

# CLT rib panel by Stora Enso

English





# Stora Enso

## The renewable materials company

Part of the bioeconomy, Stora Enso is a leading provider of renewable solutions in packaging, biomaterials, wooden constructions and paper on global markets.

We believe that everything that is made from fossil-based materials today can be made from a tree tomorrow. Our materials are renewable, reusable and recyclable, and form the building blocks for a range of innovative solutions that can help replace products based on fossil fuels and other non-renewable materials.

With carbon captured in the wood, the products offer a truly sustainable means of combating climate change.

Stora Enso products are entirely made from renewable wood, sourced from sustainably managed forests. The wood supply chains to Stora Enso's Wood Products units are covered by a third-party certified wood traceability system.



# Where structural performance meets architectural freedom

Prefabricated CLT rib panels by Stora Enso make the perfect choice for long-span structures and large open areas featuring unobstructed, column-free spaces.

Made of massive wood they are lightweight, cost competitive and environmentally sound.

Our ready-to-install CLT rib panels are powering a new wave of visionary design and bringing the forest back to the cities.

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# Key data

We offer CLT rib panels made from Cross Laminated Timber (CLT) and glue-laminated timber (glulam) by Stora Enso. Enabling long span floor and roof structures, CLT rib panels provide more flexible and attractive layouts e.g. commercial office buildings, residential construction, schools, industrial buildings, long span roofs etc.

CLT rib panels are made in a climate-controlled environment. They can be transported to the construction site just in time for assembly. You can install the CLT rib panels quickly, using regular tools and just a few carpenters.

Stora Enso's CLT rib panels are CE marked and have European technical ETA 17/0911.



Use	Floor and roof elements
Maximum dimensions*	0,8–2,45 m 6–12,0 m Ideal for spans from 6 m onwards.
Height*	220 mm to 580 mm
Certification	ETA available and CE marked. Available as PEFC™-certified upon request.
Adhesive	PUR
Surface quality	Visible / Non-visible
Service class	1 and 2 according to EN 1995-1-1
Resistance to fire	CLT rib panels can be manufactured and certified to meet fire resistance requirements from REI 30 to REI 90.

\*) Non-standard dimensions possible, subject to enquiry

## CLT by Stora Enso

Cross Laminated Timber (CLT) by Stora Enso is a massive wood construction product consisting of at least three single-layer panels that are bonded together crosswise. CLT is available in different panel thicknesses depending on your structural requirements. We currently offer dimensions up to 2,95 × 16 m.

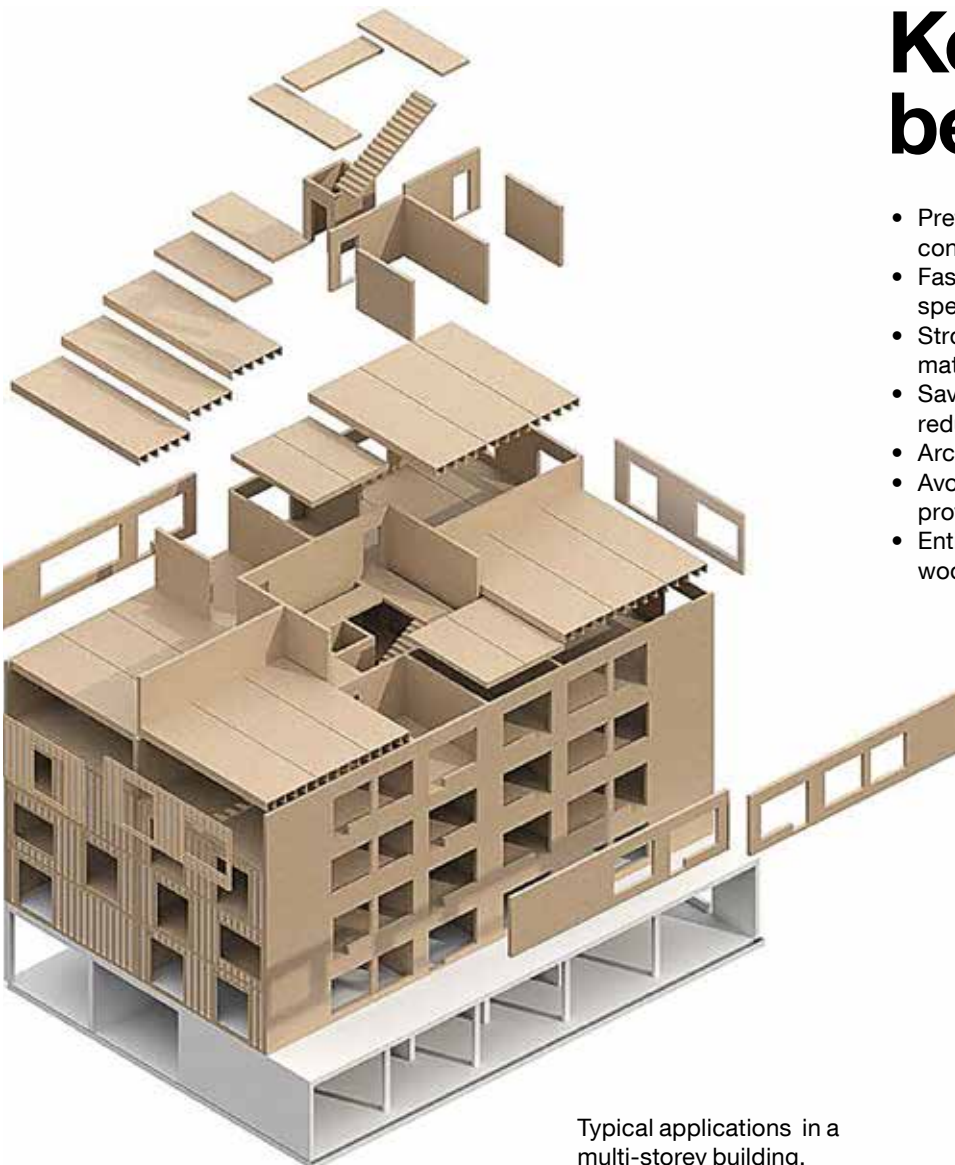
# Applications

For spans longer than 6 metres, CLT rib panels provide an effective, economical solution. They have superior strength, stability and high load-bearing capacity, at a low weight and minimum material. This provides you new possibilities in design, as well as maximum structural performance using ~45% less material.

The space between ribs can be used to route service lines or other installations. This can be ideal for public buildings that require good acoustic characteristics.

## Flexible, long span layouts for

- Commercial office buildings
- Residential buildings
- Schools
- Industrial buildings
- Long span roofs



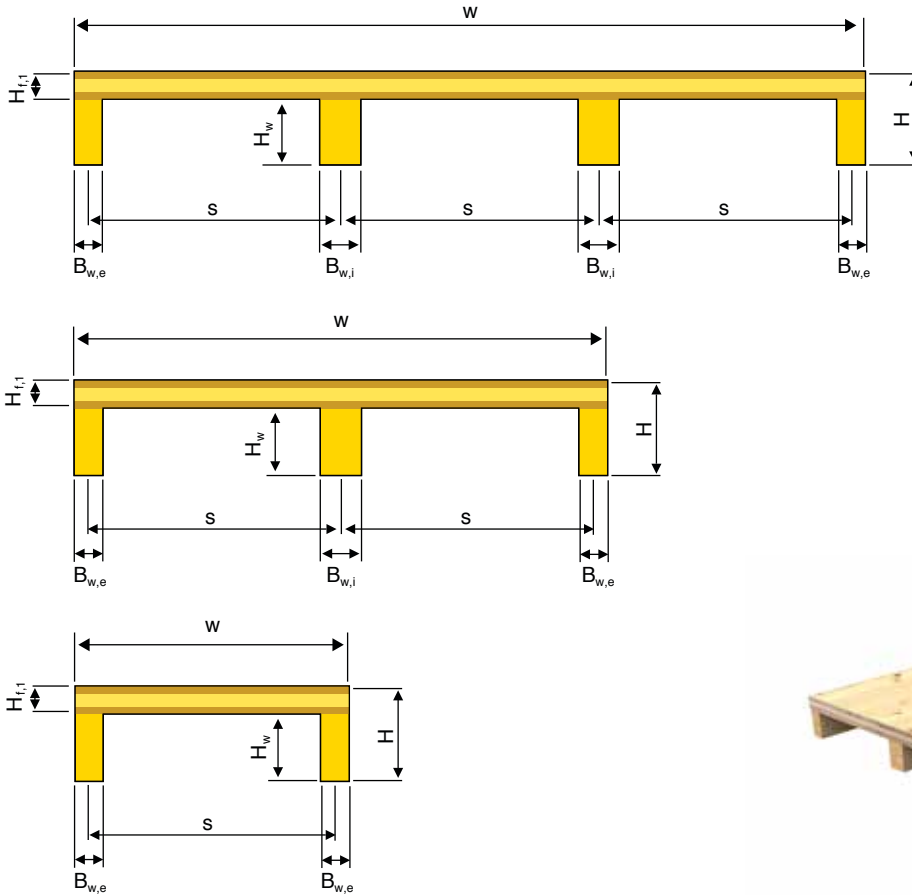
Typical applications in a multi-storey building.

## Key benefits

- Prefabrication allows faster construction and lower cost
- Fast installation, no need for special equipment
- Stronger structures with less material
- Savings in foundation costs due to reduced self-weight
- Architectural flexibility
- Avoid columns and beams to provide free space and long spans
- Entirely sourced from renewable wood

# Standard product offering

## Open rib panels

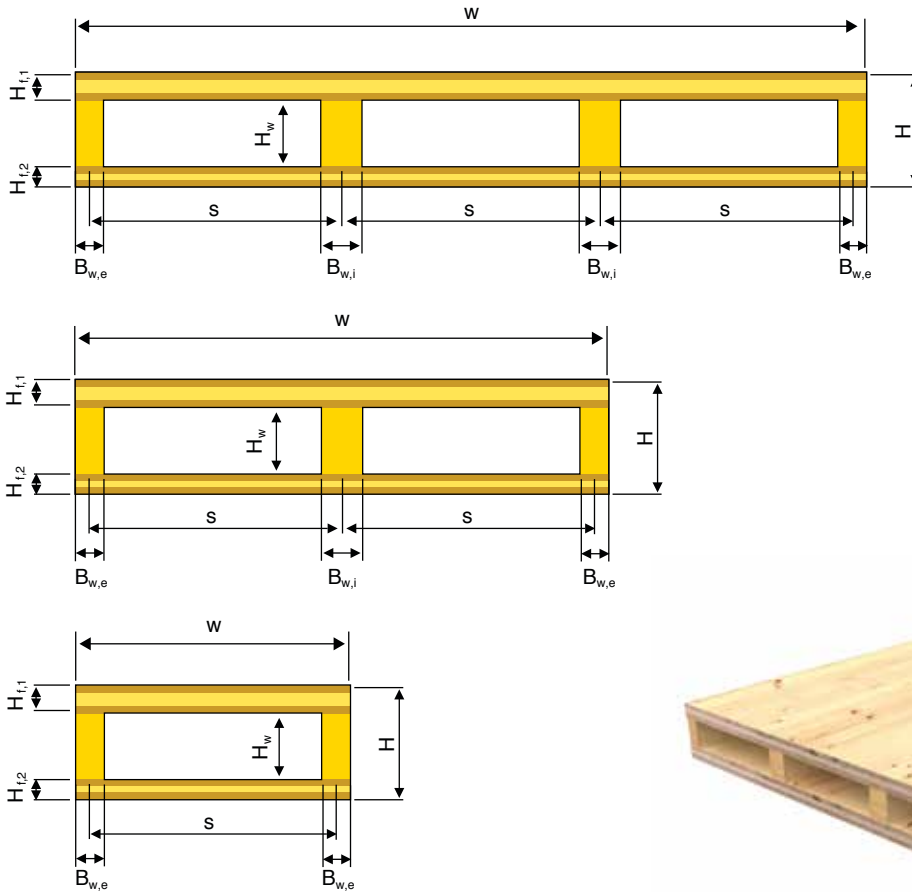


	$H_{f,1}$	$B_{w,i}$	$B_{w,e}$	$H_w$									S
				160	200	240	280	320	360	400	440	480	
R0	60 L3s	120	80	H220 60L3s	H260 60L3s	H300 60L3s	H340 60L3s						600 to 800 mm max.
	80 L3s	120	80	H240 80L3s	H280 80L3s	H320 80L3s	H360 80L3s	H400 80L3s	H440 80L3s	H480 80L3s			
	90 L3s	120	80	H250 90L3s	H290 90L3s	H330 90L3s	H370 90L3s	H410 90L3s	H450 90L3s	H490 90L3s	H530 90L3s		
	100 L3s	120	80	H260 100L3s	H300 100L3s	H340 100L3s	H380 100L3s	H420 100L3s	H460 100L3s	H500 100L3s	H540 100L3s	H580 100L3s	
	120 L3s	120	80	H280 120L3s	H320 120L3s	H360 120L3s	H400 120L3s	H440 120L3s	H480 120L3s	H520 120L3s	H560 120L3s		
R30	90 L3s	120	100	H250 90L3s	H290 90L3s	H330 90L3s	H370 90L3s	H410 90L3s	H450 90L3s	H490 90L3s	H530 90L3s		400 to 600 mm max.
	100 L3s	120	100	H260 100L3s	H300 100L3s	H340 100L3s	H380 100L3s	H420 100L3s	H460 100L3s	H500 100L3s	H540 100L3s	H580 100L3s	
	120 L3s	120	100	H280 120L3s	H320 120L3s	H360 120L3s	H400 120L3s	H440 120L3s	H480 120L3s	H520 120L3s	H560 120L3s		
R60	100 L5s	200 <sup>1</sup>	140		H300 100L5s	H340 100L5s	H380 100L5s	H420 100L5s	H460 100L5s	H500 100L5s	H540 100L5s	H580 100L5s	400 to 600 mm max.
	120 L5s	200 <sup>1</sup>	140		H320 120L5s	H360 120L5s	H400 120L5s	H440 120L5s	H480 120L5s	H520 120L5s	H560 120L5s		
	140 L5s	200 <sup>1</sup>	140		H340 140L5s	H380 140L5s	H420 140L5s	H460 140L5s	H500 140L5s	H540 140L5s	H580 140L5s		

1) Screws to be staggered in 2 rows

Note: R30 and R60 structural adequacy should be determined by the project structural engineer. The CLT thickness, rib height and rib width, noted in the standard product range represent the minimum sizes.

## Closed rib panels

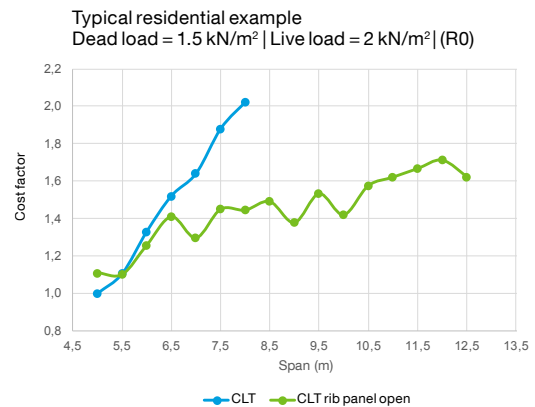


	H <sub>f,1</sub>	H <sub>f,2</sub>	B <sub>w,i</sub>	B <sub>w,e</sub>	H <sub>w</sub>							S
					160	200	240	280	320	360	400	
R0	60 L3s	60 L3s	120	80	H280 60L3s	H320 60L3s	H360 60L3s	H400 60L3s				600 to 800 mm max.
	80 L3s	60 L3s	120	80	H300 80L3s	H340 80L3s	H380 80L3s	H420 80L3s	H460 80L3s	H500 80L3s	H540 80L3s	
	90 L3s	60 L3s	120	80	H310 90L3s	H350 90L3s	H390 90L3s	H430 90L3s	H470 90L3s	H510 90L3s	H550 90L3s	
	100 L3s	60 L3s	120	80	H320 100L3s	H360 100L3s	H400 100L3s	H440 100L3s	H480 100L3s	H520 100L3s	H560 100L3s	
	120 L3s	60 L3s	120	80	H340 120L3s	H380 120L3s	H420 120L3s	H460 120L3s	H500 120L3s	H540 120L3s	H580 120L3s	
R60	60 L3s	80 L3s	120	80	H300 60L3s	H340 60L3s	H380 60L3s	H420 60L3s				400 to 600 mm max.
	80 L3s	80 L3s	120	80	H320 80L3s	H360 80L3s	H400 80L3s	H440 80L3s	H480 80L3s	H520 80L3s	H560 80L3s	
	90 L3s	80 L3s	120	80	H330 90L3s	H370 90L3s	H410 90L3s	H450 90L3s	H490 90L3s	H530 90L3s	H570 90L3s	
	100 L3s	80 L3s	120	80	H340 100L3s	H380 100L3s	H420 100L3s	H460 100L3s	H500 100L3s	H540 100L3s	H580 100L3s	
	120 L3s	80 L3s	120	80	H360 120L3s	H400 120L3s	H440 120L3s	H480 120L3s	H520 120L3s	H560 120L3s		

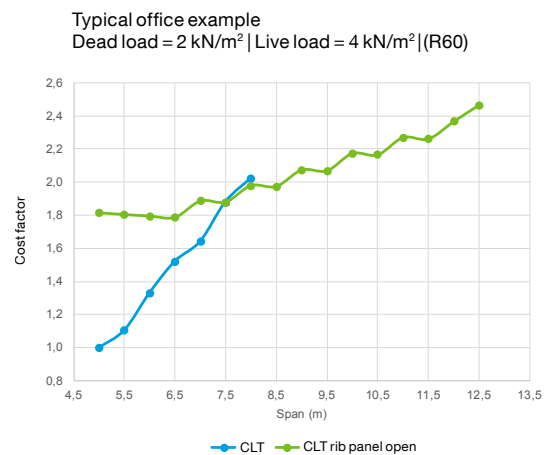
Note: R30 and R60 structural adequacy should be determined by the project structural engineer. The CLT thickness, rib height and rib width, noted in the standard product range represent the minimum sizes.

# Comparison to CLT

At longer spans, CLT rib panels have a significant advantage in cost over other wooden floor types. By choosing a rib panel, a row of columns and beams can easily be omitted, increasing open plan space and making the layout more flexible.



In residential buildings, CLT rib panels are competitive from approximately 5,5 m onwards, including transport



In office buildings, CLT rib panels are competitive from approximately 7,5 m onwards, including transport



The structural grid will impact the extent of open-plan lettable floor space and spans will typically fall into a range between 6 m and 12 m, with over 8m spans being very common in commercial office schemes.

### **CLT panels (6m + 3m + 6m)**



### **CLT rib panels (9m + 6m)**



# Economic benefits

## Reduced number of elements means efficient construction programme

Because CLT rib panels are prefabricated and lightweight, a quicker work flow is possible from delivery to assembly compared to other construction methods. No forming or curing time, no special equipment needed, reducing the noise and dust pollution normally associated with construction using non-renewable materials.

It is important to maintain the speed of construction as the frame will be on a project's critical path, so the allowance for sufficient craneage is paramount, coupled with the careful planning of deliveries and the time connected to the crane.

Installation rates are dominated by hook time. Fewer pieces to install will reduce the construction programme, and therefore savings in e.g. preliminaries. Also other construction activities can be therefore started earlier.

Long span floors with CLT rib panel can reduce the number of components to be installed by up to 20–30% keeping the construction costs down.

## CLT rib panels are a good solution in challenging ground conditions

While a long span layout may have a higher overall frame cost, there are usually efficiencies in other areas of the construction, that can compensate for this and bring savings in total costs.

In poor soil conditions, a reduced loading from lower self-weight will help, to keep foundation works to a minimum. The capability of CLT rib panels, spanning over long distances, will increase the foundation grid and therefore reduce the total foundation cost.

Thanks to low self-weight and good spanning capability of CLT rib panels, fewer load-bearing walls or columns are required, resulting in direct savings in foundation costs. The good spanning capability is also a benefit for buildings with car parks or other similar spaces impacting the (usually wider) column spacing above.

## Increased open-plan lettable space

Long span CLT rib panels enable more flexible and attractive layouts e.g. office buildings. This gives more freedom in later layout modifications during building lifetime.



# Production

## **Stora Enso's Wood Products division provides versatile wood-based solutions for building and construction.**

The ribs are glued to the CLT panels using scientifically proven methods, that were established together with several research facilities across Europe.

The pressure to the glue line will be applied by means of a screw glue application. While the screws will remain in the rib panels, they will not transfer any load in the regular service state. However they become essential for fire design.

To ensure a proper quality in the structural glue line between rib and CLT, small samples are drawn from the CLT rib panel. That happens in a way, so the sampling location will not be visible when installed.

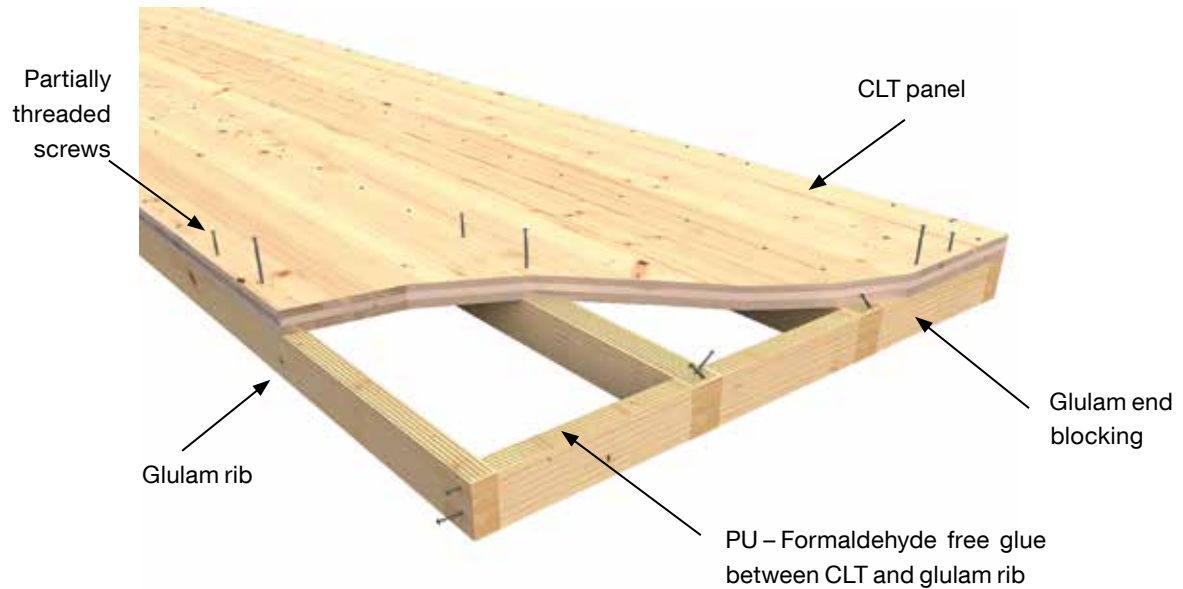
CLT rib panels are produced in Stora Enso's Ybbs mill in Austria.





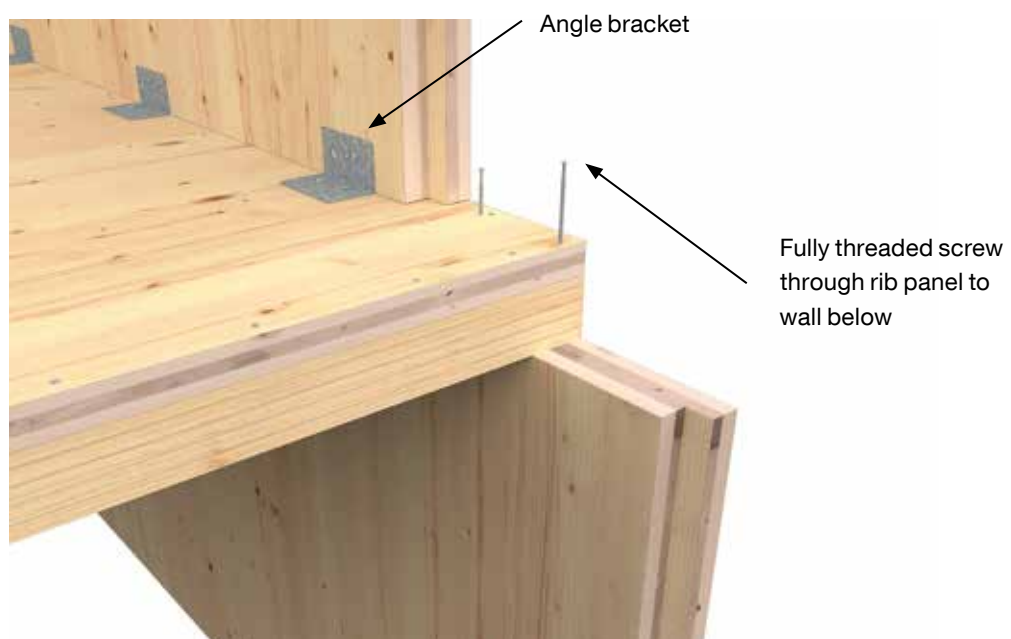
# Typical connection details

## Rib panel construction



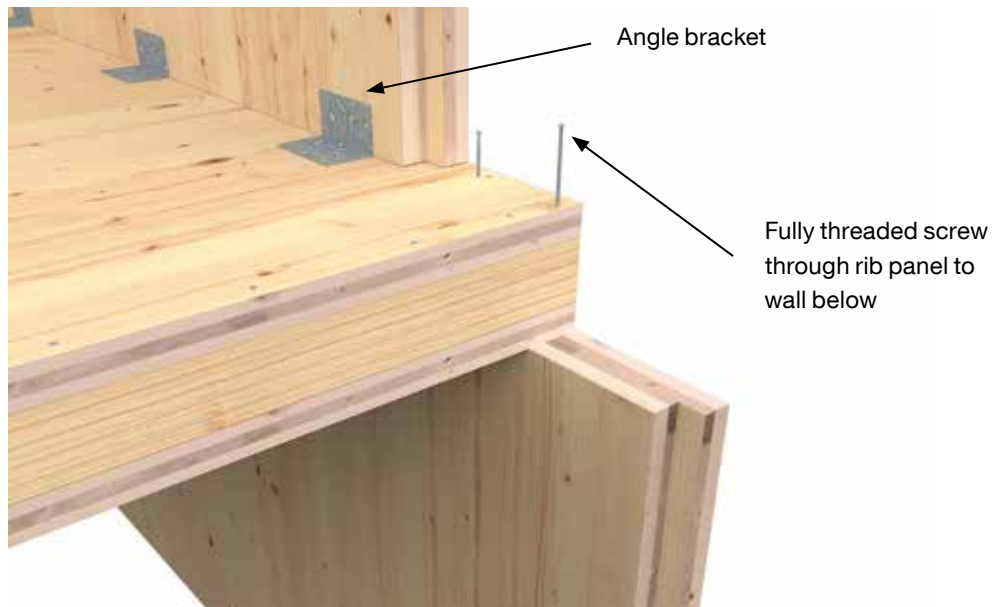
Sacrificial screws used to hold elements in place while glue cures.

## Rib panel to CLT walls

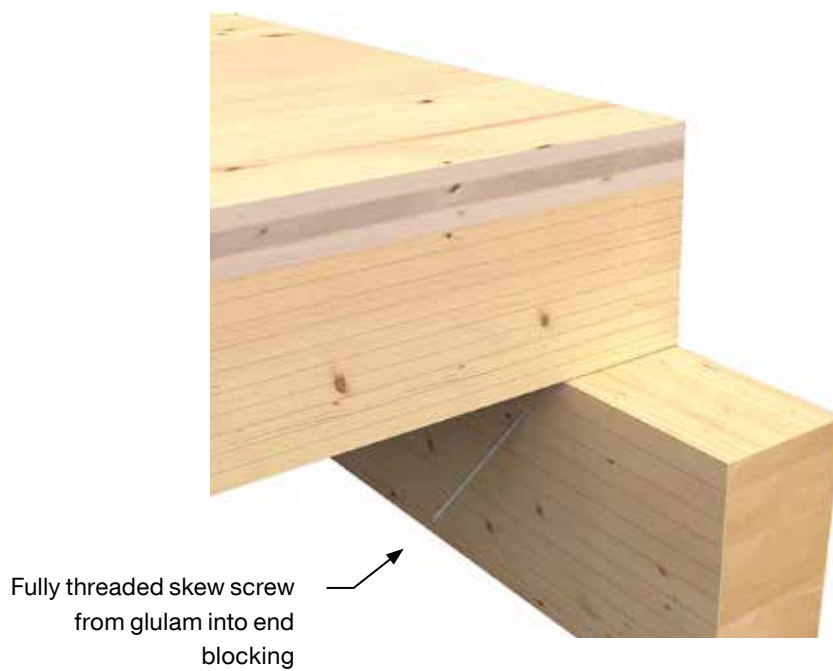




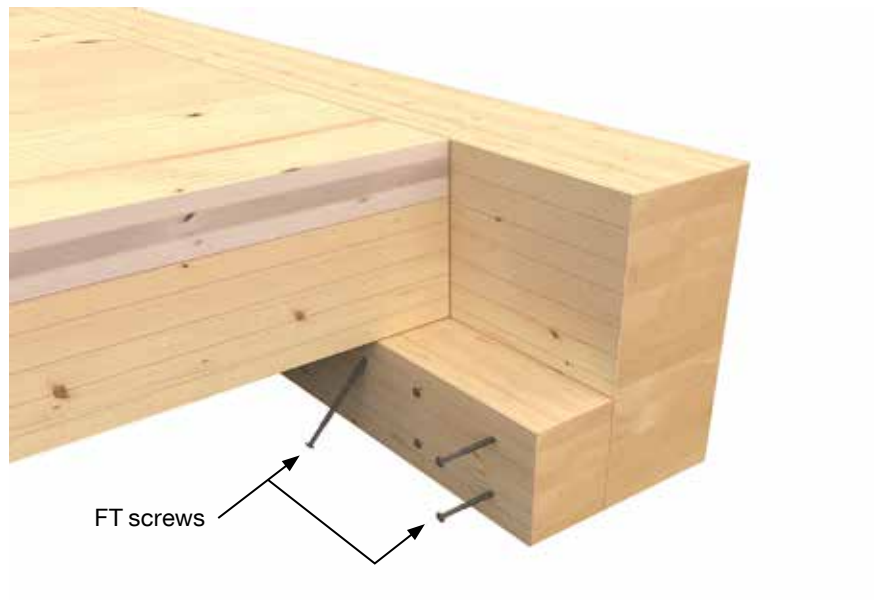
## Closed rib panel to CLT walls



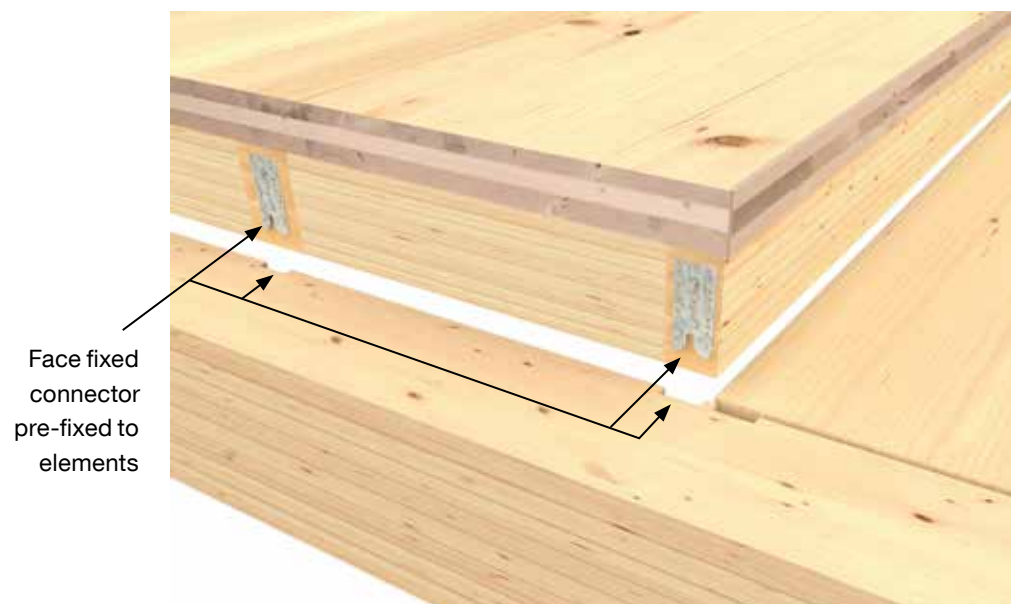
## Rib panel to glulam beam



## Rib panel to glulam beam – bearing block



## Rib panel to glulam beam





# BIM Toolbox

**To support building professionals, Stora Enso brings the building components to every architect and engineer's desktops.**

Stora Enso's product information is now available as BIM objects.

Designers can find CLT and CLT rib elements as BIM objects (currently only for Revit), and many structural details in DWG and PDF format.

The structure types and construction details are easy to find with a customised interface by clicking a specific part in the example building.

ProdLib users need to download the product library first and after that the Stora Enso's building components and systems are easily available and continuously updated. Revit users get the BIM objects directly in their own software by clicking the Stora Enso icon.





# Calculatis by Stora Enso

**Stora Enso provides an efficient, state of the art design tool for engineers. Calculatis is a single member design program that can analyse structural elements in LVL, CLT, glued laminated timber and classic sawn products.**

Calculatis now includes design modules for our new CLT rib panels, according to ETA-17/0911. Together with the other modules, all required design steps in timber construction can be done using Calculatis.

The software is available in 6 different languages. Output files (PDF) can be created in each of these languages, independent from the operating language.

Calculatis is independent from any operating system and can be used on desktop, laptop, or tablet computers. It can be used through your web browser.

The software is being developed, updated and maintained on a continuous basis.

Simply register in order to be granted access by Stora Enso at [www.storaenso.com/calculatis](http://www.storaenso.com/calculatis)

Ultimate limit state (ULS) - design results (21.74)

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General design

field	dist.	$f_{yk}$	$f_{yk}$	$f_{yk}$	$T_{yk}$	$R_{yk}$	$R_{yk}$	$f_{yk}$	$f_{yk}$	$M_{yk}$	$M_{yk}$	$N_{yk}$	$N_{yk}$	$M_{yk}$	$N_{yk}$	$M_{yk}$	$N_{yk}$	utilization
	[m]	[N/mm <sup>2</sup> ]	[N/mm <sup>2</sup> ]	[N/mm <sup>2</sup> ]	[t]	[t]	[N/mm <sup>2</sup> ]	[N/mm <sup>2</sup> ]	[N/mm <sup>2</sup> ]	[N/mm <sup>2</sup> ]	[N/mm <sup>2</sup> ]	[N/mm <sup>2</sup> ]	[N/mm <sup>2</sup> ]	[N/mm <sup>2</sup> ]	[N/mm <sup>2</sup> ]	[N/mm <sup>2</sup> ]	[N/mm <sup>2</sup> ]	[N/mm <sup>2</sup> ]
1	1.0	44.00	35.00	33.00	1.20	0.80	1.00	31.17	23.33	24.90	6.03	0.00	0.00	0.00	9.79	0.00	0.00	31 %

shear analysis

field	dist.	$f_{yk}$	$T_{yk}$	$R_{yk}$	$f_{yk}$	$V_k$	$\tau_{yk}$	utilization
	[m]	[N/mm <sup>2</sup> ]	[t]	[t]	[N/mm <sup>2</sup> ]	[kN]	[N/mm <sup>2</sup> ]	
1	0.2	4.50	1.20	0.80	2.73	10.44	0.76	25 %

buckling design

field	dist.	$f_{yk}$	$f_{yk}$	$T_{yk}$	$R_{yk}$	$R_{yk}$	$R_{yk}$	$f_{yk}$	$f_{yk}$	$f_{yk}$	$f_{yk}$	$f_{yk}$	$f_{yk}$	$f_{yk}$	$f_{yk}$	$f_{yk}$
	[m]	[N/mm <sup>2</sup> ]	[N/mm <sup>2</sup> ]	[t]	[t]	[t]	[t]	[t]	[t]	[t]	[t]	[t]	[t]	[t]	[t]	[t]
1	1.0	44.00	35.00	1.20	0.80	1.00	1.00	2.000	1.000	35	35	0.61	0.61	0.61	0.61	0.61

field	dist.	$f_{yk}$	$f_{yk}$	$R_{yk}$	$R_{yk}$	$f_{yk}$	$f_{yk}$	$M_{yk}$	$M_{yk}$	$M_{yk}$	$M_{yk}$	$M_{yk}$	$M_{yk}$	utilization
	[m]	[t]	[t]	[t]	[t]	[N/mm <sup>2</sup> ]	[N/mm <sup>2</sup> ]	[N/mm <sup>2</sup> ]	[N/mm <sup>2</sup> ]	[N/mm <sup>2</sup> ]	[N/mm <sup>2</sup> ]	[N/mm <sup>2</sup> ]	[N/mm <sup>2</sup> ]	
1	1.0	0.70	0.70	0.96	0.96	31.17	23.33	6.03	0.00	0.00	0.00	9.79	0.00	31 %

lateral torsional buckling design

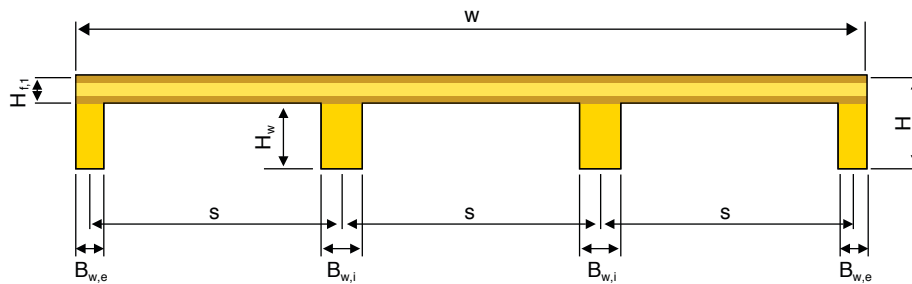
field	dist.	$f_{yk}$	$f_{yk}$	$T_{yk}$	$R_{yk}$	$R_{yk}$	$f_{yk}$	$f_{yk}$	$f_{yk}$	$f_{yk}$	$f_{yk}$	$f_{yk}$	$f_{yk}$	$f_{yk}$	$f_{yk}$	$f_{yk}$
	[m]	[N/mm <sup>2</sup> ]	[N/mm <sup>2</sup> ]	[t]	[t]	[t]	[m]	[m]	[t]	[t]	[t]	[t]	[t]	[t]	[t]	[t]
1	1.0	44.00	35.00	1.20	0.80	1.00	1.000	1.000	17	0.30	0.40	0.1	0.35	1.00	1.00	1.00

# Span tables

## CLT rib panel open, single span, R0

### Preliminary design tables

The design tables below are intended as an aid for the preliminary design but are not a substitute for a full structural design.



Product designation										
CLT panel		Rib height								
		160	200	240	280	320	360	400	440	480
R0	60L3s	H220 60L3s	H260 60L3s	H300 60L3s	H340 60L3s					
	80L3s	H240 80L3s	H280 80L3s	H320 80L3s	H360 80L3s	H400 80L3s	H440 80L3s	H480 80L3s		
	90L3s	H250 90L3s	H290 90L3s	H330 90L3s	H370 90L3s	H410 90L3s	H450 90L3s	H490 90L3s	H530 90L3s	
	100L3s	H260 100L3s	H300 100L3s	H340 100L3s	H380 100L3s	H420 100L3s	H460 100L3s	H500 100L3s	H540 100L3s	H580 100L3s
	120L3s	H280 120L3s	H320 120L3s	H360 120L3s	H400 120L3s	H440 120L3s	H480 120L3s	H520 120L3s	H560 120L3s	

Fire governing

Vibration governing

Connector: Rothoblaas TBS 8/200, or equivalent  
 $K_{ser} = 2993,89 \text{ N/mm}$

### Design boundary conditions:

#### a. Initial deflection

$$w_{inst} < L/300$$

#### b. Net final deflection

$$w_{net,fin} < L/250$$

#### c. Final deflection

$$w_{fin} < L/150$$

#### d. Single span system

#### e. Service class 1

#### f. Imposed live load

category A ( $\Psi_0 = 0.7$ ;  $\Psi_1 = 0.5$ ;  $\Psi_2 = 0.3$ )

category B ( $\Psi_0 = 0.7$ ;  $\Psi_1 = 0.5$ ;  $\Psi_2 = 0.3$ )

#### g. Vibration

Vibration in accordance with ÖNORM B 1995-1-1 (2014)

Category A: floor class II

Category B: floor class I

Screed = 6 cm

$E = 26,000 \text{ N/mm}^2$

Damping coeff  $\zeta = 4\%$

Flexural rigidity in cross dir.:  $0,468 \text{ [MNm}^2/\text{m]}$

#### h. Ribs geometry

$B_{w,i} = 120 \text{ mm}$

$B_{w,e} = 80 \text{ mm}$

The CLT rib panel self-weight is already taken into account in the table with density of CLT and GL.

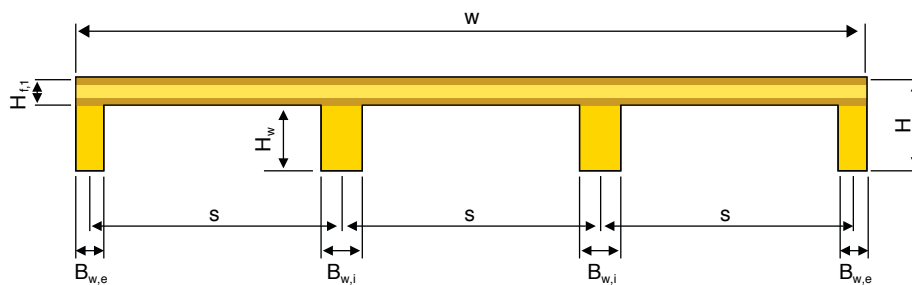
Category	Char. dead load $g_k$ Char. live load $q_k$ Spacing between ribs [mm]		(B <sub>w,i</sub> = 120 mm & B <sub>w,e</sub> = 80 mm) Total height H and CLT thickness H <sub>f</sub>																		
			Span																		
			5,00 m	5,50 m	6,00 m	6,50 m	7,00 m	7,50 m	8,00 m	8,50 m	9,00 m	9,50 m	10,00 m	10,50 m	11,00 m	11,50 m	12,00 m	12,50 m	13,00 m	13,50 m	
CAT A	1,5 kN/m <sup>2</sup>	1,5 kN/m	S800	H220 60L3s	H220 60L3s	H240 80L3s	H250 90L3s	H280 120L3s	H290 90L3s	H320 120L3s	H340 100L3s	H360 60L3s	H400 60L3s	H420 60L3s	H440 60L3s	H480 60L3s	H520 60L3s	H560 60L3s	H580 60L3s	-	-
			S600	H220 60L3s	H220 60L3s	H220 60L3s	H240 80L3s	H260 100L3s	H280 120L3s	H290 90L3s	H320 120L3s	H330 90L3s	H360 120L3s	H400 120L3s	H420 100L3s	H450 90L3s	H480 120L3s	H520 120L3s	H560 120L3s	H580 100L3s	-
		2,0 kN/m	S800	H220 60L3s	H220 60L3s	H250 90L3s	H280 120L3s	H290 90L3s	H320 120L3s	H320 120L3s	H360 120L3s	H370 90L3s	H400 120L3s	H410 90L3s	H440 120L3s	H480 120L3s	H520 120L3s	H560 120L3s	H580 100L3s	-	-
			S600	H220 60L3s	H220 60L3s	H220 60L3s	H250 90L3s	H280 120L3s	H290 90L3s	H320 120L3s	H330 90L3s	H340 100L3s	H360 120L3s	H400 120L3s	H420 100L3s	H440 120L3s	H480 120L3s	H520 120L3s	H560 120L3s	H580 100L3s	-
		2,5 kN/m	S800	H220 60L3s	H200 60L3s	H250 90L3s	H280 120L3s	H290 90L3s	H320 120L3s	H340 100L3s	H360 120L3s	H380 100L3s	H400 120L3s	H440 120L3s	H440 120L3s	H480 120L3s	H520 120L3s	H560 120L3s	H580 100L3s	-	-
			S600	H220 60L3s	H220 60L3s	H240 80L3s	H250 90L3s	H280 120L3s	H290 90L3s	H320 120L3s	H330 90L3s	H360 120L3s	H370 90L3s	H400 120L3s	H410 90L3s	H440 120L3s	H480 120L3s	H520 120L3s	H560 120L3s	H580 100L3s	-
	2,0 kN/m <sup>2</sup>	1,5 kN/m	S800	H220 60L3s	H220 60L3s	H250 90L3s	H280 120L3s	H290 90L3s	H320 120L3s	H330 90L3s	H360 120L3s	H380 100L3s	H410 90L3s	H440 120L3s	H480 120L3s	H520 120L3s	H560 120L3s	H580 100L3s	-	-	-
			S600	H220 60L3s	H220 60L3s		H250 90L3s	H280 120L3s	H290 90L3s	H320 120L3s	H330 90L3s	H360 120L3s	H400 120L3s	H420 100L3s	H460 100L3s	H480 120L3s	H520 120L3s	H560 120L3s	H580 100L3s	-	-
		2,0 kN/m	S800	H220 60L3s	H240 80L3s	H250 90L3s	H280 120L3s	H290 90L3s	H320 120L3s	H340 100L3s	H360 120L3s	H380 100L3s	H420 100L3s	H440 120L3s	H480 120L3s	H520 120L3s	H560 120L3s	H580 100L3s	-	-	-
			S600	H220 60L3s	H220 60L3s	H240 80L3s	H250 90L3s	H280 120L3s	H290 90L3s	H320 120L3s	H330 90L3s	H360 120L3s	H400 120L3s	H420 100L3s	H460 100L3s	H480 120L3s	H520 120L3s	H560 120L3s	H580 100L3s	-	-
		2,5 kN/m	S800	H220 60L3s	H250 90L3s	H260 100L3s	H280 120L3s	H320 120L3s	H330 90L3s	H360 120L3s	H370 90L3s	H400 120L3s	H420 100L3s	H440 120L3s	H480 120L3s	H520 120L3s	H560 120L3s	H580 100L3s	-	-	-
			S600	H220 60L3s	H220 60L3s	H250 90L3s		H280 120L3s	H320 120L3s	H330 90L3s	H360 120L3s	H370 90L3s	H400 120L3s	H420 100L3s	H460 100L3s	H480 120L3s	H520 120L3s	H560 120L3s	H580 100L3s	-	-
CAT B	1,0 kN/m <sup>2</sup>	2,0 kN/m	S800	H260 100L3s	H280 120L3s	H320 120L3s	H320 120L3s	H360 120L3s	H380 100L3s	H400 120L3s	H420 100L3s	H440 120L3s	H480 120L3s	H480 120L3s	H480 120L3s	H520 120L3s	H560 120L3s	H580 100L3s	-	-	-
			S600		H260 100L3s		H340 100L3s		H400 120L3s	H420 100L3s	H440 120L3s	H460 100L3s		H500 100L3s	H520 120L3s	H560 120L3s	H580 100L3s	-	-	-	-
		3,0 kN/m	S800	H260 100L3s	H280 120L3s	H320 120L3s	H320 120L3s	H360 120L3s	H380 100L3s	H400 120L3s	H420 100L3s	H440 120L3s	H480 120L3s	H480 120L3s	H480 120L3s	H520 120L3s	H560 120L3s	H580 100L3s	-	-	-
			S600	H260 100L3s	H280 120L3s		H340 100L3s		H400 120L3s		H420 100L3s	H440 120L3s		H460 100L3s	H500 100L3s	H520 120L3s	H560 120L3s	H580 100L3s	-	-	-
		4,0 kN/m	S800	H260 100L3s	H280 120L3s	H320 120L3s	H320 120L3s	H360 120L3s	H380 100L3s	H400 120L3s	H420 100L3s	H440 120L3s	H480 120L3s	H480 120L3s	H480 120L3s	H520 120L3s	H560 120L3s	H580 100L3s	-	-	-
			S600	H260 100L3s	H280 120L3s		H340 100L3s		H400 120L3s		H420 120L3s	H440 100L3s		H460 100L3s	H500 100L3s	H520 120L3s	H560 120L3s	H580 100L3s	-	-	-
	2,0 kN/m <sup>2</sup>	2,0 kN/m	S800	H260 100L3s	H280 120L3s	H320 120L3s	H320 120L3s	H360 120L3s	H380 100L3s	H400 120L3s	H420 100L3s	H440 120L3s	H480 120L3s	H480 120L3s	H520 120L3s	H520 120L3s	H560 120L3s	H580 100L3s	-	-	-
			S600	H280 120L3s	H290 90L3s		H340 100L3s		H400 120L3s		H440 120L3s	H460 100L3s		H500 100L3s		H560 120L3s	H580 100L3s	-	-	-	-
		3,0 kN/m	S800	H260 100L3s	H280 120L3s	H320 120L3s	H320 120L3s	H360 120L3s	H380 100L3s	H400 120L3s	H420 100L3s	H440 120L3s	H480 120L3s	H480 120L3s	H520 120L3s	H520 120L3s	H560 120L3s	H580 100L3s	-	-	-
			S600	H280 120L3s	H290 90L3s		H340 100L3s		H400 120L3s		H440 120L3s	H460 100L3s		H500 100L3s		H560 120L3s	H580 100L3s	-	-	-	-
		4,0 kN/m	S800	H260 100L3s	H280 120L3s	H320 120L3s	H320 120L3s	H360 120L3s	H380 100L3s	H400 120L3s	H420 100L3s	H440 120L3s	H480 120L3s	H480 120L3s	H520 120L3s	H520 120L3s	H560 120L3s	H580 100L3s	-	-	-
			S600	H280 120L3s	H290 90L3s		H340 100L3s		H400 120L3s		H440 120L3s	H460 100L3s		H500 100L3s		H520 120L3s	H560 120L3s	H580 100L3s	-	-	-

# Span tables

## CLT rib panel open, single span, R30

### Preliminary design tables

The design tables below are intended as an aid for the preliminary design but are not a substitute for a full structural design.



Product designation										
CLT panel		Rib height								
		160	200	240	280	320	360	400	440	480
R30	90 L3s	H250 90L3s	H290 90L3s	H330 90L3s	H370 90L3s	H410 90L3s	H450 90L3s	H490 90L3s	H530 90L3s	
	100 L3s	H260 100L3s	H300 100L3s	H340 100L3s	H380 100L3s	H420 100L3s	H460 100L3s	H500 100L3s	H540 100L3s	H580 100L3s
	120 L3s	H280 120L3s	H320 120L3s	H360 120L3s	H400 120L3s	H440 120L3s	H480 120L3s	H520 120L3s	H560 120L3s	

**Fire governing**

**Vibration governing**

Connector: Rothoblaas TBS 8/200, or equivalent  
 $K_{ser} = 2993,89 \text{ N/mm}$

### Design boundary conditions:

#### a. Initial deflection

$$w_{inst} < L/300$$

#### b. Net final deflection

$$w_{net,fin} < L/250$$

#### c. Final deflection

$$w_{fin} < L/150$$

#### d. Single span system

#### e. Service class 1

#### f. Imposed live load

category A ( $\Psi_0 = 0.7$ ;  $\Psi_1 = 0.5$ ;  $\Psi_2 = 0.3$ )

category B ( $\Psi_0 = 0.7$ ;  $\Psi_1 = 0.5$ ;  $\Psi_2 = 0.3$ )

#### g. Vibration

Vibration in accordance with ÖNORM B 1995-1-1 (2014)

Category A: floor class II

Category B: floor class I

Screed = 6 cm

$E = 26,000 \text{ N/mm}^2$

Damping coeff  $\zeta = 4\%$

Flexural rigidity in cross dir.:  $0,468 \text{ [MNm}^2/\text{m]}$

#### h. Ribs geometry

$B_{w,i} = 120 \text{ mm}$

$B_{w,e} = 100 \text{ mm}$

The CLT rib panel self-weight is already taken into account in the table with density of CLT and GL.



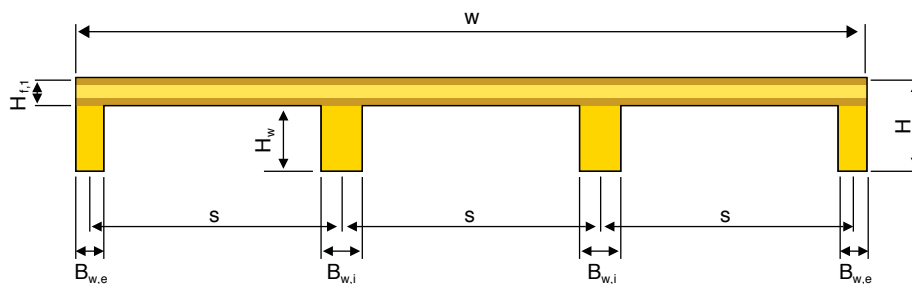
Category	Char. dead load $g_k$ Char. live load $q_k$ Spacing between ribs [mm]		(B <sub>w,i</sub> = 120 mm & B <sub>w,e</sub> = 100 mm) Total height H and CLT thickness H <sub>f</sub>																			
			Span																			
			5,00 m	5,50 m	6,00 m	6,50 m	7,00 m	7,50 m	8,00 m	8,50 m	9,00 m	9,50 m	10,00 m	10,50 m	11,00 m	11,50 m	12,00 m	12,50 m	13,00 m	13,50 m		
CAT A	1,5 kN/m <sup>2</sup>	1,5 kN/m	S800	H250 90L3s	H250 90L3s	H250 90L3s	H290 90L3s	H290 90L3s	H290 90L3s	H320 120L3s	H330 90L3s	H330 90L3s	H360 120L3s	H400 120L3s	H420 100L3s	H440 120L3s	H480 120L3s	H520 120L3s	H540 100L3s	H580 100L3s	-	-
		S600	H250 90L3s	H250 90L3s	H250 90L3s	H250 90L3s	H260 100L3s	H290 90L3s	H290 90L3s	H320 120L3s	H330 90L3s	H360 120L3s	H400 120L3s	H420 100L3s	H440 120L3s	H480 120L3s	H520 120L3s	H560 120L3s	H580 100L3s	-	-	
		2,0 kN/m	S800	H250 90L3s	H250 90L3s	H290 90L3s	H290 90L3s	H290 90L3s	H330 90L3s	H330 90L3s	H360 120L3s	H370 90L3s	H400 120L3s	H420 100L3s	H440 120L3s	H480 120L3s	H520 120L3s	H540 100L3s	H580 100L3s	-	-	
		S600	H250 90L3s	H250 90L3s	H250 90L3s	H250 90L3s	H290 90L3s	H290 90L3s	H320 120L3s	H330 90L3s	H330 90L3s	H360 120L3s	H400 120L3s	H420 100L3	H440 120L3s	H480 120L3s	H520 120L3s	H560 120L3s	H580 100L3s	-	-	
		2,5 kN/m	S800	H250 90L3s	H250 90L3s	H290 90L3s	H290 90L3s	H300 100L3s	H330 90L3s	H340 100L3s	H370 90L3s	H380 100L3s	H400 120L3s	H440 120L3s	H440 120L3s	H480 120L3s	H520 120L3s	H540 100L3s	H580 100L3s	-	-	
		S600	H250 90L3s	H250 90L3s	H250 90L3s	H250 90L3s	H290 90L3s	H290 90L3s	H330 90L3s	H330 90L3s	H360 120L3s	H410 90L3s	H410 90L3s	H410 90L3s	H440 120L3s	H480 120L3s	H520 120L3s	H560 120L3s	H580 100L3s	-	-	
	2,0 kN/m <sup>2</sup>	1,5 kN/m	S800	H250 90L3s	H250 90L3s	H290 90L3s	H290 90L3s	H320 120L3s	H330 90L3s	H360 120L3s	H370 90L3s	H380 100L3s	H410 90L3s	H440 120L3s	H480 120L3s	H520 120L3s	H560 120L3s	H560 120L3s	-	-	-	
		S600	H250 90L3s	H250 90L3s	H250 90L3s	H290 90L3s	H290 90L3s	H290 90L3s	H320 120L3s	H360 120L3s	H360 120L3s	H400 120L3s	H420 100L3s	H440 120L3s	H480 120L3s	H520 120L3s	H560 120L3s	H580 100L3s	-	-	-	
		2,0 kN/m	S800	H250 90L3s	H260 100L3s	H290 90L3s	H290 90L3s	H320 120L3s	H330 90L3s	H360 120L3s	H370 90L3s	H380 100L3s	H410 90L3s	H440 120L3s	H480 120L3s	H520 120L3s	H560 120L3s	H560 120L3s	-	-	-	
		S600	H250 90L3s	H250 90L3s	H290 90L3s	H290 90L3s	H290 90L3s	H290 90L3s	H320 120L3s	H340 100L3s	H360 120L3s	H400 120L3s	H420 100L3s	H440 120L3s	H480 120L3s	H520 120L3s	H560 120L3s	H580 100L3s	-	-	-	
		2,5 kN/m	S800	H250 90L3s	H290 90L3s	H290 90L3s	H300 100L3s	H330 90L3s	H330 90L3s	H370 90L3s	H370 90L3s	H400 120L3s	H420 100L3s	H440 120L3s	H480 120L3s	H520 120L3s	H560 120L3s	H580 100L3s	-	-	-	
		S600	H250 90L3s	H250 90L3s	H250 90L3s	H280 120L3s	H290 90L3s	H320 120L3s	H320 120L3s	H360 120L3s	H370 90L3s	H400 120L3s	H420 100L3s	H440 120L3s	H480 120L3s	H520 120L3s	H560 120L3s	H580 100L3s	-	-	-	
CAT B	1,0 kN/m <sup>2</sup>	2,0 kN/m	S800	H260 100L3s	H280 120L3s	H320 120L3s	H320 120L3s	H360 120L3s	H380 100L3s	H400 120L3s	H420 100L3s	H440 120L3s	H480 120L3s	H480 120L3s	H520 120L3s	H560 120L3s	H580 100L3s	-	-	-		
		S600	H260 100L3s	H280 120L3s	H320 120L3s	H340 100L3s	H360 120L3s	H400 120L3s	H400 120L3s	H440 120L3s	H440 120L3s	H460 100L3s	H480 120L3s	H500 100L3s	H560 120L3s	H560 120L3s	-	-	-	-		
		3,0 kN/m	S800	H260 100L3s	H280 120L3s	H320 120L3s	H320 120L3s	H360 120L3s	H380 100L3s	H400 120L3s	H420 100L3s	H440 120L3s	H480 120L3s	H480 120L3s	H520 120L3s	H560 120L3s	H580 100L3s	-	-	-		
		S600	H260 100L3s	H280 120L3s	H320 120L3s	H340 100L3s	H360 120L3s	H400 120L3s	H400 120L3s	H440 120L3s	H440 120L3s	H460 100L3s	H480 120L3s	H500 100L3s	H560 120L3s	H560 120L3s	-	-	-	-		
		4,0 kN/m	S800	H260 100L3s	H290 90L3s	H320 120L3s	H330 90L3s	H360 120L3s	H400 120L3s	H400 120L3s	H420 100L3s	H440 120L3s	H480 120L3s	H480 120L3s	H520 120L3s	H560 120L3s	H580 100L3s	-	-	-		
		S600	H260 100L3s	H280 120L3s	H320 120L3s	H340 100L3s	H360 120L3s	H400 120L3s	H400 120L3s	H440 120L3s	H440 120L3s	H460 100L3s	H480 120L3s	H500 100L3s	H560 120L3s	H560 120L3s	-	-	-	-		
	2,0 kN/m <sup>2</sup>	2,0 kN/m	S800	H260 100L3s	H280 120L3s	H320 120L3s	H330 90L3s	H360 120L3s	H380 100L3s	H400 120L3s	H420 100L3s	H440 120L3s	H480 120L3s	H480 120L3s	H520 120L3s	H560 120L3s	H580 100L3s	-	-	-		
		S600	H260 120L3s	H290 90L3s	H320 120L3s	H340 100L3s	H360 120L3s	H400 120L3s	H400 120L3s	H440 120L3s	H440 120L3s	H460 100L3s	H480 120L3s	H500 100L3s	H560 120L3s	H560 120L3s	-	-	-	-		
		3,0 kN/m	S800	H260 100L3s	H290 90L3s	H320 120L3s	H330 90L3s	H360 120L3s	H380 100L3s	H400 120L3s	H420 100L3s	H440 120L3s	H480 120L3s	H480 120L3s	H540 100L3s	H560 120L3s	H580 100L3s	-	-	-		
		S600	H280 120L3s	H280 90L3s	H320 120L3s	H340 100L3s	H360 120L3s	H400 120L3s	H410 90L3s	H440 120L3s	H440 120L3s	H460 100L3s	H480 120L3s	H500 100L3s	H560 120L3s	H560 120L3s	-	-	-	-		
		4,0 kN/m	S800	H290 90L3s	H290 90L3s	H320 120L3s	H330 90L3s	H360 120L3s	H380 100L3s	H400 120L3s	H420 100L3s	H440 120L3s	H480 90L3s	H490 90L3s	H520 120L3s	H540 100L3s	H560 120L3s	H480 100L3s	-	-	-	
		S600	H280 120L3s	H290 90L3s	H320 120L3s	H340 100L3s	H360 120L3s	H400 120L3s	H400 120L3s	H440 120L3s	H440 120L3s	H460 100L3s	H480 120L3s	H500 100L3s	H520 120L3s	H560 120L3s	H560 120L3s	-	-	-	-	

# Span tables

## CLT rib panel open, single span, R60

### Preliminary design tables

The design tables below are intended as an aid for the preliminary design but are not a substitute for a full structural design.



Product designation										
CLT panel		Rib height								
		160	200	240	280	320	360	400	440	480
R60	100 L5s		H300 100L5s	H340 100L5s	H380 100L5s	H420 100L5s	H460 100L5s	H500 100L5s	H540 100L5s	H580 100L5s
	120 L5s		H320 120L5s	H360 120L5s	H400 120L5s	H440 120L5s	H480 120L5s	H520 120L5s	H560 120L5s	
	140 L5s		H340 140L5s	H380 140L5s	H420 140L5s	H460 140L5s	H500 140L5s	H540 140L5s	H580 140L5s	

Fire governing

Vibration governing

Connector: Rothoblaas TBS 8/200, or equivalent  
 $K_{ser} = 2993,89 \text{ N/mm}$

### Design boundary conditions:

#### a. Initial deflection

$$w_{inst} < L/300$$

#### b. Net final deflection

$$w_{net,fin} < L/250$$

#### c. Final deflection

$$w_{fin} < L/150$$

#### d. Single span system

#### e. Service class 1

#### f. Imposed live load

category A ( $\Psi_0 = 0.7$ ;  $\Psi_1 = 0.5$ ;  $\Psi_2 = 0.3$ )

category B ( $\Psi_0 = 0.7$ ;  $\Psi_1 = 0.5$ ;  $\Psi_2 = 0.3$ )

#### g. Vibration

Vibration in accordance with ÖNORM B 1995-1-1 (2014)

Category A: floor class II

Category B: floor class I

Screed = 6 cm

$E = 26,000 \text{ N/mm}^2$

Damping coeff  $\zeta = 4\%$

Flexural rigidity in cross dir.:  $0,468 \text{ [MNm}^2/\text{m]}$

#### h. Ribs geometry

$B_{w,i} = 200 \text{ mm}$

$B_{w,e} = 140 \text{ mm}$

The CLT rib panel self-weight is already taken into account in the table with density of CLT and GL.

Category	Char. dead load $g_k$	Char. live load $q_k$	Spacing between ribs[mm]	(B <sub>w,i</sub> = 200 mm & B <sub>w,e</sub> = 140 mm) Total height H and CLT thickness H <sub>f</sub>																	
				Span																	
				5,00 m	5,50 m	6,00 m	6,50 m	7,00 m	7,50 m	8,00 m	8,50 m	9,00 m	9,50 m	10,00 m	10,50 m	11,00 m	11,50 m	12,00 m	12,50 m	13,00 m	13,50 m
CAT A	1,5 kN/m <sup>2</sup>	1,5 kN/m	S800	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s
			S600	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s
		2,0 kN/m	S800	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s
			S600	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s
		2,5 kN/m	S800	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s
			S600	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s
	2,0 kN/m <sup>2</sup>	1,5 kN/m	S800	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s
			S600	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s
		2,0 kN/m	S800	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s
			S600	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s
		2,5 kN/m	S800	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s
			S600	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s
CAT B	1,0 kN/m <sup>2</sup>	2,0 kN/m	S800	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	
			S600	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	
		3,0 kN/m	S800	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s
			S600	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s
		4,0 kN/m	S800	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s
			S600	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s
	2,0 kN/m <sup>2</sup>	2,0 kN/m	S800	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s
			S600	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s
		3,0 kN/m	S800	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s
			S600	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s
		4,0 kN/m	S800	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s
			S600	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s	H300 100L5s



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