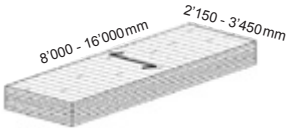
DL → DOUBLE LAYER; Outer layers consisting of two layers with parallel (identical) grain orientation.

Panel format

For logistical reasons, the panel type, thickness and the orientation of the layers determine the maximum recommended dimension of the panel ; up to a panel thickness of 60mm, they are therefore only available with outer layers with a longitudinal orientation of the grain.



Longitudinal grain of outer layers



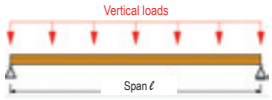
Transverse grain of outer layers

Billing

Length: from 8.00 m to 16.00 m (every 100 mm).
Standard widths: 2.15 m / 2.45 m / 2.75 m / 2.95 m / 3.25 m / 3.45 m.
The reference area is the raw panel, optimised for production. On request, large cut-outs can be supplied with the panel.

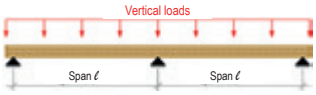
PRE-SIZING TABLE

SINGLE-SPAN SYSTEM



Loads (kN/m²)		Span ℓ (m) 3.0		3.5		4.0		4.5		5.0		5.5		6.0		6.5		7.0	
		Panel thickness in mm at a maximum deformation of:																	
g_k	q_k	ℓ/350	ℓ/500	ℓ/350	ℓ/500	ℓ/350	ℓ/500	ℓ/350	ℓ/500	ℓ/350	ℓ/500	ℓ/350	ℓ/500	ℓ/350	ℓ/500	ℓ/350	ℓ/500	ℓ/350	ℓ/500
1.0	2.0	90	100	120	120	120	140	140	160	160	180	180	200	200	220	220	240	220	240
1.5	2.0	90	120	120	120	140	140	140	160	160	200	180	220	200	240	220	240	240	260
2.0	2.0	100	120	120	140	140	160	160	180	180	200	200	220	220	240	240	240	240	280
2.0	2.5	100	120	120	140	140	160	160	180	180	220	200	220	220	240	240	260	240	280
2.0	3.0	120	120	120	140	140	160	160	200	180	220	220	240	220	240	240	260	260	280
2.0	3.5	120	120	140	140	160	180	180	200	200	220	220	240	240	240	240	280	260	300
2.0	4.0	120	120	140	160	160	180	180	200	200	220	220	240	240	260	240	280	260	300
2.5	2.0	120	120	140	140	160	180	180	200	180	220	220	240	240	260	240	280	260	300
2.5	2.5	120	120	140	140	160	180	180	200	180	220	220	240	240	260	240	280	260	300
2.5	3.0	120	120	140	160	160	180	180	200	200	220	220	240	240	260	240	280	260	300
2.5	3.5	120	140	140	160	160	180	180	200	200	220	220	240	240	260	240	280	260	300
2.5	4.0	120	140	140	160	160	180	180	220	200	220	220	240	240	260	260	280	280	320

TWO-SPAN SYSTEM



Loads (kN/m²)		Span ℓ (m) 3.0		3.5		4.0		4.5		5.0		5.5		6.0		6.5		7.0	
		Panel thickness in mm at a maximum deformation of:																	
g_k	q_k	ℓ/350	ℓ/500	ℓ/350	ℓ/500	ℓ/350	ℓ/500	ℓ/350	ℓ/500	ℓ/350	ℓ/500	ℓ/350	ℓ/500	ℓ/350	ℓ/500	ℓ/350	ℓ/500	ℓ/350	ℓ/500
1.0	2.0	80	80	80	90	120	120	120	120	120	140	140	160	140	180	160	180	180	200
1.5	2.0	80	90	90	100	120	120	120	140	140	140	140	160	160	180	180	200	180	220
2.0	2.0	80	90	120	120	120	120	120	140	140	160	160	180	160	180	180	220	200	220
2.0	2.5	80	90	120	120	120	120	120	140	140	160	160	180	180	200	200	220	200	240
2.0	3.0	80	100	120	120	120	140	140	140	140	160	160	180	180	200	200	220	220	240
2.0	3.5	90	100	120	120	120	140	140	160	160	180	160	200	180	220	200	220	220	240
2.0	4.0	90	100	120	120	120	140	140	160	160	180	180	200	180	220	200	240	220	240
2.5	2.0	90	100	120	120	120	140	140	160	160	180	180	200	180	220	200	240	220	240
2.5	2.5	120	100	120	120	120	140	140	160	160	180	180	200	180	220	200	240	220	240
2.5	3.0	120	100	120	120	120	140	140	160	160	180	180	200	180	220	200	240	220	240
2.5	3.5	120	100	120	120	120	140	140	160	160	180	180	200	200	220	220	240	220	240
2.5	4.0	120	100	120	120	120	140	140	160	160	180	180	200	200	220	220	240	220	240

Application example: Single-span floor with a dead load of g_k = 2.0 kN/m². Living area with a live load of q_k = 3.0 kN/m². Span ℓ = 5.5 m, deformation of w = ℓ/500. Usable thickness: CLT-7L-220 mm

Requirements and assumptions

Calculation according to the «gamma» method, the Eurocode standards and ETA-18/0884
- Minimum width of slab elements: 1.0 m
- Moisture class 1
- g_k: CLT dead loads excluding own weight (already taken into account)
- q_k: variable actions categories A and B (Ψ_0 = 0.7, Ψ_1 = 0.5, Ψ_2 = 0.3)
- Outer layer with a longitudinal orientation of the panel
- In the two-span system, the length of one of the spans can be assumed to be between 80% and 100% of the span ℓ.

Verification of fitness for service (deformation) according to DTA 3.3/17-920_V3:
- Long-term deformation (creep) is taken into account: k_{def} = 0.8
- Feature limit state for items not very sensitive to deformations: w ≤ ℓ/350
- Feature limit state for items susceptible to deformations: w ≤ ℓ/500

Fire resistance classification (according to AL13-119_V3) :
- No protective panel is considered
- Single-sided burning rate of the first layer: β_0 = 0,65 mm/min
- Burning rate after the previous ply has fallen (up to 25 mm): β_1 = 1.30 mm/min
- Burning rate after the previous ply has fallen (from 25 mm): β_1 = 0.65 mm/min
- Compensation depth s_0 = 12 mm

Collapse resistance RXX (in minutes): R30 R60 R90

80	CLT-3L-80mm
90	CLT-3L-90mm
100	CLT-3L-100mm
120	CLT-3L-120mm
140	CLT-5L-140mm
160	CLT-5L-160mm
180	CLT-5L-180mm
200	CLT-5L-200mm
220	CLT-7L-220mm
240	CLT-7DL-240mm
260	CLT-7DL-260mm
280	CLT-7DL-280mm
300	CLT-8DL-300mm
320	CLT-8DL-320mm

This table gives information for pre-sizing but does not replace a static calculation.

CLT – SIMPLE IN DIVERSITY

CLT panels are a pleasure to build with.

INDIVIDUALLY CONSTRUCTED

On the website www.clt-tech.com you will find a comprehensive collection of construction solutions shown in 3D on the building and backed up with the necessary technical data sheets. Join us for a virtual tour of our demo building and learn about the variety of panel construction.

DIRECTLY FROM PLAN

We support you in drawing with 2D and 3D, in the use of construction details and in the creation of assembly plans. For dimensioning we use RFEM and RSTAB, for drawings in 2D and 3D Cadwork. On request we also import other data provided by the customer. We will gladly make you an offer in this regard.

EXTREMELY ACCURATE

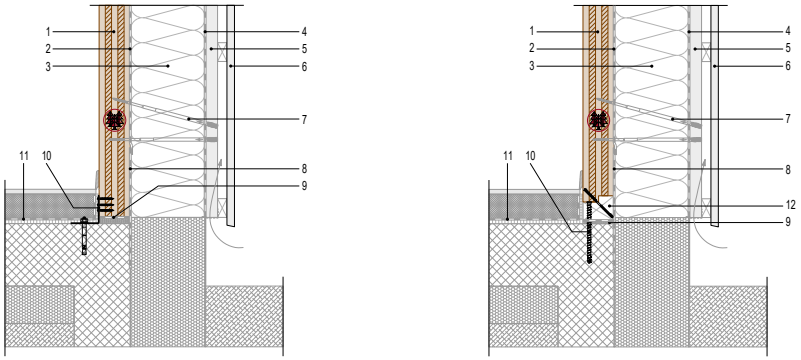
Thanks to our high-performance, CNC cutting system, we mill even complicated profiles and details into the panels with maximum precision – from vertical format cuts to angled cuts, deburrings, blanks, rabbets and panel joints to drill holes. This reduces the set-up time.

SECURELY INSTALLED

On request, we provide the panels with the necessary holes and suspension devices so that they can be lifted safely from the truck and set down with a perfect fit.

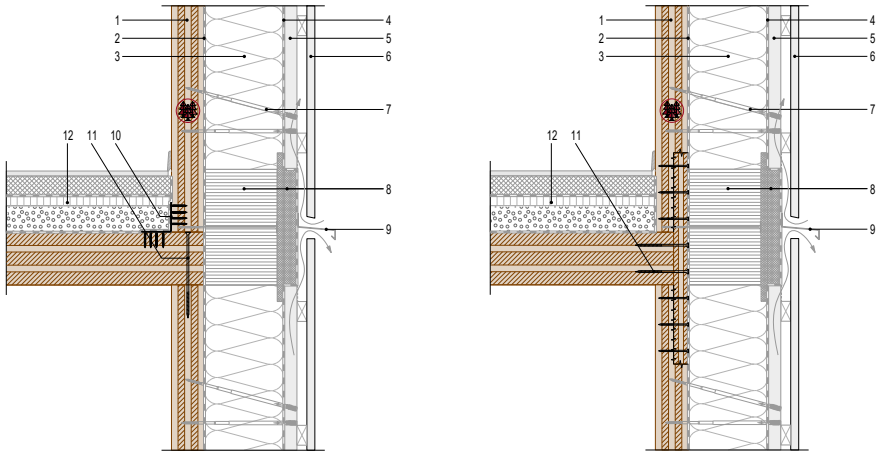
CONSTRUCTION DETAILS

EXTERNAL WALL ANCHORING



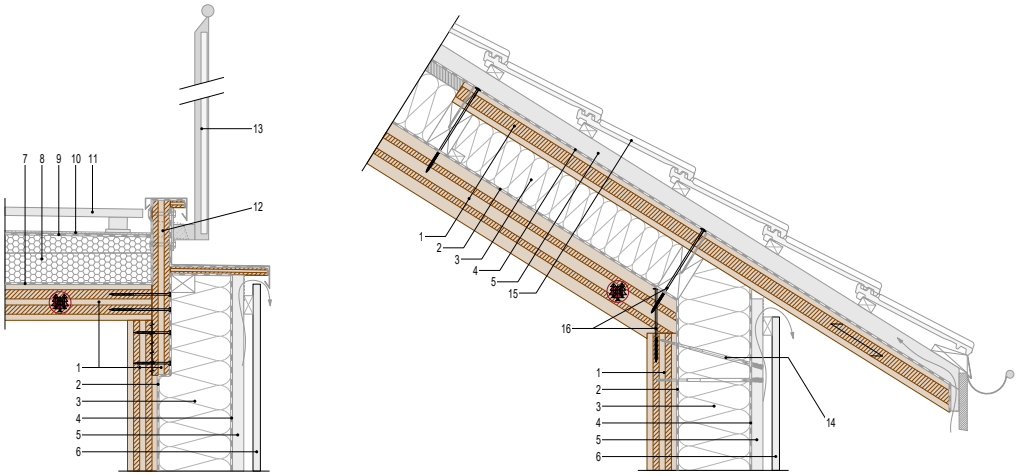
1 CLT cross laminated timber (according to statics)
2 Vapour retarder (according to building physics)
3 Insulation
4 Protection layer
5 Air gap, counter battens
6 Exterior timber cladding
(see profiles on www.schilliger.ch)
7 Connector/fastener (according to statics)
8 Waterproofing/sealing
9 Barrier layer and mortar bed
10 Perforated sheet and concrete anchors
(According to statics)
11 Flooring
12 Sill plate

WALL/FLOOR ANCHORING



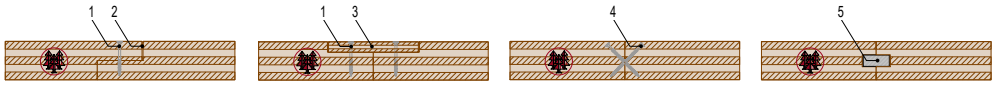
1 CLT cross laminated timber (according to statics)
2 Vapour retarder (according to building physics)
3 Insulation
4 Protection layer
5 Air gap, counter battens
6 Exterior timber cladding
(see profiles on www.schilliger.ch)
7 Connector/fastener (according to statics)
8 Fire barrier
(according to fire safety regulations)
9 Apron (horizontal fire protection measure)
10 Angle-bracket and concrete anchors
(According to statics)
11 Construction screws
12 Flooring

ROOF CONSTRUCTION DETAILS



1 CLT cross laminated timber (according to statics)
2 Vapour retarder (according to building physics)
3 Insulation
4 Protection layer
5 Air gap, counter battens
6 Exterior timber cladding
(see profiles on www.schilliger.ch)
7 Vapour retarder
8 Tapered insulation
9 Bitumen waterproofing membrane
10 Protection layer
11 Decking
12 Waier drainage
13 Railing
14 Connector/fastener (according to statics)
15 Roof cladding
16 Construction screws

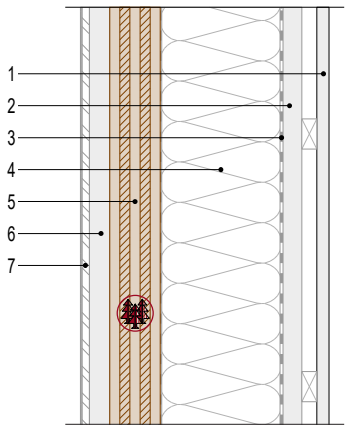
PANEL JOINTS



1 Screws (according to statics)
2 Gap (1 to 2 mm)
3 Spline
4 Double threaded screws (according to statics)
5 Internal spline

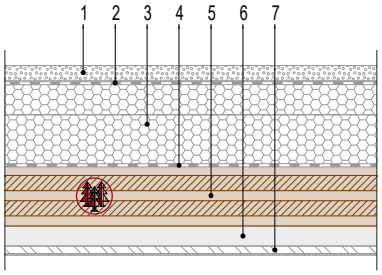
These detailed representations are for illustration purposes only and in no way replace a construction plan. Such plans should be adapted to reflect statics and building physics calculations and fire protection regulations. Please refer to the technical library at www.clt-tech.com. Our technical office will be pleased to answer any further questions you may have.

EXAMPLES OF CONSTRUCTION SOLUTIONS



		Wood fiber insulation		Glass wool		Extruded polystyrene (XPS)		
1	Cladding	20	20	20	20	20	20	mm
2	Air gap	30	30	30	30	30	30	mm
3	Protection layer	0	0	0	0	0	0	mm
4	Insulation	180	120	140	120	140	120	mm
	λ	0.042	0.042	0.035	0.035	0.035	0.035	W/(m·K)
5	CLT wall panel	80	80	80	80	80	80	mm
6	Insulation		50		50		50	mm
	λ		0.035		0.035		0.035	W/(m·K)
7	Plasterboard		13		13		13	mm
	Wall thickness	310	313	270	313	270	313	mm
	Phase shift	16	15	7.7	11	9	12	h
	U-value	0.20						W/(m²·K)

Wall with wooden cladding for various insulation solutions, with or without an internal service cavity.



		No protection		Gravel		Green roof		
1	Protection			40	40	100	100	mm
2	Sealing	5	5	5	5	5	5	mm
3	Extruded polystrene Insulation (XPS)	280	240	280	240	280	240	mm
	λ	0.035	0.035	0.035	0.035	0.035	0.035	W/(m·K)
4	Vapour barrier	0	0	0	0	0	0	mm
5	CLT roof panel	140	140	140	140	140	140	mm
6	Insulation		50		50		50	mm
	λ		0.035		0.035		0.035	W/(m·K)
7	Plasterboard		13		13		13	mm
	Roof thickness	425	448	465	488	525	548	mm
	Phase shift	15	18	16	19	15	18	h
	U-value	0.10						W/(m²·K)

Inaccessible flat roof with polystyrene insulation, with or without an internal service cavity.

Remarks:

The values have been chosen to reflect current, commonly-used construction materials, and are intended to be indicative only. In planning, it is important to consider the actual characteristics of the materials utilised.

A calculation of the U-value is not sufficient in itself; the risk of condensation must also be proofed. Depending on the climatic conditions and the components of the walls, a vapour barrier may not necessarily be required. This should be confirmed by a thermal engineering office.

All walls should be insulated: If a wall is not insulated, it will weaken the performance of the entire construction. The choice of insulation material will also impact phase shift, and thus on interior comfort in summer.

These tables are intended as an aid for the composition of the elements in a preliminary draft only, and should not in any instance replace a case-specific analysis by a professional.

OUTSTANDING ARCHITECTURE

CLT panels are ideal for complex projects, bold ideas and innovative developments.

Vidy theater, Lausanne (CH)

House La Rochette, Château-d'Oex (CH)

Stadium Yves-du-Manoir, Colombe (F)

Church tower, Bleibach (D)

St Agnes Primary School, Manchester (UK)

Waingels College, Woodley (UK).
Photo: Pierluigi Chinellato

< Palazzo Meridia, Nice (F) Photo credit: © Antoine-Duhamel-Photography

Competence and Innovation

SCHILLIGER HOLZ

SCHILLIGER HOLZ AG – VARIETY FROM A SINGLE SOURCE

Haltikon (CH)
Headquarter: Solid timber, Glulam, CLT, planed products, chips and sawdust

Küssnacht am Rigi (CH)
Wood fiber insulation products

Perlen (CH)
Solid timber

Volgelsheim (F)
Solid timber, Finger jointed solid timber, CLT, chips and sawdust

SCHILLIGER HOLZ AG
Haltikon 33
CH-6403 Küssnacht am Rigi

+41 41 854 08 00

info@schilliger.ch
www.schilliger.ch

SCHILLIGER BOIS SAS
Rue du Port Rhénan
F-68600 Volgelsheim

+33 389 72 16 00

info@schilliger.fr
www.schilliger.fr

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