Martinsons' **guide to CLT**

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Dimensionally stable, strong and easy to assemble

CLT, or cross-laminated timber, is planed spruce timber that is glued together, with each layer at right angles to the previous layer, ensuring increased dimensional stability. The result is a construction element that is transversely rigid and durable in relation to its low weight. This allows for both greater span widths and rational methods for rapid assembly. The construction properties of CLT open up the opportunity for a number of different applications.

Rational splices allow for rapid assembly and the material can be machined with traditional tools. The moisture buffering properties of CLT help achieve a good indoor climate, as well as the 'massive' design construction providing good fire resistance.

A **floor structure** in CLT panels can be supplied in wide span widths, allowing significant freedom in floorplans and the option to create large, open spaces. CLT is designed to simplify efficient assembly and can also be used as a mezzanine or detached house joist.

Walls using CLT are usually chosen for their large load-bearing and stabilizing capacity. CLT also provides good physical building properties such as sound and fire retardation. The panel's moisture buffering properties also contribute to a more even and improved indoor climate.

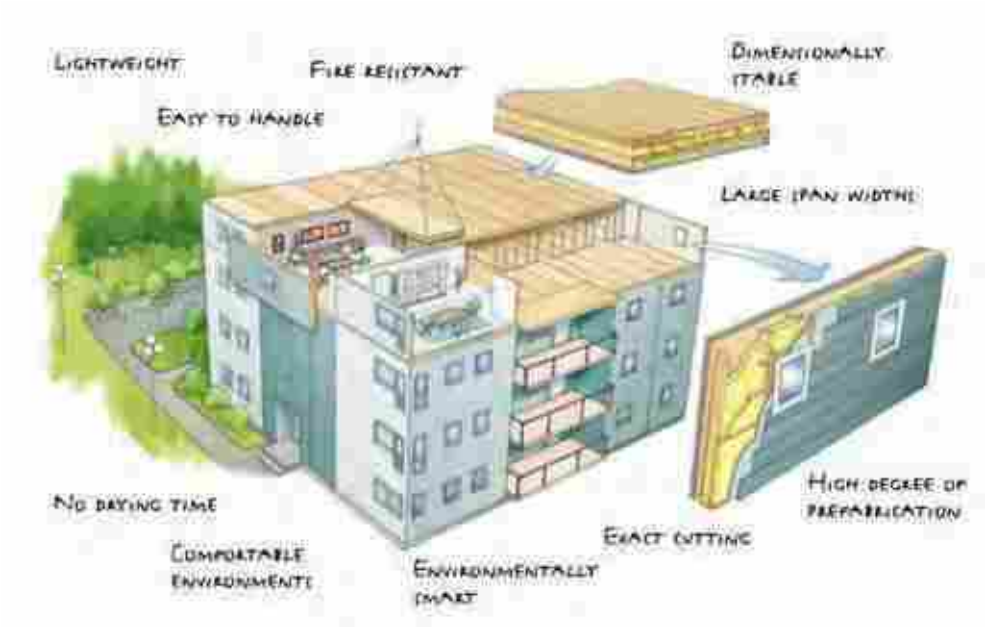
For external roofs, CLT panels can be supplied as composite elements covering a large surface area and covered with sheet metal or tiles. This roof design uses the roof as a stabilizing element, meaning that no additional stabilizing panels are needed.

External walls

Internal walls

Floor structure

External roof



Why choose CLT?

CLT is extremely easy to use Large elements and rational joists allow for rapid assembly, giving a good total cost. The material can be machined with traditional tools and is rational in terms of fixing installations. For example, on-site electricians can drill exactly the holes they need, where needed.

Lightweight material Its low weight makes it simple to make 20–30 hoists per day with a relatively small crane. Wood is around five times lighter than concrete, and therefore weighs down the building much less, which is an advantage when extra floors are added or when the ground conditions do not tolerate heavier weights.

Dimensionally stable material As the panel is cross-laminated, it retains its shape and does not move as a solid beam would do to changes in moisture levels. The structural capacity of CLT is similar to concrete in its material strength, with dimensionally stable and robust elements.

High bearing capacity and large span widths Its design means that CLT is a dimensionally stable material, offering flexible solutions with few load-bearing walls and freedom in the floorplan. Span widths of 7.7 m are achieved with one massive sheet and up to 16 m is reached by strengthening the cross-section with glulam beams.

High degree of prefabrication The panels are manufactured in elements up to 3 x 16 m. Using CNC machining allows larger cut-outs or holes to be made in the material for easier work on-site in construction.

No drying time As CLT does not need any drying time, the material can be given a surface coating directly after fitting, which achieves must better flow on the construction site. Other parts of the construction process can therefore begin much faster.

Exact cutting CLT is manufactured in a quality-assured factory setting and CNC machining allows for high precision when cutting. The level of precision in the elements saves time and allows movement in each project, without any delays in subsequent adjustments.

Comfortable internal environments As CLT comes in different surface lining classifications, from industrial to visible, there is great opportunity to create attractive environments as desired. The visible parts can be sanded, to create numerous aesthetic solutions. Thanks to its moisture buffering properties, CLT helps achieve a good indoor climate.

High fire resistance The CLT massive panels have particularly good properties in terms of burn resistance. Its 5-layer panels often achieve R60 (residential load) fire resistance without the use of plaster or other materials.

An environmentally clever choice CLT is made from renewable raw materials and is manufactured in an energy-smart process with a minimal environmental impact. The material forms a natural part of the ecological cycle, as it traps CO2 during its entire lifespan.

Atmospheric CO_2

A1: Forests trap 858 kg CO_{2B}/m^3 that is used as raw materials.

Biogenic carbon dioxide (CO_{2B})

A3: Sawmills and CLT manufacturing releases 140 kg CO_{2B}/m^3 from bio-fuels used in the whole process.

B: During the usage phase of a building, a total of 718 kg CO_{2B}/m^3 is stored - delayed emissions, a carbon dioxide sink.

C: When the product is not used and is used as fuel, the fixed carbon is release and creates 718 kg CO_{2B}/m^3 after complete combustion.

Sequestered carbon in our CLT products 718 kg CO_{2B}/m^3

Fossil fuel emissions
A 1-3 60 kg CO_2e/m^3

The forest traps carbon dioxide and stores it as carbon in the wood and in the ground.

Manufacturing CLT means releasing carbon dioxide.

CLT is a carbon sink, as it binds carbon for as long as it is in use.

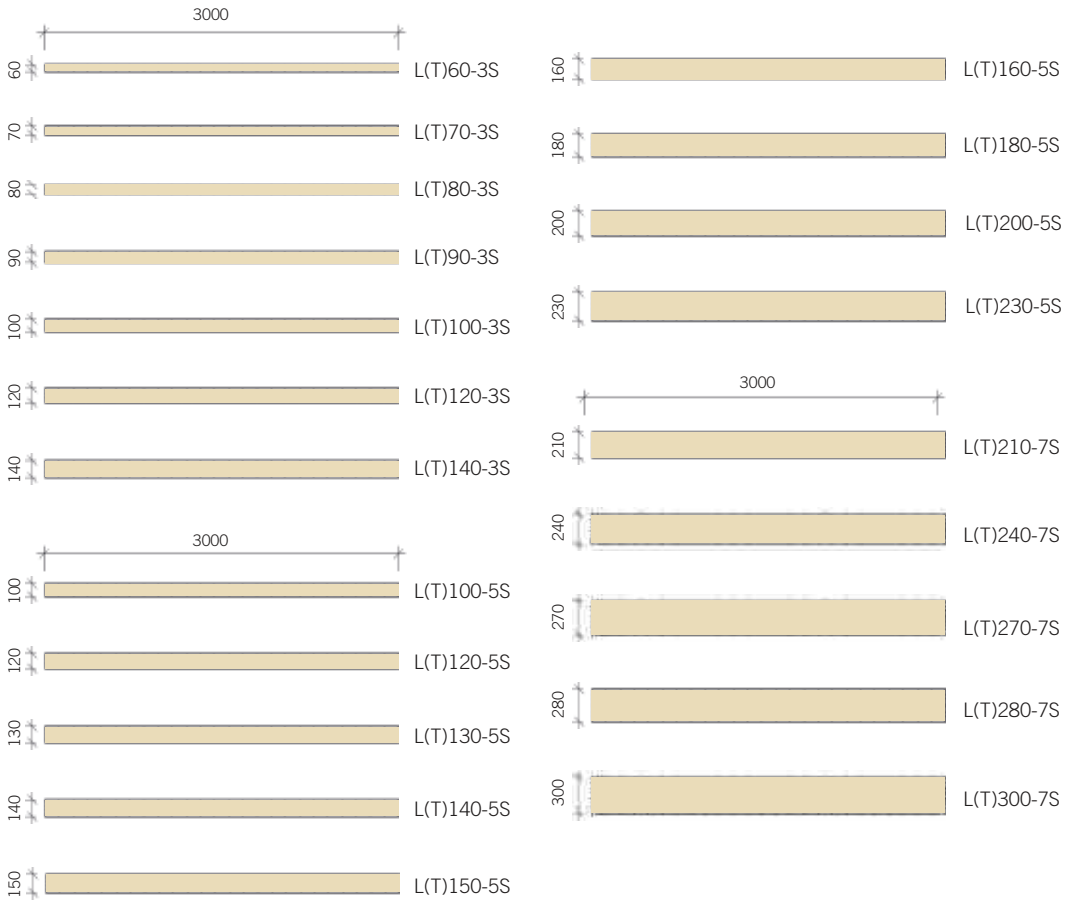
The calculations have been made by IVL Swedish Environmental Research Institute – an independent qualified environmental body.

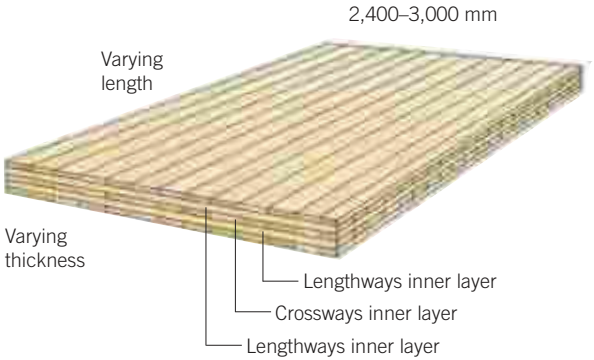
A building with 60 m^3 CLT sequesters 45 tons of carbon dioxide over its lifetime.
This is as much as a new petrol-powered car releases if it is driven 184 times from the bottom to the top of Sweden, a distance of around 1700 km.

Range

CLT is manufactured from planed quality wood from the forests of Västerbotten, and is available in different lengths up to 16 meters. The width can be anything from 2.4 m to 3.0 m. CLT either has the surface lining running lengthways (L) or crossways (C), with the latter being suitable for use in walls.

Standard thicknesses
Max. length 16 m





Thickness (mm)	Dead load[1] (kg/m²)	Number of layers	U value[2]	Constructed dimensions	Constructed raw materials classification
60	24	3	1.49	20+20+20	C24-C24-C24
70	28	3	1.33	20+30+20	C24-C14-C24
80	32	3	1.20	30+20+30	C24-C14-C24
90	36	3	1.09	30+30+30	C24-C14-C24
100	40	3	1.00	33.3+33+33	C24-C14-C24
120	48	3	0.85	40+40+40	C24-C14-C24
140	56	3	0.75	46.5+46.5+46.5	C24-C14-C24
100	40	5	1.00	20+20+20+20+20	C24-C24-C24-C24-C24
120	48	5	0.85	20+30+20+30+20	C24-C14-C24-C14-C24
130	52	5	0.80	30+20+30+20+30	C24-C14-C24-C14-C24
140	56	5	0.75	20+40+20+40+20	C24-C14-C24-C14-C24
150	60	5	0.70	30+30+30+30+30	C24-C14-C24-C14-C24
160	64	5	0.67	40+20+40+20+40	C24-C14-C24-C14-C24
180	72	5	0.60	30+45+30+45+30	C24-C14-C24-C14-C24
200	80	5	0.54	40+40+40+40+40	C24-C14-C24-C14-C24
230	92	5	0.48	46+46+46+46+46	C24-C14-C24-C14-C24
210	84	7	0.52	30+30+30+30+30+30+30	C24-C14-C24-C14-C24-C21-C24
240	96	7	0.46	45+20+45+20+45+20+45	C24-C14-C24-C14-C24-C21-C24
270	108	7	0.41	45+30+45+30+45+30+45	C24-C14-C24-C14-C24-C21-C24
280	112	7	0.40	40+40+40+40+40+40+40	C24-C14-C24-C14-C24-C21-C24
300	120	7	0.37	45+40+45+40+45+40+45	C24-C14-C24-C14-C24-C21-C24

[1] Density = 400 kg/m³ . [2] Lambda = 0.12 as per tech. approval. Rsi + Rse = 0.17.

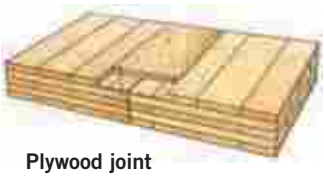
Table of span widths [1)]

Martinsons CLT panels Format: 3000 x length x thickness [mm]						
Load type[2)]		Category A (Housing) 2.0 kN/m²				Category B (Offices)
Panel[3)]	Panel dead load [kg/m²]	Max. span width[4)]	Deformation[6)]	Max. span width[5)]	Deformation[6)]	Max. span width[4)]
L60-3L	24	2.3	L/315	2.0	L/465	2.2
L70-3L	28	2.6	L/321	2.6	L/321	2.5
L80-3L	32	3.1	L/304	3.0	L/333	2.9
L90-3L	36	3.4	L/312	3.4	L/312	3.2
L100-3L	40	3.7	L/316	3.7	L/316	3.5
L120-3L	48	4.5	L/302	4.3	L/341	4.2
L140-3L	56	5.1	L/313	4.7	L/395	4.9
L100-5s	40	3.5	L/318	3.5	L/318	3.4
L120-5s	48	4.0	L/317	3.9	L/315	3.8
L130-5s	52	4.6	L/319	4.4	L/336	4.4
L140-5s	56	4.5	L/308	4.3	L/350	4.3
L150-5s	60	5.2	L/302	4.6	L/397	4.9
L160-5s	64	5.7	L/311	5.0	L/420	5.5
L180-5s	72	5.7	L/335	5.0	L/446	5.6
L200-5s	80	6.3	L/368	5.6	L/514	6.3
L230-5s	92	6.8	L/422	6.0	L/594	6.8
L210-7s	84	6.3	L/380	5.6	L/528	6.3
L240-7s	96	7.1	L/455	6.3	L/643	7.1
L270-7s	108	7.4	L/500	6.5	L/722	7.4
L280-7s	112	7.4	L/493	6.6	L/673	7.4
L300-7s	120	7.7	L/538	6.9	L/726	7.7

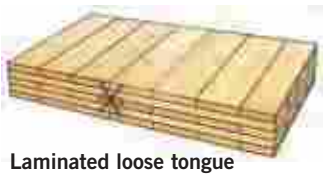
1) EKS10, SS-EN1995-1-1, Safety class 3, Climate class 1, Dead load = panel dead load + 50 kg/m²

2) Useful loads excluding movable dividing walls as per 6.3.1.2(8) i SS-EN 1991-1-1

3) 'L' = Lengthways outer layer. '60' = thickness in mm. '3L' = 3 layers.



Plywood joint

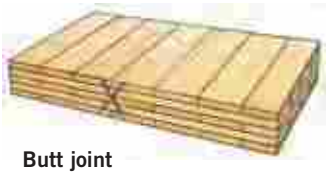


Laminated loose tongue

Visible joint

2.5 kN/m²	Category C:3 3.0 kN/m²		Category C:4 4.0 kN/m²		Category C:5 5.0 kN/m²	
Deformation[6]	Max. span width[4]	Deformation[6]	Max. span width[4]	Deformation[6]	Max. span width[4]	Deformation[6]
L/310	2.4	L/211	2.2	L/218	2.1	L/206
L/309	2.7	L/218	2.5	L/217	2.4	L/203
L/315	3.2	L/211	3.0	L/203	2.8	L/207
L/320	3.5	L/217	3.3	L/208	3.1	L/207
L/318	3.9	L/206	3.6	L/211	3.4	L/207
L/318	4.6	L/218	4.3	L/214	4.1	L/206
L/306	5.3	L/217	5.0	L/209	4.6	L/204
L/301	3.7	L/208	3.4	L/214	3.2	L/213
L/319	4.2	L/212	3.9	L/212	3.7	L/208
L/317	4.9	L/205	4.6	L/201	4.3	L/205
L/305	4.7	L/211	4.4	L/208	4.1	L/214
L/312	5.3	L/222	5.1	L/202	4.8	L/203
L/302	5.7	L/244	5.6	L/210	5.3	L/208
L/309	5.7	L/263	5.6	L/227	5.5	L/202
L/325	6.3	L/290	6.3	L/240	6.3	L/205
L/374	6.8	L/335	6.8	L/279	6.8	L/239
L/335	6.3	L/300	6.3	L/248	6.3	L/211
L/406	7.1	L/364	7.1	L/303	7.1	L/260
L/446	7.4	L/404	7.4	L/338	7.4	L/290
L/440	7.4	L/398	7.4	L/332	7.4	L/286
L/481	7.7	L/438	7.7	L/367	7.7	L/317

4) Natural frequency minimum req. ≥ 8 Hz, Flex ≤ 1.3 mm at 3.0 m floor structure width
5) Natural frequency rec. for housing ≥ 10 Hz, Flex ≤ 0.9 mm at 3.0 m floor structure width
6) Semi-permanent combination equiv. 6.16a & 6.16b (SS-EN 1990)



Butt joint

Half and half

Surface lining classifications

CLT is available in three different surface lining classifications: Visible, Industry and Inbuilt, where the end use and requirements will determine which surface lining is needed. Note that the CLT classed as Visible may also need to be polished, to remove any remaining glue.

Appearance specifications as per SS-EN 13017-1

CLT Visible
May occur A few pitch pockets under 3x40 mm. Glue caught between layers. Fresh knots permitted in unlimited quantities. Dark knots max 10 mm. Dry knots max 10 mm.

Not permitted Bark inclusion/pockets. Firm rot. Loose rot. Pith. Insect attack. Wane. Knot holes. Rotten knots. Bark ring knots.
Burls. Splits/cracks. (However, dry cracks may occur in the finished building.)

CLT Industry quality
May occur A few pitch pockets under 3x40 mm.
Fresh knots in unlimited quantities. Knot holes and burls to some extent. Dark knots max 20 mm. Dry knots max 20 mm. Pith.

Not permitted Bark inclusion/pockets. Firm rot. Loose rot. Insect attack. Wane. Rotten knots. Bark ring knots. Glue caught between layers. Cracks (However, dry cracks may occur in the finished building.) Obvious knots are resorted.

CLT Inbuilt
May occur Pitch pockets. Glue caught between layers. Color differences between layers. Knots in unlimited quantities. Knot holes. Black knots. Rotten knots. Dry knots. Bark ring knots. Burls. Splits/cracks. Bark inclusion/pockets. Bluestain. Timber bind. Pith. Insect attack.

Not permitted Firm rot. Loose rot.

Material properties

Strength classification – Characteristic values			
Soft wood		C14	C24
Strength properties (in N/mm²)			
Bending strength	$f_{m,k}$	14	24
Tensile strength, lengthways	$f_{t.0.k}$	8	14
Tensile strength, crossways	$f_{t.90.k}$	0.4	0.4
Compressive strength, length-ways	$f_{c.0.k}$	16	21
Compressive strength, crossways	$f_{c.90.k}$	2.0	2.5
Stiffness for stability calculations and load-bearing capacity (in N/mm²)			
Elasticity modulus	$E_{0.05}$	4.7	7.4
Stiffness in serviceability limit states (in N/mm²)			
Elasticity modulus, lengthways	$E_{0,mean}$	7	11
Elasticity modulus, crossways	$E_{90.mean}$	0.23	0.37
Shear modulus	$G._{mean}$	0.44	0.69
Density (in kg/m³)			
Density	Pk	290	350
Density modulus	Pmean	350	420

Sound

CLT panels can be used as framework in buildings, with in principle the same span widths and dimensions as concrete. However, the volume weight is only 1/5th of concrete and the e-modulus is more than 10 times lower. This means that sound insulation is around 15 dB less efficient for normal thicknesses between 100-250 mm. For businesses with higher sound insulation requirements than offices, the wooden framework requires additional insulation.

Sizes and terms used Sound insulation is a combined term for airborne sound insulation and footfall insulation. The requirements for airborne sound insulation are to avoid disruption and maintain confidentiality in the surroundings. The requirements for footfall sound insulation are to avoid disruption.

Airborne sound insulation has previously been stated as R'w and, specifically for housing, R'w +C 50-3150, and footfall sound insulation as L'n,w and L'n,w+CI,50-3150 respectively, plus all stated in dB. These measurements state the sound insulation for construction and in this section we relate to these magnitudes.

Table 1 states the typical values for 200 mm concrete in comparison with CLT panels.

In practice, consideration must also be given to the attachment of the construction and flanking transmission. Flanking transmission is the sound conducted by other constructions than the division between two rooms or apartments.

Sound requirements The requirements for sound insulation vary between R'w = 35 dB for offices, and up to R'w +C 50-3150 = 60 dB for housing in sound class A. For music halls, cinemas, etc, the requirements are greater. CLT can achieve sound requirements up to R'w +C 50-3150 = 60 dB.

For footfall sound insulation, the requirements vary from nothing (such as between office rooms), down to L'n,w+CI,50-3150 = 48 dB for sound class A. In some cases, such as studios, auditoriums, etc., there are greater requirements.

Table 2 states the typical sound insulation requirements for various types of buildings.

Table 1. Comparison between concrete and CLT panel

Construction	Airborne sound insulation, R'_w, dB	Footfall sound insulation, $L'_{n,w}$, dB
200 concrete panels	54	74
200 CLT panels	42	88

The table shows the sound insulation for the room division design.

Table 2. Examples of sound requirements for different usage areas

	Lowest airborne sound insulation		Highest footfall sound insulation	
	R'_w, dB	$R'_w + C_{50\text{-}3150}$, dB	$L'_{n,w}$ dB	$L'_{n,w} + C_{I,50\text{-}3150}$ dB
Offices	33	-	68	
Schools	44	-	56-58	
Hospitals	48	-	64	
Hotels	52	-	56	
Housing, BBR	-	52	-	56
Housing, class B	-	57	-	52

For the complete requirements, refer to the Swedish National Board of Housing, Building and Planning regulations (BBR), SS25267 and SS25268.

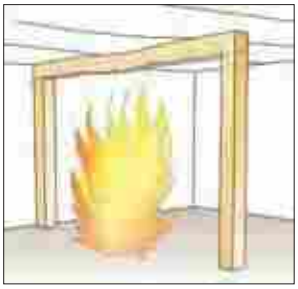
Burning behavior

CLT is often used as a framework material where there are high fire resistance requirements, such as in housing complexes over four storeys high. In the event of a fire, wooden materials will of course begin to burn, but penetration is slow, as the carbon layer that is created is heat insulating.

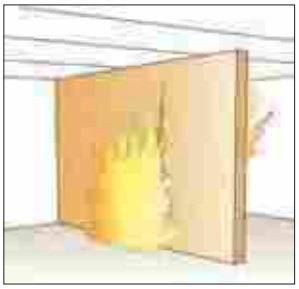
The structural engineering fire protection requirements in Sweden are formulated as requirements for a construction/building part, or for a specific fire rating for a surface lining.

Fire resistance The fire rating for bearing or dividing room elements, regardless of material, is divided according to function; load-bearing capacity (R), integrity (E, density in respect of fumes and flames), and insulation capacity (I, insulation in respect of temperature increase on the non-exposed side). Together with a time, such as 15, 30, 45, 60 or 90 minutes, the requirement for a building element can be described. The figures state the time in minutes that the building element will resist the impact from a standard fire, without losing its load-bearing or dividing function. A load-bearing dividing wall may, for example, need to meet requirement REI60, meaning that it must withstand a standard fire for one hour as per the criteria with respect to all three requirements. Here it must be noted that a building element can be exposed to fire on one side or both sides simultaneously. It is primarily the building elements that only have R requirements which must be dimensioned for multiple side fire impact.

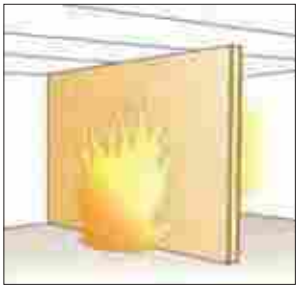
Fire rating for surface linings Surface lining is defined as the outer part of a building that can be exposed in the early stages of a fire, and surface lining classification represents the ability to prevent or delay a flashover and the creation of smoke. The surface lining classification of an untreated CLT panel meets class D-s2,d0. If a higher class is needed, the CLT panel can be painted with a specific treatment, or clad in a material with a higher surface lining classification, such as fire-protection impregnated paneling or plaster.



Load-bearing capacity R



Integrity E



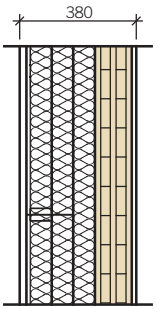
Insulation I

Fire-resistant material In the event of a fire, penetration is slow, as the carbon layer created is heat-insulating.

M walls For walls that risk being exposed to mechanical impact during a fire, the M wall is a perfect alternative. The CLT panels are both light, cost-efficient and environmentally friendly. You are welcome to contact Martinsons for more information.

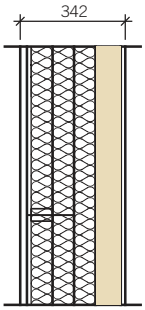
Housing construction elements

External walls



Facade cladding included
22x70 batten upright S600
Wind deflection fabric
12x70 plywood S600
Ø50x70 plastic pipe
70 insulation
45x140 joist upright S600
70+70 insulation
0.2 construction foil
120 CLT
15 fire-resistant plaster

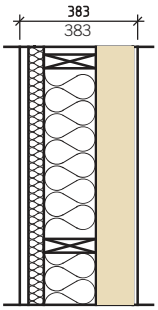
YV-16-01
Usage area:
Load-bearing and stabilizing external walls.
Fire-resistance classification: REI 90, single side fire.
Sound insulation:
With 22 mm wooden panel R'_w = 48 dB
With 10 mm fiber cement R'_w = 55 dB
U value: ~0.15 W/(m^{2}K)



Facade cladding included
22x70 batten upright S600
Wind deflection fabric
12x70 plywood S600
Ø50x70 plastic pipe
70 insulation
45x140 joist upright S600
70+70 insulation
0.2 construction foil
82 CLT
15 fire-resistant plaster

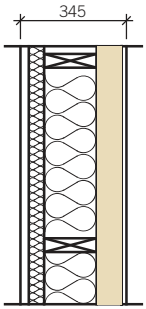
YV-16-02
Usage area:
Load-bearing and stabilizing external walls.
Fire-resistance classification: REI 60, single side fire.
Sound insulation:
With 22 mm wooden panel R'_w = 44 dB
With 10 mm fiber cement R'_w = 52 dB
U value: ~0.16 W/(m^{2}K)

External walls



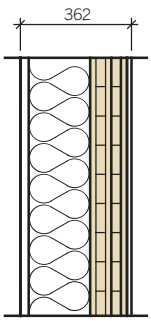
Facade cladding (not included)
28x95 batten upright S600
Wind deflection fabric
50 Västkustskiva panel
45x170 Joists horizontal S600
170 insulation
0.2 construction foil
120 CLT
15 plaster

YV-06-03
Usage area:
Load-bearing and stabilizing external walls.
Fire-resistance classification: REI 90, single side fire.
Sound insulation:
With 22 mm wooden panel R'_w = 48 dB
With 10 mm fiber cement R'_w = 55 dB
U value: ~0.15 W/(m^{2}K)



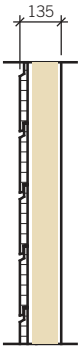
Facade cladding (not included)
28x95 batten upright S600
Wind deflection fabric
50 Västkustskiva panel
45x170 joists horizontal S600
170 insulation
0.2 construction foil
82 CLT
15 plaster

YV-06-04
Usage area:
Load-bearing and stabilizing external walls.
Fire-resistance classification: REI 60, single side fire.
Sound insulation:
With 22 mm wooden panel R'_w = 44 dB
With 10 mm fiber cement R'_w = 52 dB
U value: ~0.16 W/(m^{2}K)



Facade cladding included
27x97 LVL batten upright S600
200 hard insulation
0.2 vapor barrier
120 CLT
15 plaster

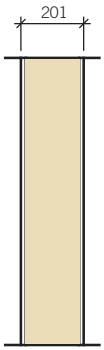
YV-22-01
Usage area:
Load-bearing and stabilizing external walls.
Fire-resistance classification: REI 90, single side fire.
Sound insulation: R'w = 52 dB
U value: ~0.15 W/(m2K)



25 laminated wooden panel
28x70 batten
82 CLT

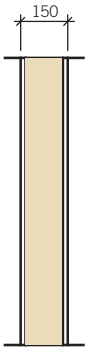
YV-23-01
Usage area:
Load-bearing and stabilizing external walls.
Fire-resistance classification: REI 15, single side fire.

Internal walls



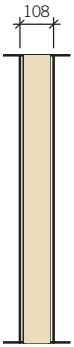
15 fire-resistant
plaster
170 CLT
15 fire-resistant
plaster

IV-03-04
Usage area:
Load-bearing and stabilizing wall within same apartment
Fire-resistance classification: REI 90, double side fire.
Sound insulation: R'_w = 43 dB



15 fire-resistant
plaster
120 CLT
15 fire-resistant
plaster

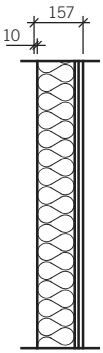
IV-03-02
Usage area:
Load-bearing and stabilizing wall within same apartment, standard, as elevator shaft wall
Fire-resistance classification: REI 90, single side fire.
Sound insulation: R'_w = 38 dB



13 plaster
82 CLT
13 plaster

IV-01-02
Usage area:
Load-bearing and stabilizing wall within same apartment.
Fire-resistance classification: -
Sound insulation: R'_w = 30 dB

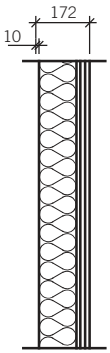
Apartment dividing wall



10 air gap
45x120 joist cc 600
120 insulation
12 construction plywood
15 fire-resistant plaster

LS-07-02
Usage area: Load-bearing, stabilizing and apartment dividing wall. Note: two LS-07-02 are needed for a complete wall.
The total thickness is 314 mm.
Fire-resistance classification: REI 60, single side fire.
Sound insulation: $R'_w + C_{50\text{-}3150} = 60$ dB

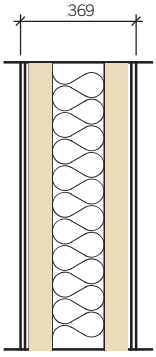
Additional: This wall can also be combined with IV-03-02 locally with elevator shafts. The total thickness for this is also 314 mm.



10 air gap
45x120 joist cc 600
120 insulation
12 construction plywood
2x15 fire-resistant plaster

LS-07-04
Usage area: Load-bearing, stabilizing and apartment dividing wall. Note: two LS-07-04 are needed for a complete wall.
The total thickness is 344 mm.
Fire-resistance classification: REI 90, single side fire.
Sound insulation: $R'_w + C_{50\text{-}3150} \geq 60$ dB

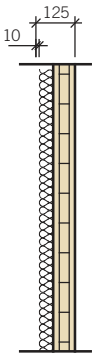
Additional: This wall can also be combined with IV-03-02 locally with elevator shafts. The total thickness for this is also 344 mm.



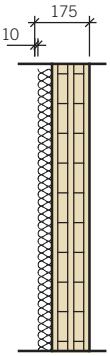
2x15 fire-resistant plaster
70 CLT
170 rockwool
70 CLT
2x15 fire-resistant plaster

LS-11-01
Usage area: Load-bearing, stabilizing and apartment dividing wall. The total thickness is 370 mm.
Fire-resistance classification: REI 60, single side fire.
Sound insulation: $R'_w + {}_{C50\text{-}3150} \geq 60$ dB

Apartment dividing wall



70 CLT (visible grain)
45 mineral wool
10 air gap

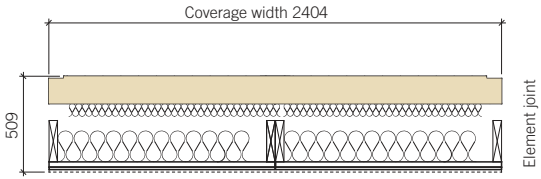


120 CLT (visible grain)
45 mineral wool
10 air gap

LS-10-02
Usage area:
Load-bearing, stabilizing and apartment dividing wall. Note: two LS-10-02 are needed for a complete wall. The total thickness is 250 mm.
Fire-resistance classification: EI 60, single side fire.
Sound insulation:
$R'_w + C_{50\text{-}3150} \geq 52$ dB
Variants: the distance between the CLT panels changed from 110 mm to:
50 mm => $R'_w + C_{50\text{-}3150} \geq 48$ dB
170 mm => $R'_w + C_{50\text{-}3150} \geq 56$ dB
200 mm => $R'_w + C_{50\text{-}3150} \geq 58$ dB

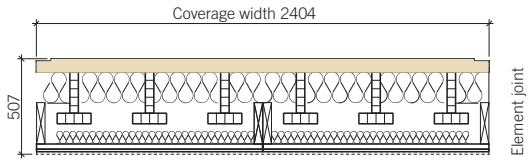
LS-10-05
Usage area: Load-bearing, stabilizing and apartment dividing wall. Note: two LS-10-05 are needed for a complete wall. The total thickness is 344 mm.
Fire-resistance classification: REI 60, single side fire.
Sound insulation:
$R'_w + C_{50\text{-}3150} \geq 55$ dB
Variants: the distance between the CLT panels changed from 110 mm to:
50 mm => $R'_w + C_{50\text{-}3150} \geq 50$dB
170 mm => $R'_w + C_{50\text{-}3150} \geq 60$ dB
200 mm => $R'_w + C_{50\text{-}3150} \geq 61$dB

Floor structure



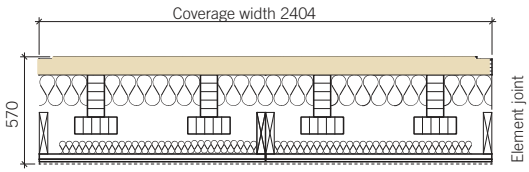
145 CLT
70 insulation
45x220 joist
170 insulation
batten 28x70 cc300
13 plaster
13 plaster (not included)

MB-02-01
Usage area:
Apartment dividing floor structure in housing
Fire-resistance classification: REI 90, single side fire.
Sound insulation:
$R'_w + C_{50\text{-}3150} \geq 56$ dB
$L'_w + C_{50\text{-}3150} \leq 54$ dB*
Span width for housing: 4.3 m



70 CLT
45x220 liv
56x180 flange
170 insulation
45x220 joist
70 insulation
batten 20x70 cc300
13 plaster
13 plaster (not included)

MBK-03-02
Usage area:
Apartment dividing floor structure in housing
Fire-resistance classification: REI 90, single side fire.
Sound insulation:
$R'_w + C_{50\text{-}3150} \geq 56$ dB
$L'_w + C_{50\text{-}3150} \leq 54$ dB*
Span width for housing: 6.5 m

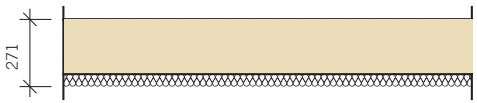


95 CLT
90x220 liv
90x225 flange
170 insulation
45x220 joist
70 insulation
batten 28x70 cc300
13 plaster
13 plaster (not included)

MBK-12-02
Usage area:
Apartment dividing floor structure in housing
Fire-resistance classification: REI 90, single side fire.
Sound insulation:
$R'_w + C_{50\text{-}3150} \geq 56$ dB
$L'_w + C_{50\text{-}3150} \leq 54$ dB*
Span width for housing: 8.5 m

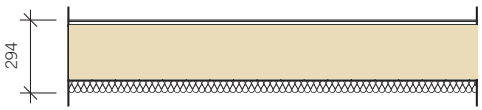
**Footfall sound value assumes an upper floor (3 mm Airolen + 14 mm parquet).*

Floor structure



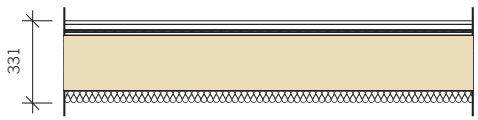
221 CLT panels
50 heavy mineral wool

MB-03-05
Usage area:
Storey separation floor structure in buildings
Fire-resistance classification: R60
Sound insulation:
R'_w = 48 dB
$L'n,_w$ =68 dB
Span width, buildings: 5.9 m (2.5 kN/m²)



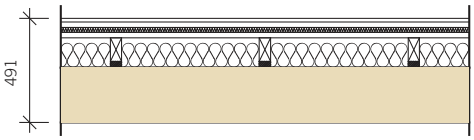
Sarlon traffic
Flooring plaster (liquid)
3 mm Airolen
221 CLT panels
50 heavy mineral wool

MB-04-05
Usage area:
Storey separation floor structure in buildings
Fire-resistance classification: R60
Sound insulation:
R'_w = 48 dB
$L'n,_w$ = 64 dB
Span width, buildings: 5.9 m (2.5 kN/m²)



15 parquet
Thick paper
22 chipboard (loose)
12 APROBO DB4
Floor plaster, screwed in
221 CLT panels
50 heavy mineral wool

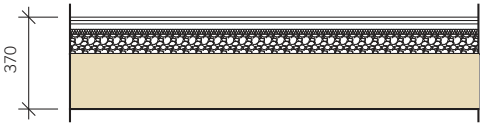
MB-05-05
Usage area:
Storey separation floor structure in buildings
Fire-resistance classification: R60
Sound insulation:
R'_w = 48 dB
$L'n,_w$ =60 dB
Span width, buildings: 5.9 m (2.5 kN/m²)



14 parquet
22 floor chipboard
20 Rockwool footfall sound damp-
ener
22 floor chipboard
95 floor joists
100 insulation
25 Sylodyn
221 CLT panels

MB-06-05

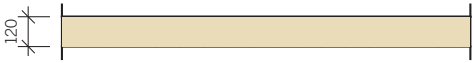
Usage area:
Storey separation floor structure in build-
ings, housing
Fire-resistance classification: R60
Sound insulation:
$R'_w \geq 52$ dB
$R'_w + C_{50\text{-}3150} \geq 48$ dB
$L'_{n,w} \leq 54$ dB
$L'_w + C_{50\text{-}3150} = 60$ dB
Span width, buildings: 5.9 m (2.5 kN/m²)



14 parquet
13 floor plaster
22 floor chipboard
20 Isover footfall sound dampener
80 washed single 8-11 mm
221 CLT panels

MB-07-05

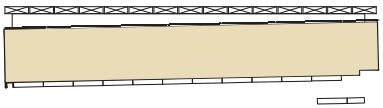
Usage area:
Storey separation floor structure in build-
ings, housing
Fire-resistance classification: R60.
Sound insulation:
$R'_w \geq 63$ dB
R'_w +C50-5000 ≥ 63 dB
$L'_{n,w} \leq 44$ dB
L'_w +C50-5000 ≤ 50 dB
Span width, buildings: 5.9 m (2.5 kN/m²)



CLT panel 100 mm
CLT panel 120 mm

CLT panel, general

Usage area:
Floor structure in same sound cell, e.g.
detached houses and holiday homes.
Fire-resistance classification:
Sound insulation:
100 mm: $R'_w \geq 33$ dB
120 mm: $R'_w \geq 35$ dB



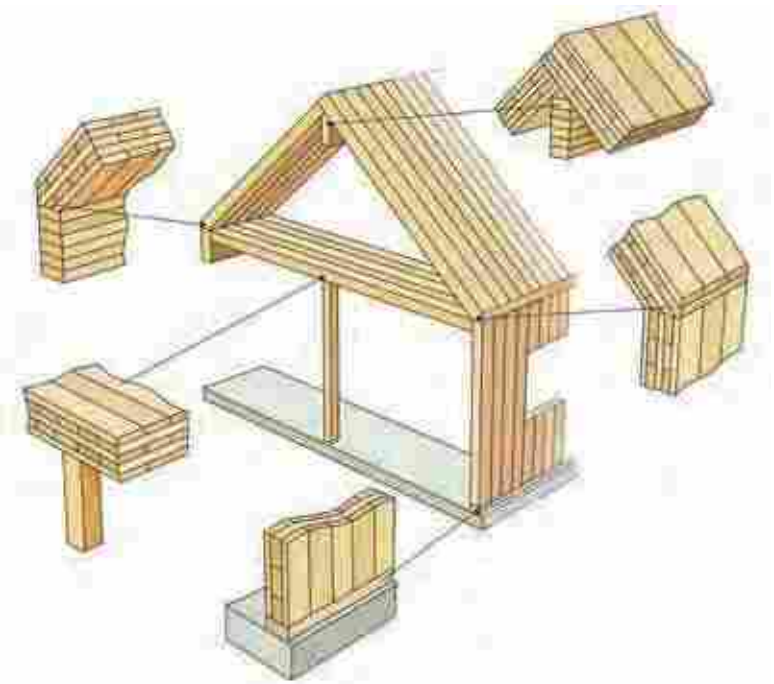
22 decking
22 decking underlay rubber cloth
208 CLT
22 fire-resistant impregnated panel

MB-10-05

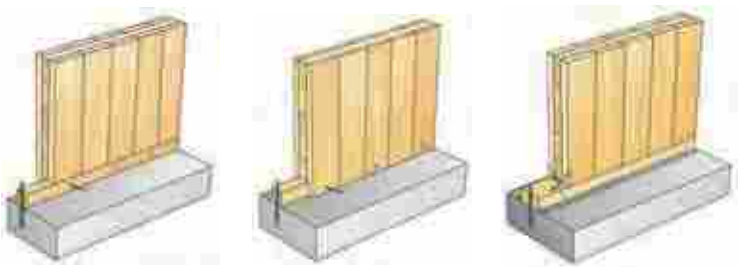
Usage area:
Balconies and loft walkways. The thick-
ness of CLT and decking can vary accord-
ing to span width and other modifications.
Fire-resistance classification: R60

Standard joins

Martinsons has created a number of proposals for standard joins for connections between floor structures, walls and ceilings. The requirements of joins varies depending on the building type and size. In the event of doubt, consult an expert to determine the correct connection between different elements.



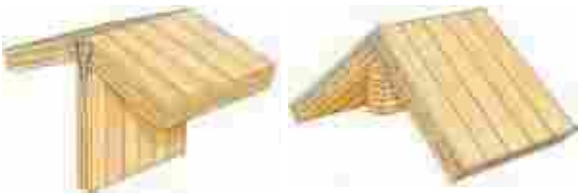
Ground fixings



Fixings of floor structures

Wall/ceiling fixings

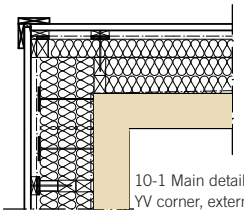
Ridge fixings



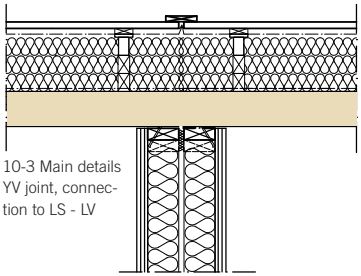
Wall connections

Below are some examples of solutions for joins that can be used to connect the various building elements of apartment buildings and premises.

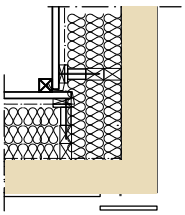
Horizontal section, apartment buildings



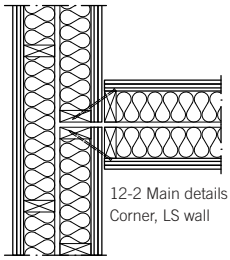
10-1 Main details
YV corner, external



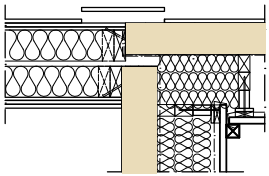
10-3 Main details
YV joint, connec-
tion to LS - LV



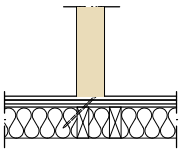
10-2 Main details
YV corner, internal



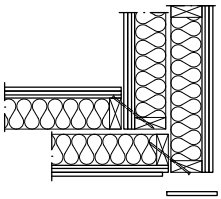
12-2 Main details
Corner, LS wall



10-4 Main details
YV corner, internal, with
connecting LS

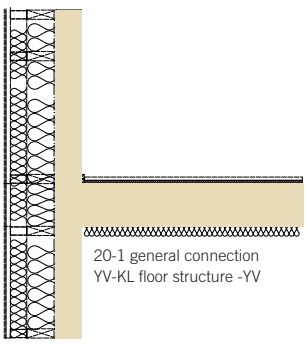


12-1 Main details
Connection LS main
partition wall

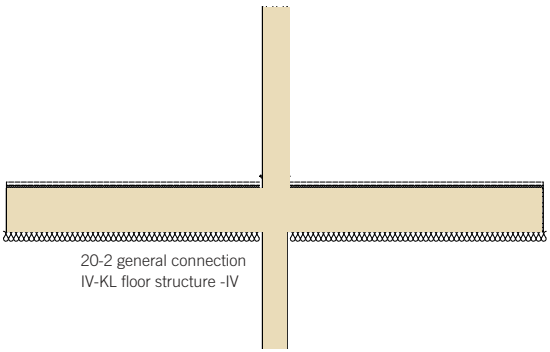


12-1 Main details
Corner, LS wall

Vertical section, buildings

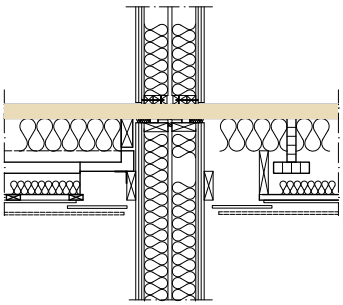


20-1 general connection
YV-KL floor structure -YV

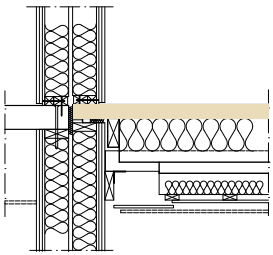


20-2 general connection
IV-KL floor structure -IV

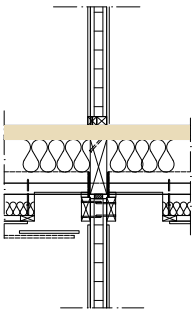
Vertical section, apartment buildings



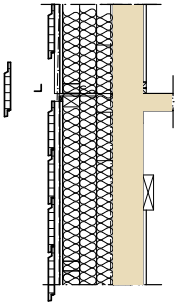
06-1 General connection
LS-MBK



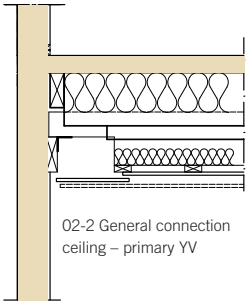
06-2 General connection
Stairwell panel cassette
in LS wall



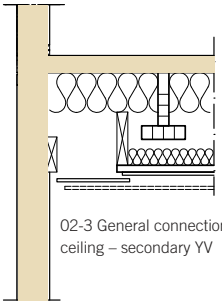
06-3 General connection
cassette floor structure
main partition wall



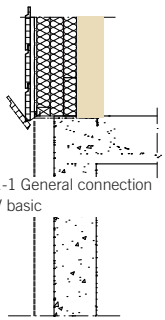
02-1 General connection,
facade
YV-MBK-YV



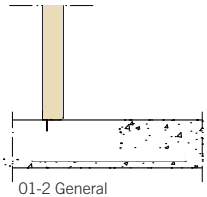
02-2 General connection
ceiling – primary YV



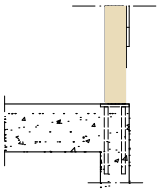
02-3 General connection
ceiling – secondary YV



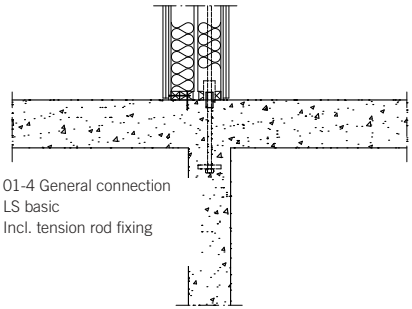
01-1 General connection
YV basic



01-2 General
connection – basic



01-3 General connection
elevator wall – basic

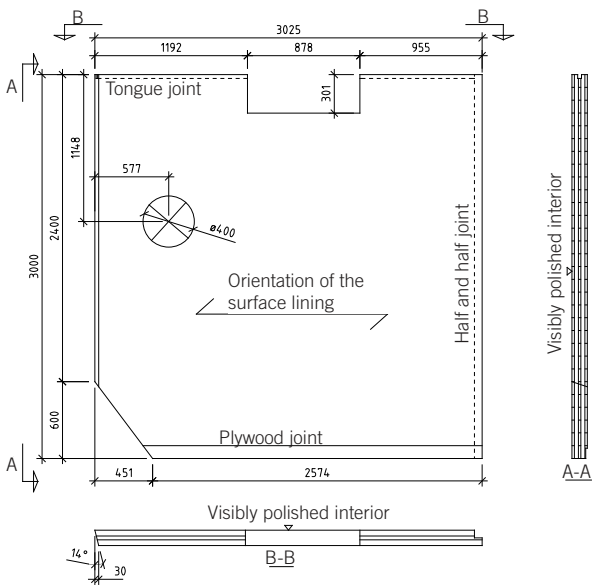


01-4 General connection
LS basic
Incl. tension rod fixing

Order documentation

When ordering CLT, it is important that the manufacturing diagrams are made according to Martinsons' standards, where the design is created yourself. In case the client does not wish to create the design themselves, Martinsons offers design and manufacturing drawings and diagrams.

Design drawing, main view



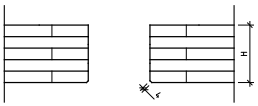
DESIGN DRAWINGS

1. All CLT panels are shown from above, as well as in cross-section from the side.
2. Always use an arrow to indicate which side is visible.
3. Dimensions and notches are measured in the X and Y axes.
4. Notches that are not at right-angles to the surface are dimensioned with angles and dimension lines.
5. Using standard joint types means they do not need to be dimensioned. (See joint types on the next page)
6. Always state the direction of the outer layers.

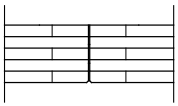
Detailed diagrams, joint types

Exploded joint | **Assembled joint**

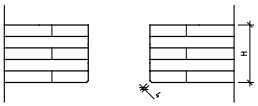
Butt joint



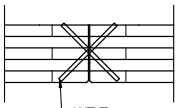
The edges are beveled on the visible side



Butt joint with screwing

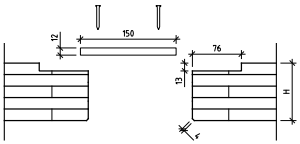


The edges are beveled on the visible side



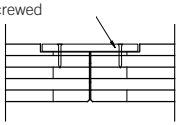
WT-T are screwed alternately

Plywood strip

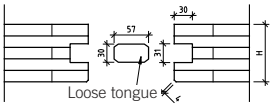


The edges are beveled on the visible side

Plywood strip 12x158 nailed/screwed



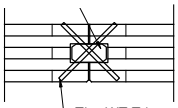
Loose tongue



Loose tongue

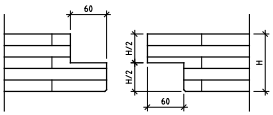
The edges are beveled on the visible side

Tongue laminated between panels



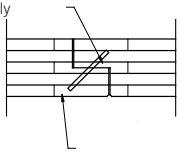
The WT-T is screwed alternately to pull together the panels

Half and half



The edges are beveled on the visible side

Joints are screwed with WT-T screws after assembly



Packaging, transport and assembly

Martinsons is happy to be given details of the assembly order, as early as possible in the process. Work in the factory can then be planned so that the elements in the CLT have the correct packaging.

Martinsons' standard is to leave 14 mm between each panel, to allow space for lifting straps. The maximum package size is 2 tons.

As standard, Martinsons always requires access for a 20 ton trailer, unless otherwise agreed. Martinsons always delivers DDP unless otherwise agreed.

When assembling several layers, the layers are laid a few cm apart from each other to make strapping easier, by pushing the strap using a crowbar. An even easier option is to fix two tension straps on the upper side to ratchet together and create tension. The tensioner is then moved to the next element.

DDP (Delivered Duty Paid)

Delivery/Receipt

Martinsons must make the goods available to the purchaser at the stated location and time or within a fixed time period. The purchaser receives the goods as soon as they are made available.

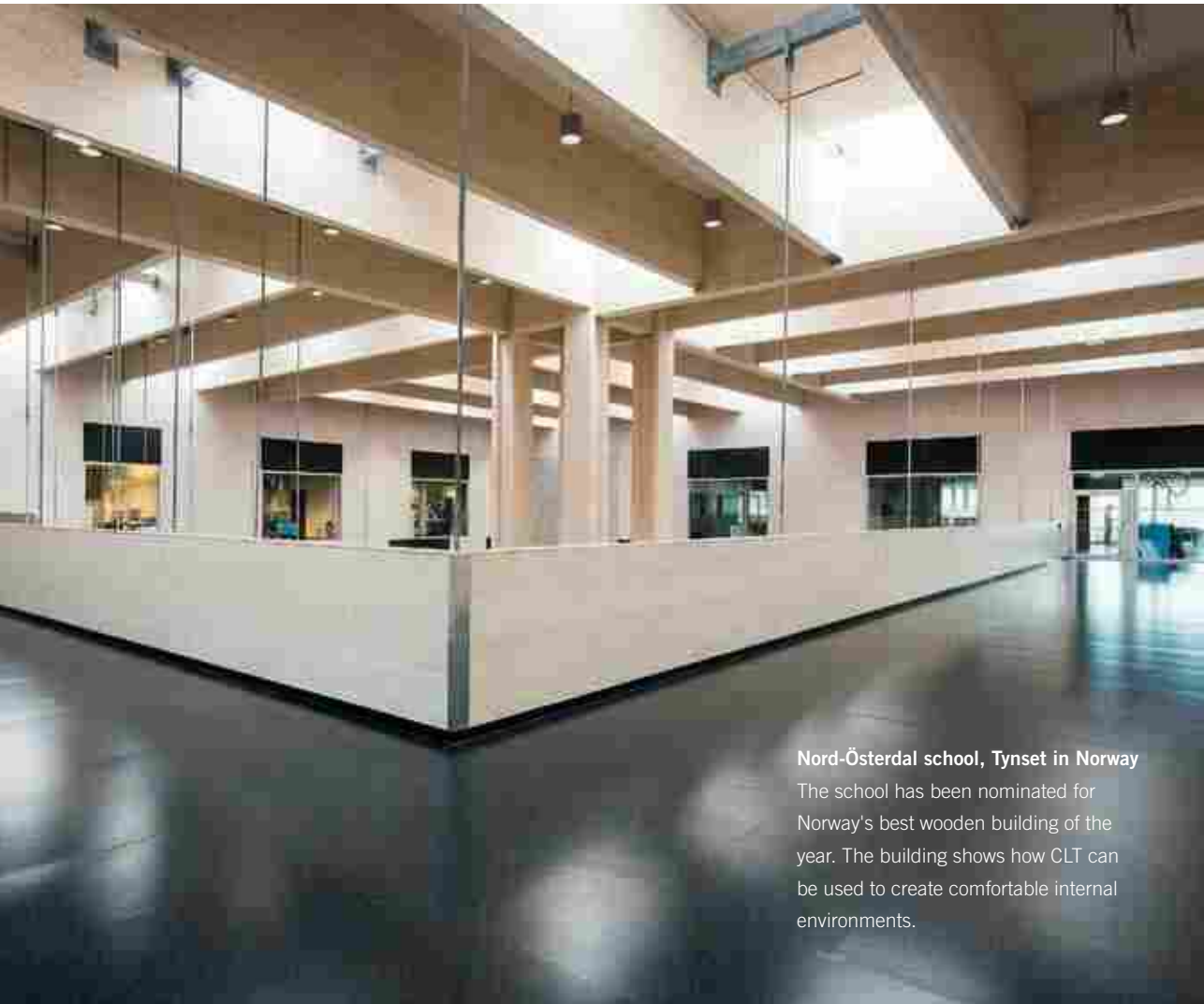
Loading/unloading

Martinsons is responsible for loading the goods. The purchaser is responsible for unloading.

Be inspired by CLT

When you build with CLT, you benefit from both practical solutions and innovative design. You can choose to have the material entirely inbuilt or leave it visible to see the natural aesthetic of the wood. Many choose to combine it with other natural materials to create an exciting juxtaposition.

Be inspired by the examples shown here. Who knows? You might find something just right for you! You are welcome to contact Martinsons if you have any queries on the possibilities and how to use CLT in the best way.



Nord-Österdal school, Tynset in Norway
The school has been nominated for Norway's best wooden building of the year. The building shows how CLT can be used to create comfortable internal environments.

Åsveien school, Norway
Visible CLT surfaces are a design detail that allows both inspiration and fascination.




Weekend cottage Fårö, Gotland

An aesthetically smart and clever structural engineering
- a quick way to use CLT in walls, ceilings and floor structures.

LEVA house factory, Gotland
In order to realize their architectural ideas, the LEVA house factory used KL-wood from Martinsons for the floors, walls and ceilings.

Sauna and boathouse
The CLT construction components make it easy for the DIY carpenter, as they are easy to work with using normal hand tools.

Apartment block
Älvsbacka strand, Skellefteå
Elements in CLT with a high degree of prefabrication form the basis of Martinsons' construction system for tall apartment blocks.

Sawmill in Bygdsiljum, Västerbotten
An aesthetically smart and clever structural engineering - a quick way to use CLT in walls.

Summit hut, Kebnekaise

Sweden's highest building has CLT in its floors, walls and roof, as the material is great at coping with extreme weather conditions.

Multi-use hall, Svenljunga
CLT walls allow for rational, efficient assembly and short build times.

Ventilation tower, Norra Länken, Stockholm

CLT panels allow for the tower's unique twisting appearance

Svartlamon nursery, Trondheim
Visible CLT surfaces create a cosy internal environment.

Embla office building, Umeå
Using CLT components in construction allows for simplified additions.

Skellefteå sports hall

CLT wall elements create ideal conditions for a great ice surface.

Strandparken, Sundbyberg
Stockholm's highest new-build apartment block in wood - an impressive sight.

Ältaberg industrial premises
CLT is an environmentally-smart choice of building material, as well as contributing to create an enjoyable atmosphere in which to conduct business.

Sätra riding school

CLT is a dimensionally stable material, and the wide range of options allows for rational construction.

Contact us

You are welcome to contact Martinsons if you have any queries on how to use CLT.
We are happy to help with both drawings and construction.

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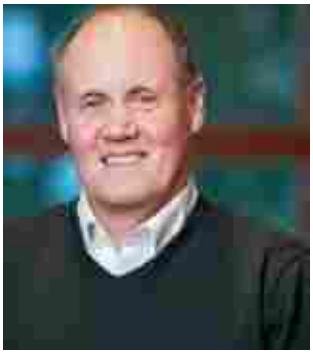

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Bygdsiljum in Västerbotten. This is where Martinsons manufactures CLT from the strong, late growth quality raw materials from the region's forests.

Martinsons in Kroksjön.

Martinsons in Hällnäs.

The family-owned company Martinsons can trace its roots back to the end of the 1920s and is today Sweden's largest producer of laminate, wooden bridges and construction systems for apartment blocks and other wooden buildings. Thanks to the development of climate neutral constructions, the group is a leader in creating a sustainable and future-proofed society. A smart use of materials and short build times has meant that Martinsons has strengthened the position of wood as a building material. The products are based on the strong, late growth quality timber from the forests of Västerbotten. Sustainable and considerate use of the forest is the basis of the company's long-term cooperation with local timber suppliers. Martinsons' premises in Bygdsiljum, Kroksjön and Hällnäs manufacture sawn and processed products for customers in the Nordic countries, Europe, Africa and Asia. The company creates a range of added values for local inhabitants, including job opportunities and significant future investments in beneficial partnerships with local entrepreneurs. The company headquarters are in Bygdsiljum, Västerbotten.

martinsons

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