Project management and transport

Quotation phase

We will be happy to draw up an appropriate quotation for you based on your documents. Documents can be submitted to Stora Enso in the following form:

- Tender text (cuttings must be taken into account)
- Individual part drawings

We will gladly assist you in determining the appropriate dimensions from planning permission submissions and building site plans. A preliminary estimate program which enables easy determination of amounts can be downloaded free of charge from **www.clt.info**. If you require our assistance during preliminary dimensioning, please provide the following information:

- Imposed load
- Permanent loads (load, floor structure, etc.)
- Location (snow load)

Please note that the amounts determined by Stora Enso may differ from those actually required, as definitive dimensioning is only carried out during the course of the preparation for work.

Order phase

If Stora Enso submits a quotation for your project, we would be grateful if you would sign and return this to us as confirmation that you wish to place the order.

A provisional production reservation is made based on the previously determined amounts. This then results in an agreed delivery date which can be met by Stora Enso under the following conditions:

- Forwarding of the required individual part drawings (see Individual part drawing request) summarised in “*.dwg” or “*.dxf” format, containing the following information:
  - Panel numbering
  - Span directions
  - Panel thickness
  - Complete dimensions
  - Panel joint
  - Surface quality
  - Visible side
- Completed order form
- Approval by the customer at least 12 days before dispatch of the panel drawings/charging list drawn up by Stora Enso
- No requests for changes by the customer during the final 12 working days before dispatch

Once the required documents have been received, the Stora Enso CLT engineering team will commence the definitive planning of your project.

On completion of the plans by Stora Enso, we request that you check them along with the panel, freight and charging list, and provide us with your written approval.

Once we have received these documents from you, Stora Enso will commence production of your CLT project.

The machined CLT panels are delivered to the destination at the agreed time in the appropriate transport sequence (see “Transport”).

Project management & transport

In the case of three-dimensional drawings, after consultation with our CLT engineering department (clt.technik@storaenso.com), we can further process your drawing files in *.ifc, *.3d DWG, *.3d dxf or *.sat (acis) format.

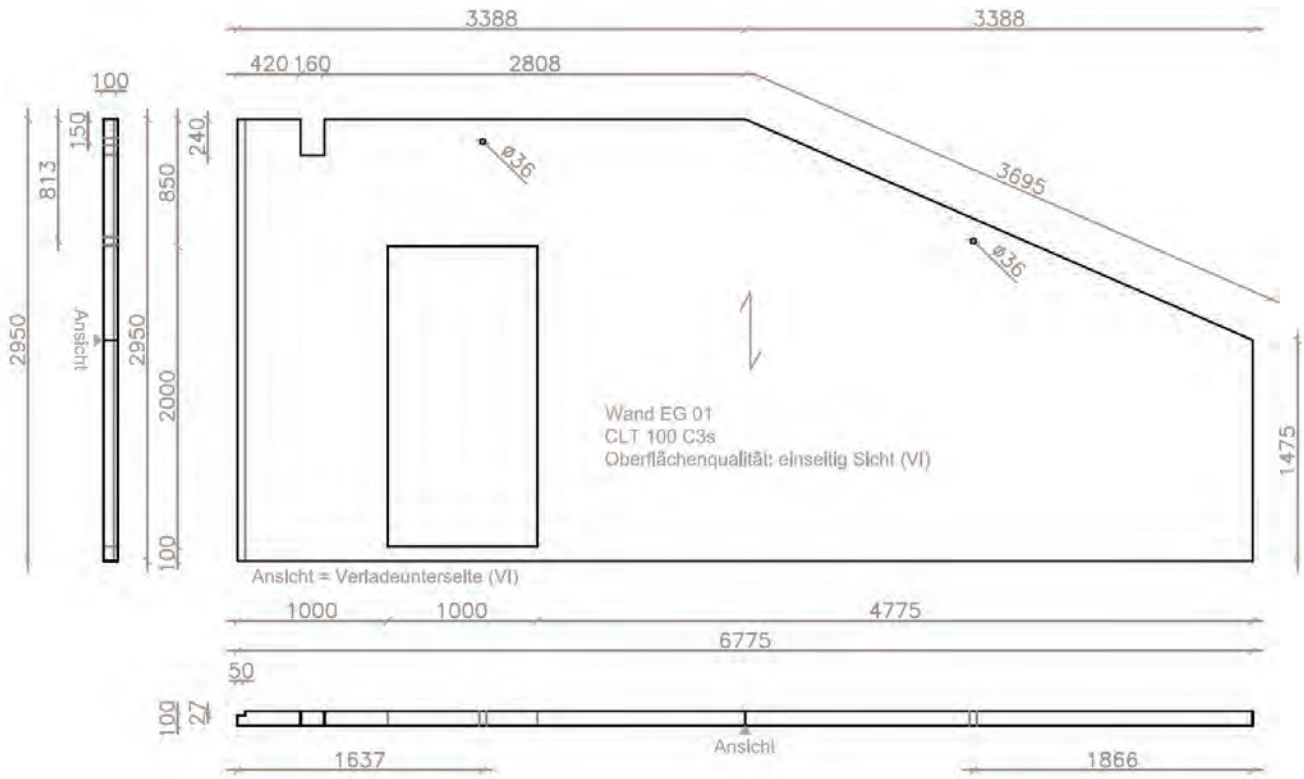
Otherwise, we require individual part drawings, which must include the following information:

- Panel numbering
- Grain direction of cover layers
- Panel thickness + panel type (C or L)
- Complete dimensions
- Panel joint
- Surface quality
- Position of visible side
- Position of upper loading side

Please ensure that we receive your drawings on schedule in order to meet your requested delivery date. In general, 20 working days should be allowed between reception of the plans and the delivery date.

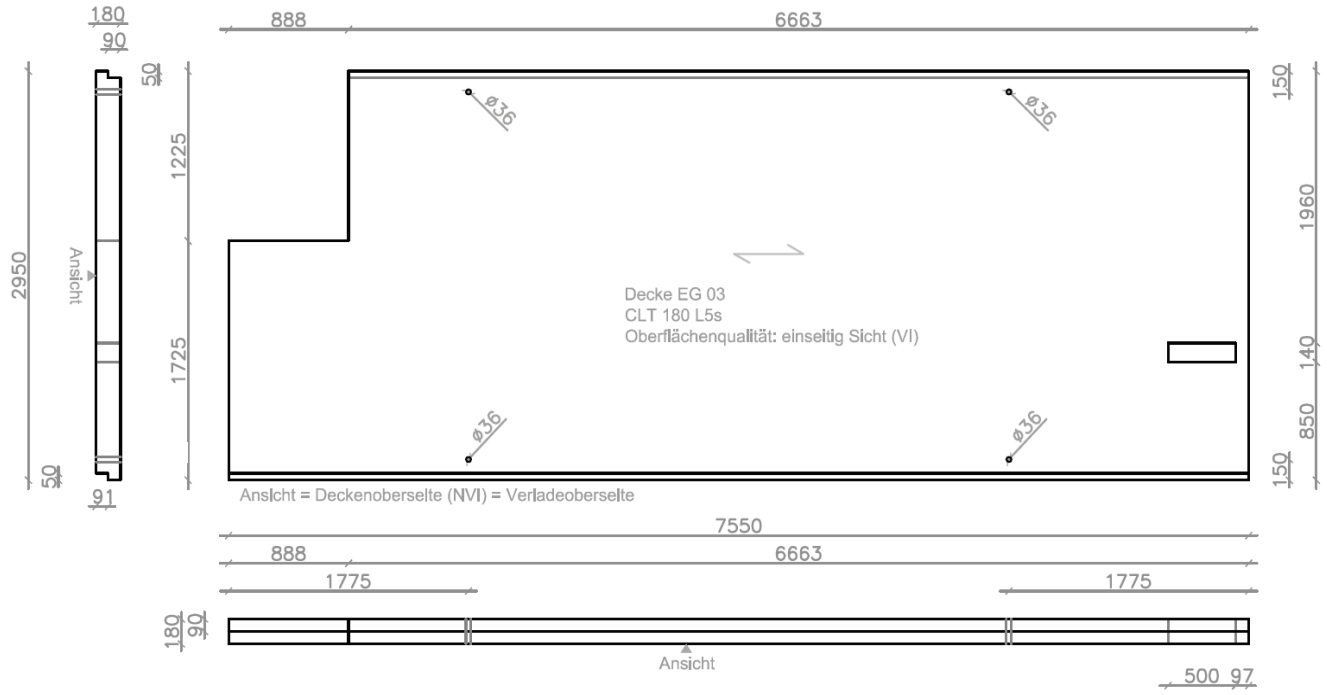
The drawing, which should be prepared as an orthographic projection with labelled views, may be similar to the following:

For walls



Project management & transport

For ceilings



Please send us your individual part drawings combined in one “*.dwg” or “*.dxf” file.

In general, you should ensure that part labelling is unambiguous. For large buildings, you can ensure unambiguous labelling by sending us drawings for each floor.

The order in which panels are later loaded should also be taken into consideration when preparing drawings (panel numbering).

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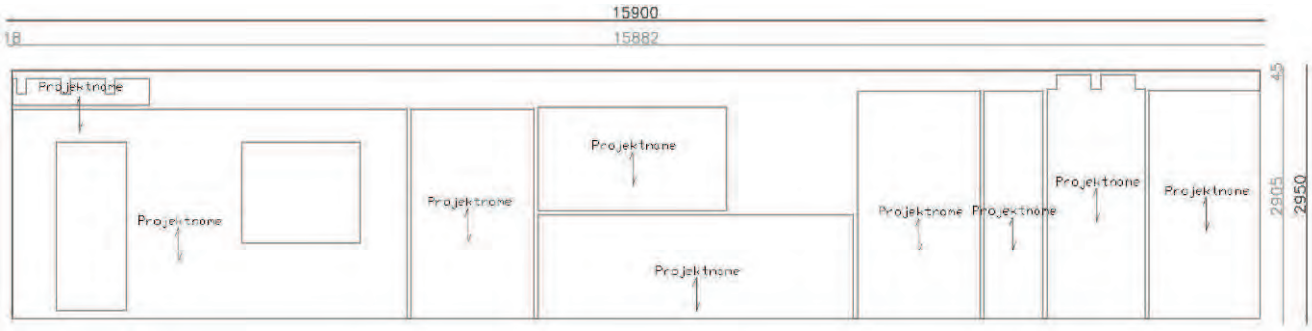
Charged lengths: From minimum production length of 8.00 m per charged width up to max. 16.00 m (in 10 cm increments)

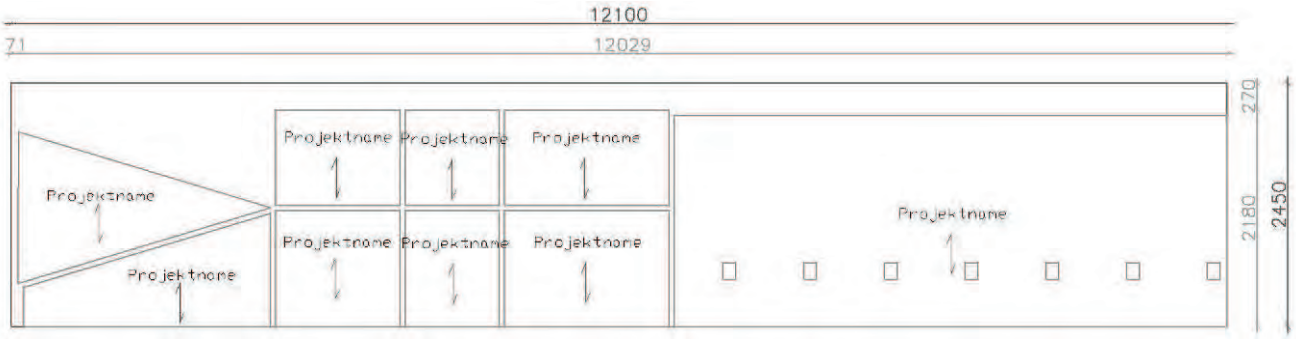
Charged widths: 2.45 m, 2.75 m, 2.95 m

Example 1 **15,900 x 2,950 mm**



Charged dimensions:	2.95 x 15.90	46.91 m²
Area of panel (net):		38.59 m²
Cutting waste:		8.32 m²
Charged dimensions:		**46.91m²**

Example 2 **12,100 x 2,450 mm**



Charged dimensions:	2.45 x 12.10	29.65 m²
Area of panel (net):		23.58 m²
Cutting waste:		6.07 m²
Charged dimensions:		**29.65 m²**

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Horizontal transport

A standard articulated trailer can be loaded to a maximum of 25 t in the case of horizontal transport, with a maximum load length of 13.6 m and a maximum load width of 2.95 m. If the panel thickness permits, CLT solid wood panels with a maximum length of 16.0 m can also be transported with a standard articulated trailer. A density of 470 kg/m³ can be applied to calculate the loading weight.

If any special equipment is required, we will be happy to provide this. However, please note the following changes to the max. load length, width and weight.

Standard equipment	Max. load	Max. load length	Max. load width
Standard articulated trailer	25 t	13.60 m	2.95

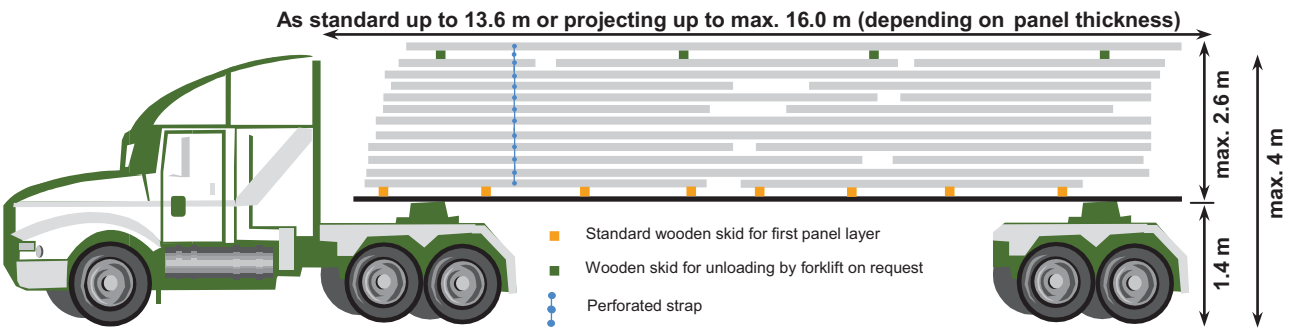
Special equipment	Max. load	Max. load length	Max. load width
Extendable trailer	22 t	16.00 m	2.95 m
Steerable trailer	22 t	16.00 m	2.95 m
Steerable trailer with all-wheel drive	20-22 t	16.00 m	2.95 m

Once loaded, the CLT solid wood panels are secured using 3 nailed straps per side to prevent sideways slippage and then covered with a truck tarpaulin. This is necessary to protect the panels against ambient influences. Cardboard edge protectors are also placed between the lashing straps and the panels.

When transporting visible quality panels, the panels are wrapped in UV impermeable foil before they leave the factory.

We use a minimum of 8 wooden skids (75 x 75 mm or 95 x 95 mm) as standard under the first layer of panels loaded onto the trailer. However, each subsequent layer is stacked horizontally, directly on top of the previous layer.

Please inform us when placing the order (and include diagrams) if you require intermediate wooden skids for unloading by crane or forklift. The wooden skids will be taken back by the haulage company. If you keep the skids for your own use, we will charge them to your account.



Vertical transport

A mega trailer can be loaded to a maximum of 20 t in the case of vertical transport, with a max. load length of 13.6 m and a max. load height of 3.0 m. Please note that as a result of the A-shaped frames, the load lifting radius is smaller than with horizontal transport (max. approx. 40 m³ depending on the panel edge dimensions and thicknesses). A density of 470 kg/m³ can be applied to calculate the load weight.

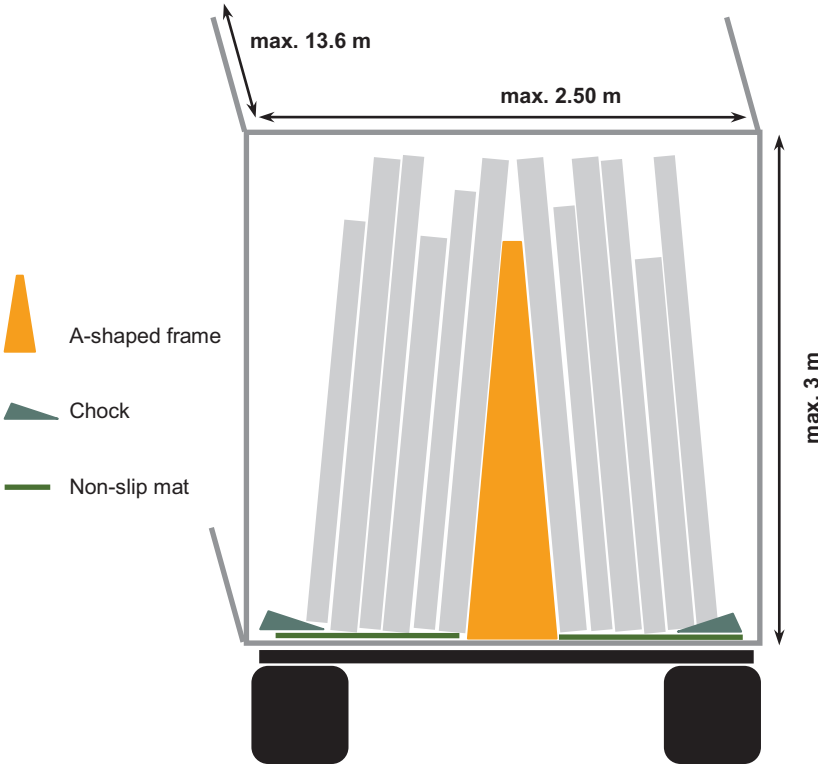
Each trailer has at least 6 A-shaped frames against which the CLT solid wood panels can be leaned and then screwed to each other (screw points are marked in colour). The panels are then further connected to each other using lashing straps on the sides of the racks, and the entire load is then also firmly strapped together.

The panels are also placed on chocks which prevent them from slipping or tilting.

As with horizontal transport, cardboard edge protectors are placed between the lashing straps and the panels.

If visible quality panels are to be loaded vertically, it may be necessary to screw fastening screws through the visible surface to ensure the necessary load securing measures.

If the A-shaped frames or chocks are not returned to us, we will charge them to your account.



Project management & transport

You must adhere to the following terms and ensure compliance with them for Stora Enso:

1. Access to the building site must be suitable for an articulated lorry or trailer-truck. You must ensure that the public roads leading to the building site can accommodate an articulated lorry having a total length of approx. 19 m.

2. Transport costs and any additional costs resulting from idle, reloading or handling times shall be charged to the purchaser. The transport price includes 3 hours' idle time for unloading but does not include work required for moving or unloading goods. The agreed price of €15.00 or €25.00 (excl. VAT) (for articulated trailers) will be charged separately for each additional quarter of an hour or part thereof. The lorry driver must sign for any idle times.

3. A maximum of 40 m³ or 20 t of CLT solid wood panels can be transported horizontally per truck load (depending on the articulated lorry). The loading order for the panels can only be complied with to the extent that this does not result in a violation of traffic laws or impair transport conditions.

4. Transport requirements are calculated based on a standard articulated lorry. If the building site can only be accessed by a special steerable articulated trailer or similar vehicle, the additional expense will be charged to the customer.

5. Normal postponement of a delivery date (i.e. up to 3 working days) can be requested by up to a period of 10 working days prior to delivery at no charge to the customer. If notice of delivery postponement is given less than 10 working days before delivery, €100.00 (excl. VAT) will be charged per day postponed for storage and handling.

6. Transport is defined as: CPT – Carriage Paid To.

7. If the goods are collected by the customer, the carrier must provide the appropriate equipment to ensure safe loading and transport. In the event of any delivery postponement (see item 5), applicable storage and handling costs must also be taken into account. If the equipment does not comply with the necessary stipulations and thus optimum load securing cannot be guaranteed, Stora Enso shall not ship any items.

8. If unforeseen events occur which are beyond Stora Enso's control, Stora Enso shall be entitled to postpone delivery correspondingly, even if such events only have an indirect effect on processing the order.

The items listed above regarding transport of Stora Enso CLT solid wood panels are essential for the order to be agreed.

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Tender text for CLT solid wood panels

The following tender texts are intended as a suggestion or guideline and can be expanded or reduced as required. These texts relate to the cross-laminated timber shell and must be adapted to the particular building project. Ideally, the items for additional coating layers and their connections should be formulated in accordance with the Austrian Building Specifications (LBHB).

A. Cross-laminated timber: general description and specifications

Cross-laminated timber (CLT) is a laminar timber panel made up of at least three solid wood layers bonded at right angles to each other. 3-, 5- and 7-layer panels are mainly used.
Cross-laminated timber is also known as CLT or X-Lam.

CLT must comply with the “General Building Inspection Approval (ABZ)” of the German Institute for Structural Engineering and the “European Technical Approval (ETA)”.
The manufacturer must hold the relevant certificates of conformity and be entitled to mark the products with the Ü and CE marks.
The manufacturing plant must hold a glulam certificate to DIN 1052.

The raw material used (softwood) must have a wood moisture content of approx. 12% and meet strength class C24 (according to EN338).

The finger jointing of the individual boards must be in the form of flat dovetailing. At least three board layers must ensure narrow side bonding for building physics and structural engineering reasons. Layers without narrow side bonding are not permitted for use as cover layers. In addition, test certificates documenting the product’s airtightness must also be available.

Formaldehyde-free adhesives must be used for bonding the finger joints and single-layer panels (narrow side bonding of lamella strands) and for the crosswise bonding of the single-layer panels to form multi-layer panels.

A general finger joint (finger jointing across the entire cross-section of a panel) is not permissible.

The surface of non-visible, industrial visible and visible quality panels must be sanded and graded according to Stora Enso’s requirements.

The design must be based solely on the concept of large-format, cross-laminated timber panels (up to a maximum panel size of 2.95 m x 16 m). This provides for high-strength wall, ceiling and roof panels while keeping the number of panel joints to a minimum.

Suggested product

CLT in accordance with the “General Building Inspection Approval Z-9.1-559” of the German Institute for Structural Engineering and “European Technical Approval ETA-08/0271”.

Manufacturer

Stora Enso Wood Products OY Ltd
Kanavaranta 1
FI-00160 Helsinki

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Manufacturing plants

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Fax: +43 (0) 2826 7001 88-3207
Email: clt.info@storaenso.com
www.clt.info

B. General information

Panels

The panels are not treated with any coatings, wood preservatives or similar at the factory.
Available surface qualities:

- Visible quality (VI, one-sided or BVI, on both sides)
- Industrial visible quality (IVI, one-sided industrial visual quality and one-sided visible quality)
- Industrial non-visible quality (INV, one-sided industrial visible quality, one-sided non-visible quality)
- Non-visible quality (NVI, on both sides)

Construction/structural analysis

The orientation of the panel cover layers must take account of load transfer and structural analysis considerations.

Transport/assembly

The panels must be protected against direct weathering during transport, assembly and when standing as a shell. Particularly where cross-laminated timber is used for visible panels it is important to avoid water stains and other cosmetic flaws. The technical function of the panels will not be impaired if they briefly come into contact with water. The entire shell should be covered using a protective sheet or tarpaulins until it has been rendered rain-proof.

The building company must establish details of site conditions (access possibilities, position of the crane, etc.) so that delivery and assembly of the solid wood panels can be carried out appropriately.

The CLT solid wood panels must be transferred using lifting gear provided on site or by the contractor. For unloading purposes, wall panels are generally provided with two attachment points, and ceiling panels with four attachment points. The respective panel's weight and the transport position must be taken into account when deciding on the attachment points. Only undamaged suspension gear, chains or slings with an adequate load capacity and load hooks with a safety catch may be used.

Care must be taken to ensure that the crane system is adequately stable during the construction phase.

Joints

A butt joint with a rebate on both sides and a jointing board or stepped rebate is recommended as the standard panel joint.

Nails, wood screws (usually self-tapping wood screws), bolts, pins and special-design dowels may be used as fasteners, as specified in the approval documents. The number and position of the fasteners must be determined in accordance with design and structural analysis considerations.

The panel joints must be made wind-proof and airtight (e.g. using wall gasket “Compriband”, expanded foam strips, butyl strip sealants, etc.).

Base points - sole plates:

CLT solid wood panels must be protected against rising damp at points at which they are in contact with concrete, masonry etc. Any unevenness in the floor plate must be corrected before commencing the building work by levelling with shims (padding elements) or appropriate sleepers. If the panels do not achieve a flush connection, the base joints must be thoroughly filled (e.g. using self-levelling mortar).

Wiring

It is recommended that wiring cut-outs are prefabricated at the factory, wherever possible. If cut out on site, the load-bearing longitudinal CLT layers must not be weakened by transverse cuts or cross-sections.

If cut-outs for wiring are produced on site by craftsmen, the contractor must monitor the craftsmen's work to ensure that structurally important areas are not weakened.

Costing

The itemised prices must include:

- All consumables and auxiliary parts such as: fasteners, jointing boards, sole plate timbers, sound-insulation and joint sealant strips
- All costs for a crane and other lifting gear
- All auxiliary equipment and structures needed to assemble the panels
- Measures to protect against weathering during assembly
- Any protective measures required for installed visible surfaces (e.g. thin soft wood fibred panels, lengths of felt, foam films, etc.)

Note

CLT manufacturers charge contractors on the basis of the rectangular area circumscribed by the charged widths, including any waste from cut-outs and off-cuts.

Charged lengths: from minimum production length of 8.00 m per charged width up to max. 16.00 m (in 10 cm increments).

Charged widths: for walls and ceilings: 245, 275 and 295 cm.

Charging of the client by the contractor in accordance with this tender is based on standard practice (certain openings, gables, etc. are disregarded or deducted when measuring) for walls, ceilings and roofs.

C. Examples for item texts

Wall panels

Machine (including window and door cut-outs, notches, rebates, etc.), supply and assemble wall panels onto the appropriate sub-structure. All the necessary fastening and sealing materials and any interlocking panels required (e.g. panel strips made of 3-layer panels or similar) must be included.

Cross-laminated timber

Wood type:	Spruce
Surface:	Smooth, sanded on both sides
Surface quality:	Non-visible (NVI), industrial visible and visible quality (VI, one-sided visible)
Structure:	Panel design from at least three single-layer panels

Recommended product:	CLT - cross-laminated timber to Z-9.1-559 and ETA-08/0271
Manufacturer:	Stora Enso WP Bad St. Leonhard GesmbH or Stora Enso Wood Products GmbH

Item 01:

Wall panel	**CLT 100 C3s**
Quantity:	1
Panel thickness:	100 mm, laminated in 3 layers, cover layer vertical
Panel height and length:	2.95 m x 9.40 m
Panel size:	parallel wall height or varying wall height
Surface quality:	Non-visible (NVI)

No. of openings < 1.5 m²: 2
No. of openings < 1.5 m²: 3

Labour …….

Misc. …….

……. m² Unit price ……. Total …….

Product offered:	……..
Manufacturer:	……..

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Ceiling panels/roof panels

Machine (including cut-outs, notches, rebates, etc.), supply and assemble ceiling or roof panels onto the sub-structure. All the necessary fastening and sealing materials and any interlocking panels required (e.g. panel strips made of 3-layer panels or similar) must be included.

Cross-laminated timber

Wood type:	Spruce
Surface:	Smooth, sanded on both sides
Surface quality:	Non-visible (NVI), industrial visible or visible quality (VI, one side visible)
Structure:	Panel design from at least three single-layer panels

Recommended product:	CLT - cross-laminated timber to Z-9.1-559 and ETA-08/0271
Manufacturer:	Stora Enso Timber Bad St. Leonhard GesmbH or Stora Enso Wood Products GmbH

Item 02

Ceiling or roof panel	**CLT 180 L5s**
Quantity:	1
Panel thickness:	180 mm, laminated in 5 layers, cover layer longitudinal
Panel width:	2.75 m
Panel length:	11.20 m
Plan shape:	right angle

No. of openings < 1.5 m²: 2
No. of openings < 1.5 m²: 3

Labour …….

Misc. …….

……. m² Unit price ……. Total …….

Product offered: ……...
Manufacturer: ……...

Machining

Machining

Below is an overview of the machining options of our Hundegger CLT panel cutting machine.

The machining options shown here cover most common machining operations. Any special machining operations must always be clarified in advance and evaluated in conjunction with the Production department.

Machining options with the panel cutting machine

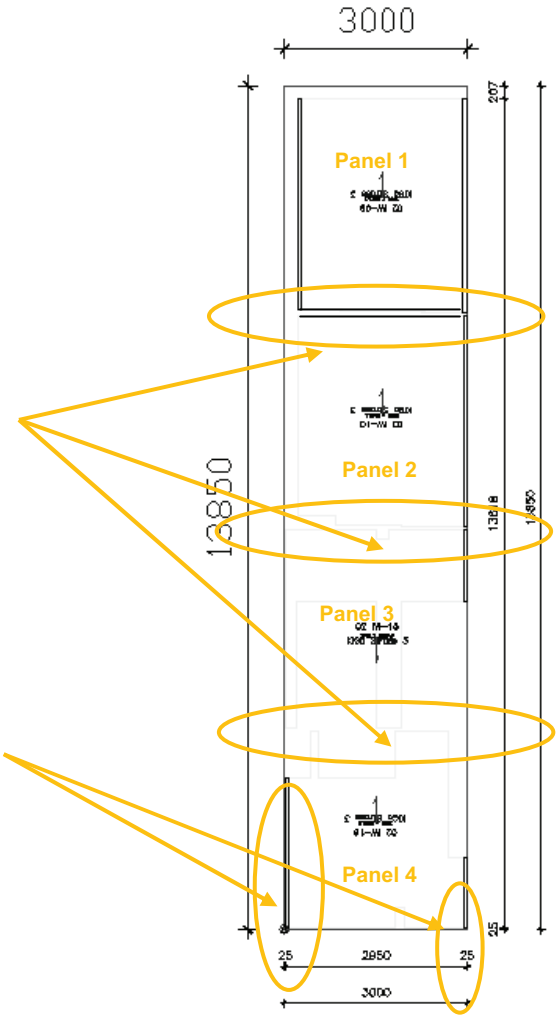
NOTE: as a basic principle, make sure that all machining process are performed on the same side of the panel (panel surface).

Individual double sided panel machining operations are only possible upon request (in this case, the panel must be turned over).

NOTE 2: by way of example, the illustration (on the right) shows several individual parts “nesting” inside a raw panel with different machining techniques.

No special edge working (e.g. rebates on underside, groove, horizontal bore) is possible.

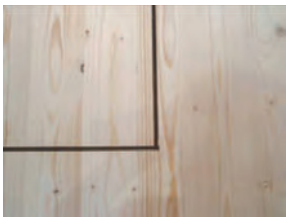
In this case, it is also possible to work rebates on the underside of the panel, as the tool can process the individual part from the outer edge of the raw panel.



Machining

a) Window and door cut-outs

Rounded corners on VI panels



Sharp-edged corners on NVI/IVI panels

Tools used:

- Circular saw
- Chainsaw
- Finger-joint cutter

Note:

With VI panels, cut-outs in corner areas are milled as standard using the finger-joint cutter (therefore a corner radius of at least 20 mm, from 160 mm panel thickness 40 mm) and not cut out with the chainsaw (because of the risk of the chainsaw blade pulling out or splashing oil).

b) Purlin/rafter/tie beam notches

Tools used:

- Chainsaw for NVI/IVI panels

- Finger-joint cutter for VI panels

Note:

In the case of purlin/rafter/tie beam notches, the corners can be formed using the chainsaw, which may have an adverse effect on the appearance (overlap).

c) Double mitre cuts

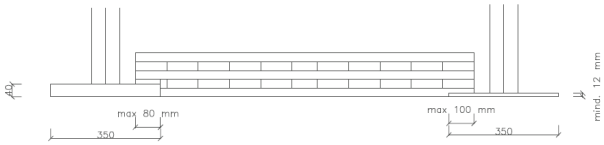
Tools used:

- Circular saw
- Chainsaw
- Finger-joint cutter

Note:

With extremely complex details, the corners may be recut manually with a chainsaw.
This should particularly be taken into account with VI panels.

d) Rebate and groove milling



Tools used:

- Plain milling cutter with 3-axis assembly

Note:

Plain milling cutter h = 12 mm	max. rebate width: 100 mm
Plain milling cutter h = 27 mm	max. rebate width: 80 mm
Plain milling cutter h = 40 mm	max. rebate width: 80 mm
Plain milling cutter h = 120 mm	max. rebate width: 120 mm

d 1) Single rebates

Tools used:

- Plain milling cutter
- Finger-joint cutter

d 2) Double rebates

Tools used:

- Plain milling cutter with 3-axis assembly

Note:

Rebates on the panel surface are possible in any rebate width and height.

Rebates on the underside of the panel depend on the tool used, but must have a minimum rebate height of 12 mm.

d 3) Groove or slot milling

Tools used:

- Plain milling cutter with 3-axis assembly

Note:

Plain milling cutter h = 12mm	max. rebate width:	100 mm
Plain milling cutter h = 27mm	max. rebate width:	80 mm
Plain milling cutter h = 40mm	max. rebate width:	80 mm
Plain milling cutter h = 120mm	max. rebate width:	120 mm

d 4) Interlocking tiles

Tools used:

- Plain milling cutters
- Finger-joint cutter d = 40 mm

Note:

In the case of interlocking tiles, the plain milling cutter is used to cut to the desired point. The corner is recut using the finger-joint cutter d = 40 mm. A rounded edge of r = 20 mm is left.

e) Birdsmouths

Tools used:

- Plain milling cutter with 5-axis assembly

f) Step machining or similar

Tools used:

- Finger-joint cutter
- Plain milling cutter

Note:

If a plain milling cutter is used, this must start laterally at the edge. Finger-joint cutters can be used directly from above.

g) Circular holes

Tools used:

- Finger-joint cutter; d = 40 / 80 mm

Note:

Smallest circular hole diameter:	45 mm
Max. bore depth at d = 40 mm:	160 mm
Max. bore depth at d = 80 mm:	300 mm

NOTE: With the Ø 40 mm and Ø 80 finger-joint cutters, holes cannot be made with a precise diameter of 40 mm or 80 mm as they scorch severely during the drilling process. 40 mm and 80 mm holes must be machined with diameters which are at least 5 mm larger.

h) Holes

Tools used:

- Drill bit; d = 8 / 10 / 20 / 22 / 30 / 35 mm

i) Electrical ducts

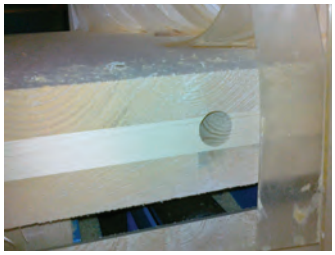
Tools used:

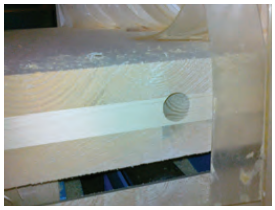
- Finger-joint cutter; d = 40 / 80 mm

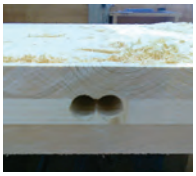
Note:

Possible structural impairments as a result of milled or saw cuts, etc. must be taken into account at the planning stage.

j) Horizontal holes (only possible on PBA 2)







Tools used:

- Drill bit; d = 28 mm

Note:

Max. drill depth: 1500 mm;

Min. centre distance for adjacent horizontal holes: 50 mm (no overlapping holes).

Horizontal holes are only possible on a panel longitudinal edge.

k) Free-form operations

Tools used:

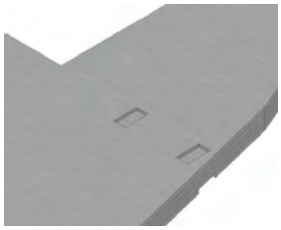
- Finger-joint cutter; d = 40 / 80 mm

Note:

Max. bore depth at d = 40 mm:	160 mm
Max. bore depth at d = 80 mm:	300 mm

Machining

l) Blind holes/pockets



Tools used:

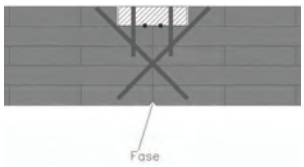
- Finger-joint cutter; d = 40 / 80 mm

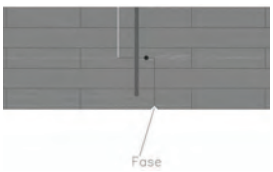
Note:

In principle, possible on the panel surface.

No sharp corners possible as the blind holes are made with a finger-joint cutter.

m) VI ceiling joints





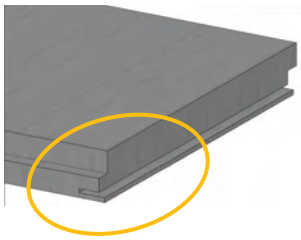
Tools used:

- Manual chamfering plane

Note:

The edges of the VI ceiling joints are manually provided with a 2 x 2 mm chamfer on each visible side.

n) Special ceiling joints



Tools used:

- Circular saw
- Plain milling cutter

Note:

This variant is sometimes used for ceiling joints with "flush joists" with steel I-beams for visible ceiling elements.