



**Ingenieur
Holzbau.de**

A campaign by
Studiengemeinschaft Holzleimbau e.V.

BSP  **Holz**



**Data Sheet –
Cross laminated timber**
August 2016

General

Load-bearing Cross laminated timber components (BSP or X-Lam) are designed for structural ability and comprise meticulously manufactured high grade components made of reclaimed material. They are used as large plates and diaphragms in service classes 1 or 2 in accordance with EN 1995-1-1: 2010-12.

Cross laminated timber may only be manufactured with national technical approval of the Deutsches Institut für Bautechnik (DIBt) or with European Technical Assessment (ETA). A list of national technical approvals and ETAs is provided on home page www.brettsperrholz.org.

A number of general rules being specific for X-Lam is explained below, drafted to ensure long term structural stability and preservation of appearance. Some important terms pertaining to determining the quality of Cross laminated timber are also explained.

Lay up

Cross laminated timber consists of at least three orthogonally arranged timber layers. For more than three timber layers, adjacent layers may be glued with the grain aligned if the specific national approval or ETA permits.

Laminations in a timber layer may be arranged with their narrow sides either with or without gaps. The narrow sides may be edge glued.

Some national technical approvals or ETAs allow arrangements including wood based panel layers. The surfaces of X-Lam members may have factory-applied non-load-bearing layers for reasons of aesthetics or building physics.

Design

The design is in accordance with the EN 1995-1-1:2010-12 (Eurocode 5-1-1, with National Annex) specification and with the requirements of the specific manufacture's technical approval or ETA.

Cross laminated timber may be designed as members carrying load along one or two axes. The load-bearing capacity can only be determined by considering the loads and the static system. Specification of properties will not suffice. The cross-sectional layup must instead be stated, describing the properties of the layers.

The manufacturers will provide design aids for conventional systems and load distributions.

Since strength and rigidity values will vary depending on the cross-sectional layup and the manufacturer's production methods, the design of the load-bearing construction and, where applicable, building physics accompanying papers should be checked when products are exchanged.

Proof of fire protection will be available as specified for national approval or ETA of the manufacturer.

Tension perpendicular to the grain

Tension perpendicular to the grain (tension at right angles to the plane of the board) must be absorbed by orthogonal reinforcements, e.g. with self-drilling full thread screws.

Later holes, notches, break-throughs, bores, cuts and additional loads

Execution of holes, notches, bores and cuts and static system changes or additional loads by the customer must in any event be coordinated with the designer of the structure.

Marking

Cross laminated timber components comply with the requirements of the building authorities. Components manufactured with a national technical approval will e.g. bear the German Ü symbol compliance mark (Ü-Zeichen) (see Figure 1); members with a European Technical Assessment will carry the CE mark (see Figure 2).



Figure 1: Example of a Ü mark



ETA-xx/yyy
zzzz - CPD - tttt
Dimension:
200 x 2950 x 15,80

Figure 2: Example of a CE mark

Wood preservation and species

Structural preservation of wood should take precedence to preservative treatment. Preservative treatment of wood is uncommon and also not required as per DIN 68800: Cross laminated timber is manufactured from kiln dried timber and is only used for service classes (SC) 1 and 2. Preservative treatment is not required since the expected moisture content of the timber $u < 20\%$. Pursuant to DIN 68800-1: 2011-10, adequate durability from wood destroying insects may be assumed in SC 1 and 2, irrespective of the species. Cross laminated timber will normally be manufactured from spruce. Manufacture from other softwood is also allowed.

Surface qualities

Cross laminated timber components can be manufactured with varying surface qualities. Three surface qualities are defined in Table 1 (see Page 4). There are also other definitions, given by specific manufacturers. In principle:

- Strength grading requirements also apply in terms of knot sizes, for instance.
- Glue lines and finger joints are not defects, since they are specific to a product.
- Wood based panel layers will normally be butt-joined.
- Additional treatment of the surface such as sanding, brushing or profiling can be arranged.
- The desired surface texture of the member must be contractually agreed and stipulated in the specifications.
- The surfaces of a X-Lam member may be supplied with different surface qualities.
- Unless otherwise agreed, the quality will be industrial quality.

Cracking

Moisture will be absorbed mainly by the outer layers of a Cross laminated timber. This moisture content must gradually approach the moisture content during later use.

As with all structural solid timber products, cracks will appear due to drying towards the moisture balance when in use – these are specific to a product and unavoidable.

Transport and assembly

Cross laminated timber components should only be transported and installed by experienced, suitably equipped and trained specialist companies. The following should be taken into account in this respect:

- The members must be protected from moisture and soiling during transportation and up to installation. To prevent discolouration and rust marks, the components must be covered when in the vicinity of welding or cutting of steel.
- Transport packaging must be removed soon after delivery, to reduce the risk of condensate formation followed by blue stain or mildew.
- Members must be stored adequately spaced from the floor, covered with tarpaulin and secured against toppling.
- Adequately dimensioned lifting gear and slings must be used for lifting.
- Cross laminated timber members must be accurately aligned. Support components temporarily, if necessary.
- Keep the installed members covered until the final weather protection is in place.
- To prevent rust marks on the timber members, steel parts must be protected from corrosion before installation.
- See also page 5.



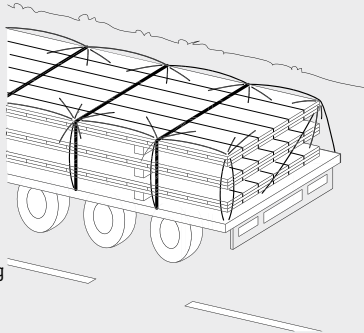
Table 1
Minimum requirements for Cross laminated timber surface qualities
 with top layers made of timber layers or and single layered (1-L) or triple layered (3-L) panels as per EN 13353

Criteria ¹	Industrial quality NSi	Industrial visual quality	Visual quality
1 Surface processing	smoothed, without further surface treatment	planed or sanded	planed or sanded
2 Colour and texture	not specified	largely even	even
3 Species	addition of other species possible	one species; Spruce / Fir would be deemed one wood type	one species; Spruce / Fir would be deemed one type of wood
4 Top layers made of timber layers			
Gap width (at 12% reference moisture content)	no restrictions	≤ 4 mm	≤ 2 mm
Knots	no restrictions	fixed knots and some black knots permitted	fixed knots and some black knots permitted
Resin pockets	no restrictions	isolated smaller resin pockets allowed	isolated smaller resin pockets allowed
Plugins (knothole plugs and wedges)	no restrictions	permitted	isolated occurrence permitted
Blue stain and red stripes	no restrictions	slight discolouration permitted	not permitted
Opened tunnels caused by past insect infestation	no restrictions	not permitted	not permitted
Bark pockets	no restrictions	isolated bark pockets permitted	not permitted
Pith	no restrictions	permitted	isolated occurrence permitted
Compression wood	no restrictions	permitted	isolated occurrence permitted
Rot	not permitted	not permitted	not permitted
5 Top layers made of single layered panels	no restrictions	Surface class C as per EN 13017-1	Surface class B as per EN 13017-1
6 Top layers made of multi-layered panels	no restrictions	Surface class C as per EN 13017-1 up to 1 mm depth	Surface class B as per EN 13017-1 up to 0.5 mm depth

Important notes
For working with Cross laminated timber (BSP)

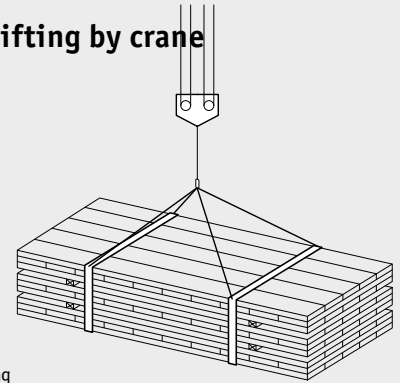
1 Transport and delivery

- Loading sequence should be coordinated with the manufacturer, as necessary.
- The members must be protected from moisture and soiling during transportation.
- Keep driveways clear to allow traffic.
- The ground must be dry and have adequate load-bearing capacity if elements are stored on the building site.



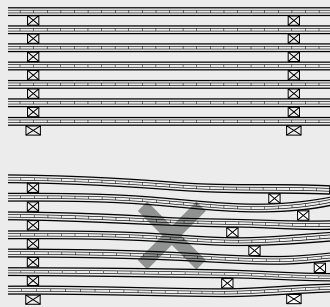
2 Fastening and lifting by crane

- Operation only by trained staff.
- Heed accident prevention regulations.
- Use suitably dimensioned lifting gear and slings, according to installation instructions.
- Check lifting gear, slings and attachment points for damage before use.



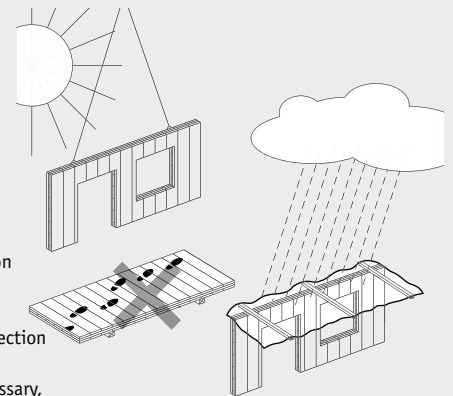
3 Storage at building site

- Use spacer timbers.
- When stacking members horizontally, arrange panels with spacer timbers vertically aligned.
- Store secured against toppling.
- Remove packaging foil to prevent condensate formation.
- Provide adequate ground clearance and tarpaulins to protect members from rain, splash water and rising damp.
- For extended storage, use extra spacer timbers to prevent creep deformation.



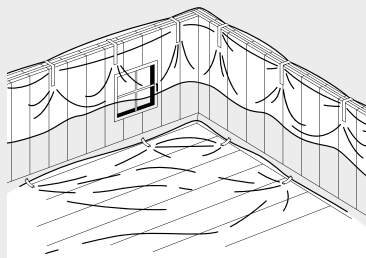
4 Components during installation

- Install in accordance with installation instructions.
- Avoid detrimental absorption of moisture.
- Keep the members covered until the final weather protection is in place.
- Prevent soiling and, if necessary, cover members for protection.



5 Protection as installed

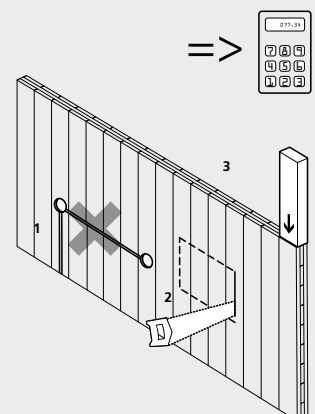
- Covers are useful to prevent soiling of visible surfaces.
- Ensure adequate ventilation to prevent discolouration due to moisture absorption in as-constructed condition (e.g. by screeding or rendering).
- Dry moist members carefully, but soon.



6 Modifications on site

Notches¹, holes² break-throughs² and additional loads³

- The effect of on-site recessing and break-through on load carrying capacities must be discussed with the site engineer in advance.
- The capacity for carrying additionally imposed static loads must be verified.





**Ingenieur
Holzbau.de**

A campaign by
Studiengemeinschaft Holzleimbau e.V.

Studiengemeinschaft Holzleimbau e.V.

Heinz-Fangman-Str. 2
D-42287 Wuppertal
+49 (0)202 · 76 97 27 33 Fax
www.ingenieurholzbau.de
www.brettsperrholz.org
info@brettsperrholz.org

BSP  **Holz**

Picture credits:

Cover picture and Page 3 bottom:

Stora Enso, Ybbs

Page 3 centre:

Merk Timber, Aichach

Page 3 top:

Lignotrend, Weilheim-Bannholz / Herlet, Cologne

1st edition: June 2013

2nd edition: August 2016