



ETA-Danmark A/S  
Göteborg Plads 1  
DK-2150 Nordhavn  
Tel. +45 72 24 59 00  
Internet [www.etadanmark.dk](http://www.etadanmark.dk)

Authorised and notified according  
to Article 29 of the Regulation (EU)  
No 305/2011 of the European  
Parliament and of the Council of 9  
March 2011

MEMBER OF EOTA



## European Technical Assessment ETA-21/0360 of 2022/07/08

### I General Part

**Technical Assessment Body issuing the ETA and designated according to Article 29 of the Regulation (EU) No 305/2011: ETA-Danmark A/S**

**Trade name of the construction product:**

LIGNO acoustic panels

**Product family to which the above construction product belongs:**

Cross laminated timber element

**Manufacturer:**

LIGNOTREND GmbH & Co. KG  
Landstrasse 25  
DE-79809 Weilheim-Bannholz  
Telephone 49 (0) 77 55 / 92 00-0  
Internet [www.lignotrend.com](http://www.lignotrend.com)

**Manufacturing plant:**

LIGNOTREND Produktions GmbH  
Landstrasse 25  
DE-79809 Weilheim-Bannholz

**This European Technical Assessment contains:**

23 pages including 5 annexes which form an integral part of the document

**This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of:**

EAD 130005-00-0304 - Solid wood slab element for use as structural element in buildings

**This version replaces:**

The ETA with the same number issued on 2021-06-25

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## **II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT**

### **1 Technical description of product and intended use**

#### **Technical description of the product**

LIGNO acoustic panels is a cross laminated timber element made of softwood consisting of 3 - 6 layers. The elements are plane.

Individual layers consist of parallel oriented lamellae made of strength graded boards. The boards may be resawn during the production process resulting in boards or strips with smaller widths.

The components and the system setup of the product are given in Annex 1, Figure 1 and Figure 2.

The application of chemical substances (wood preservatives and flame retardants) is not subject of the European technical assessment.

Wood species are softwoods spruce, fir, pine, larch and Douglas fir.

### **2 Specification of the intended use in accordance with the applicable European Assessment Document (hereinafter EAD)**

The cross laminated timber is intended to be used as a structural or non-structural element in buildings and timber structures. The cross laminated timber shall be subjected to static and quasi static actions only.

The cross laminated timber is intended to be used in service classes 1 and 2 according to EN 1995-1-1. Members which are directly exposed to the weather shall be provided with an effective protection for the cross laminated timber element in service.

The performances given in Section 3 are only valid if the cross laminated timber elements are used in compliance with the specifications and conditions given in Annex 1 to 5.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the cross laminated timber element of at least 50 years.

The real working life may be, in normal conditions, considerably longer without major degradation affecting the essential requirements of the works.

The indications given on the working life cannot be interpreted as a guarantee given by the producer or the Technical Assessment Body but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

### 3 Performance of the product and references to the methods used for its assessment

| Characteristic   | Assessment of characteristic   |
|--|--|
| <b>3.1 Mechanical resistance and stability (BWR1)<sup>1)</sup></b> |  |
| Bending <sup>2)</sup>  | Annex 3  |
| Tension and compression <sup>2)</sup>                              | Annex 3  |
| Shear <sup>2)</sup>  | Annex 3  |
| Embedment strength   | Annex 3  |
| Creep and duration of the load                                     | Annex 3  |
| Dimensional stability  | Annex 3  |
| In-service environment   | Annex 3  |
| Bond integrity   | Annex 3  |
| <b>3.2 Safety in case of fire (BWR2)</b>                           |  |
| Reaction to fire   | Annex 3  |
| Resistance to fire   | Annex 3  |
| <b>3.3 Hygiene, health and the environment (BWR3)</b>              |  |
| Content, emission and/or release of dangerous substances           | The manufacturer has submitted a written declaration that no dangerous substances > 0.1 wt. % are used in the product assessed by the present ETA.<br>Only wood-based panels which can be assigned to formaldehyde class E1 according to EN 13986 shall be used. The use of wood preservatives and flame retardants is excluded.<br>The chemical composition of the adhesives for gluing the boards and the finger joints of the individual boards has to be in compliance with the chemical composition deposited at ETA Danmark A/S. |
| Water vapour permeability – Water vapour transmission              | No performance assessed  |
| <b>3.4 Safety in use (BWR4)</b>                                    |  |
| Impact resistance  | Annex 3  |
| <b>3.5 Protection against noise (BWR5)</b>                         |  |
| Airborne sound insulation  | No performance assessed  |
| Impact sound insulation  | No performance assessed  |
| Sound absorption   | Annex 3  |
| <b>3.6 Energy economy and heat retention (BWR6)</b>                |  |
|  | No performance assessed  |

1) This characteristic also relates to BWR 4

2) Load bearing capacity and stiffness regarding mechanical actions perpendicular to and in plane of the cross laminated timber element.

### **3.7 Manufacturing**

The cross laminated timber elements are manufactured in accordance with the provisions of this European technical assessment using the automated manufacturing process in accordance with the technical documentation.

The layers shall be bonded together to the required thickness of the cross laminated timber.

Specifications of the used boards are given in Annex 2. Boards are visually or machine strength graded. Only technically dried wood shall be used.

The boards or the basic elements may be connected by finger joints in longitudinal direction according to EN 14080. There shall be no butt joints.

The cross laminated timber elements correspond to the specifications given in Annexes 1 to 3 of this European technical assessment. The material characteristics, dimensions and tolerances of the cross laminated timber elements not indicated in these Annexes are given in the technical documentation of the European technical assessment.

### **3.8 Design**

The European Technical Assessment only applies to the manufacture and use of cross laminated timber elements. Verification of stability of the building while using the cross laminated timber elements is not subject of the European Technical Assessment.

The following conditions shall be observed:

- Design of the cross laminated timber elements is carried out under the responsibility of an engineer experienced in such products.
- Design of the works shall account for the protection of the cross laminated timber elements.
- The cross laminated timber elements are installed correctly.

Design of the cross laminated timber element can be performed according to EN 1995-1-1, taking into account Annexes 2 to 5 of the European Technical Assessment. Standards and regulations valid in the place of use shall be considered.

## **4 Attestation and verification of constancy of performance (AVCP)**

### **4.1 AVCP system**

According to the Decision 97/176/EC of the European Commission, as amended by 2001/596/EC, the system of assessment and verification of constancy of performance (see Annex V to the regulation (EU) No 305/2011) is System 1.

## **5 Technical details necessary for the implementation of the AVCP system, as foreseen in the applicable EAD**

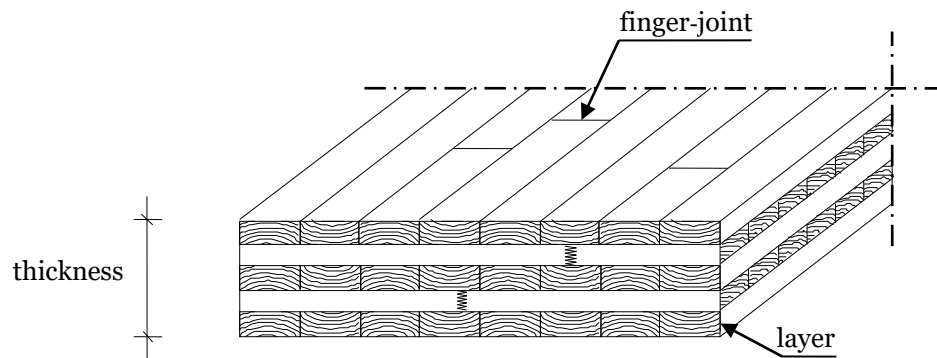
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at ETA-Danmark prior to CE marking

Issued in Copenhagen on 2022-07-08 by

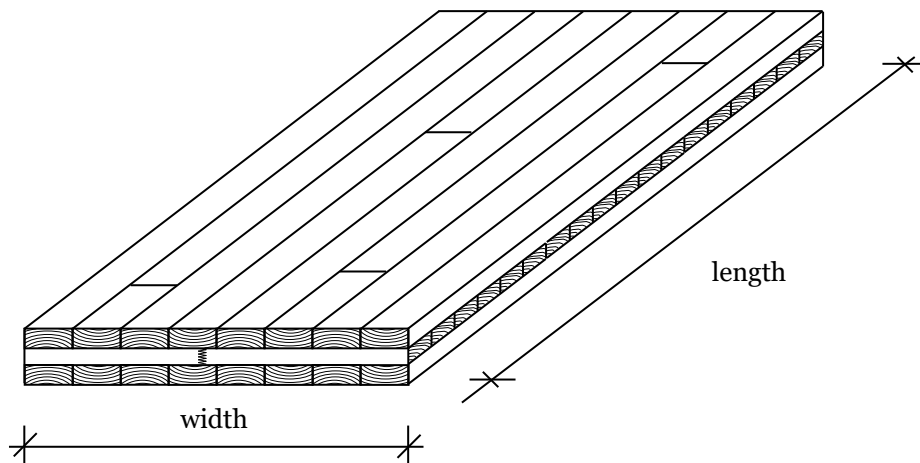


Thomas Bruun  
Managing Director, ETA-Danmark

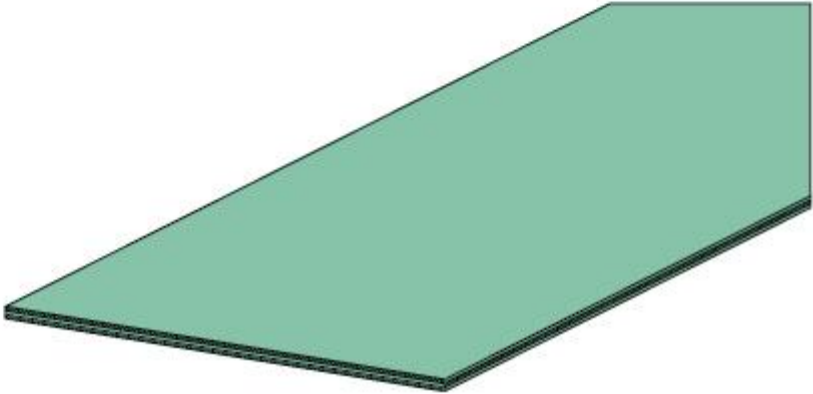
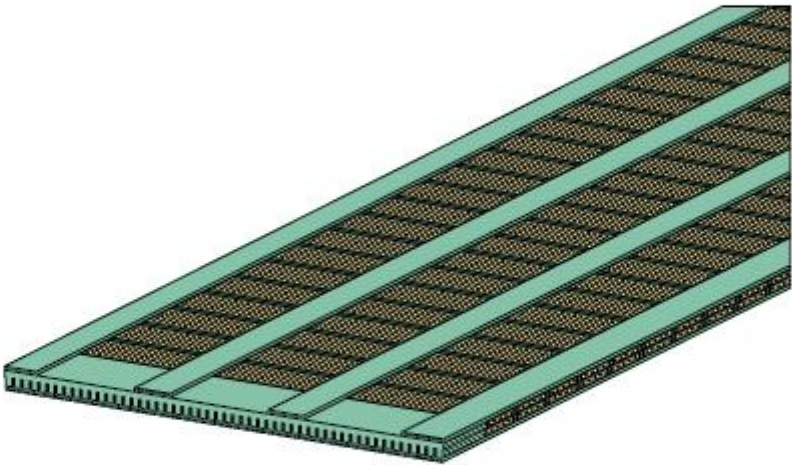
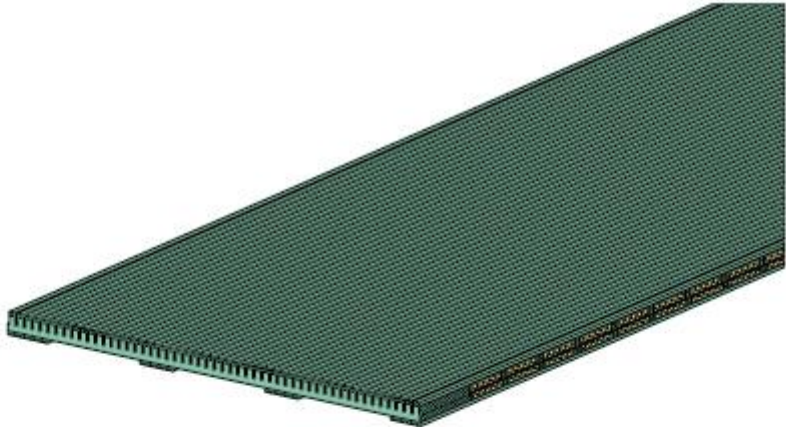
**Annex 1**  
**Construction of the wood slab elements "Lignotrend LIGNO acoustic panels" (example)**



**Figure 1: Principle structure of the cross laminated timber (five layers)**

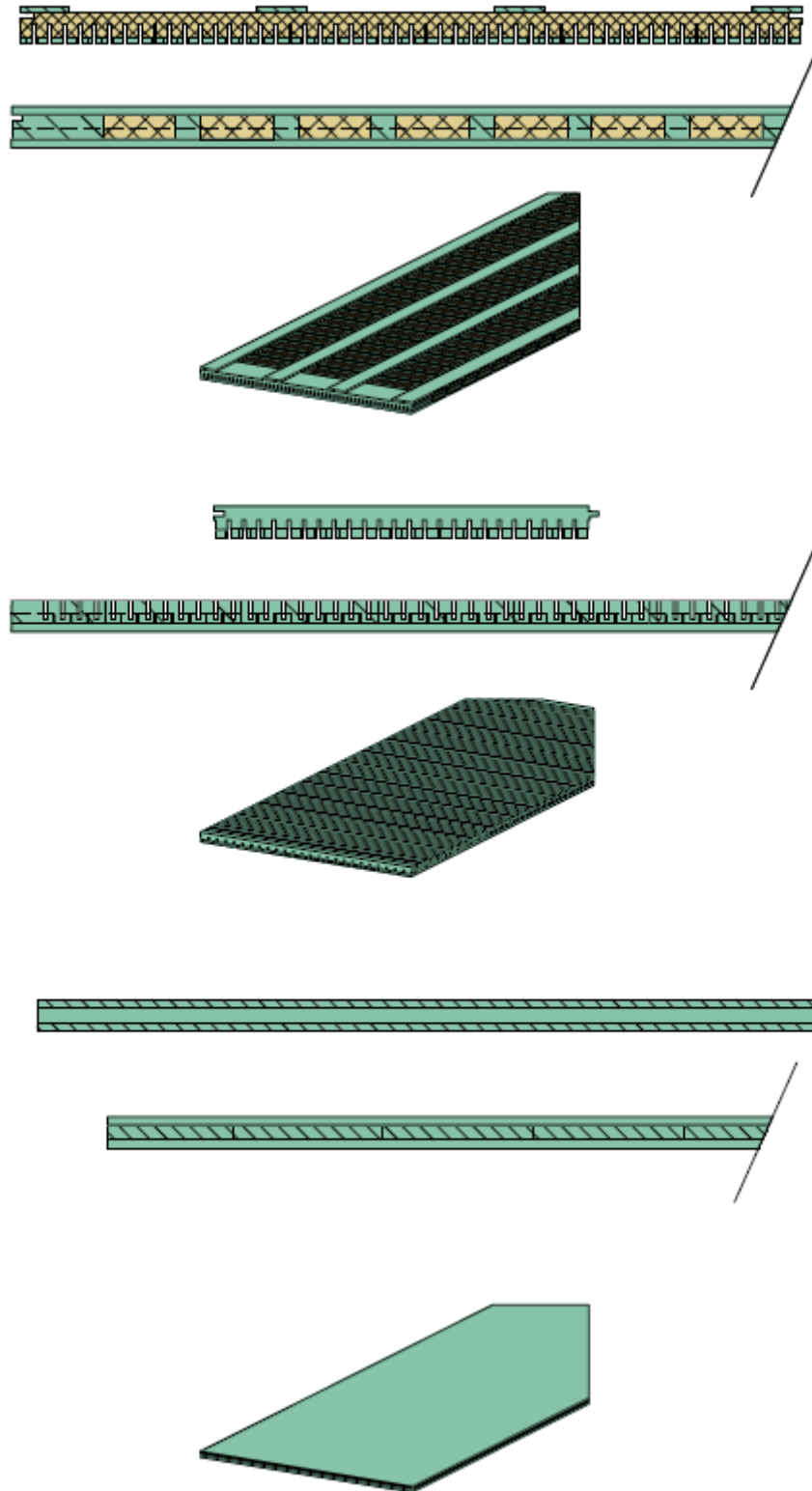


**Figure 2: Principle cross laminated timber element (three layers)**



**Figure 3 LIGNO Panels**





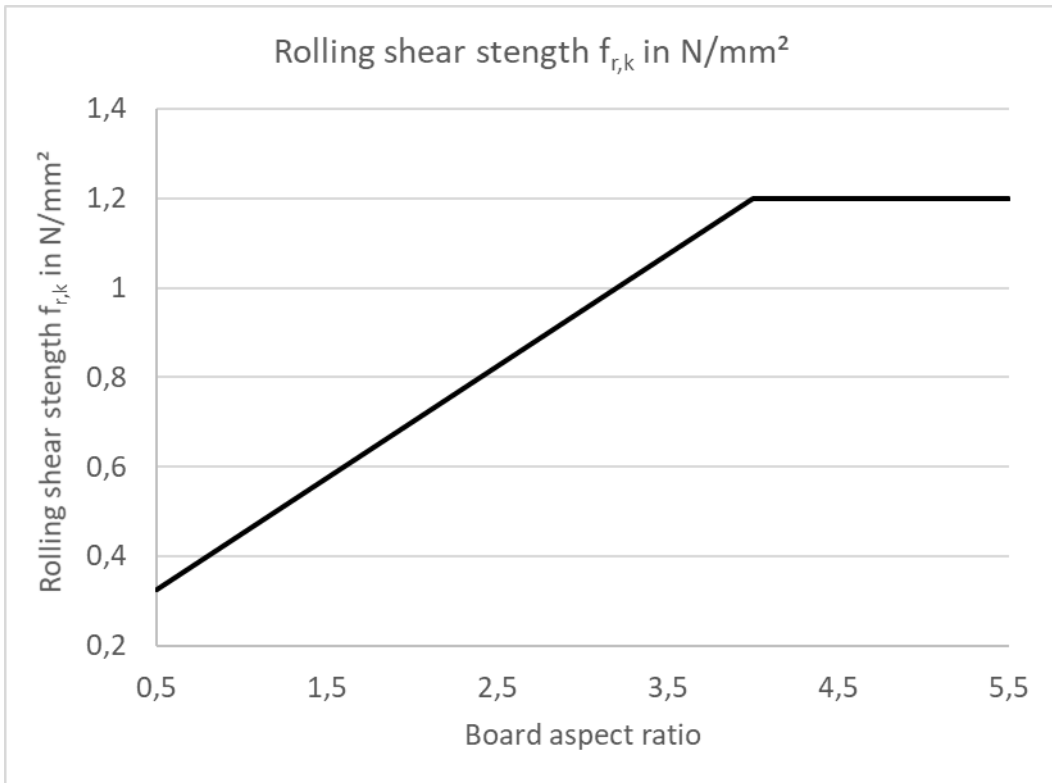
**Figure 4 LIGNO Panels**

**Annex 2**  
**Dimensions and specifications of the cross laminated timber**

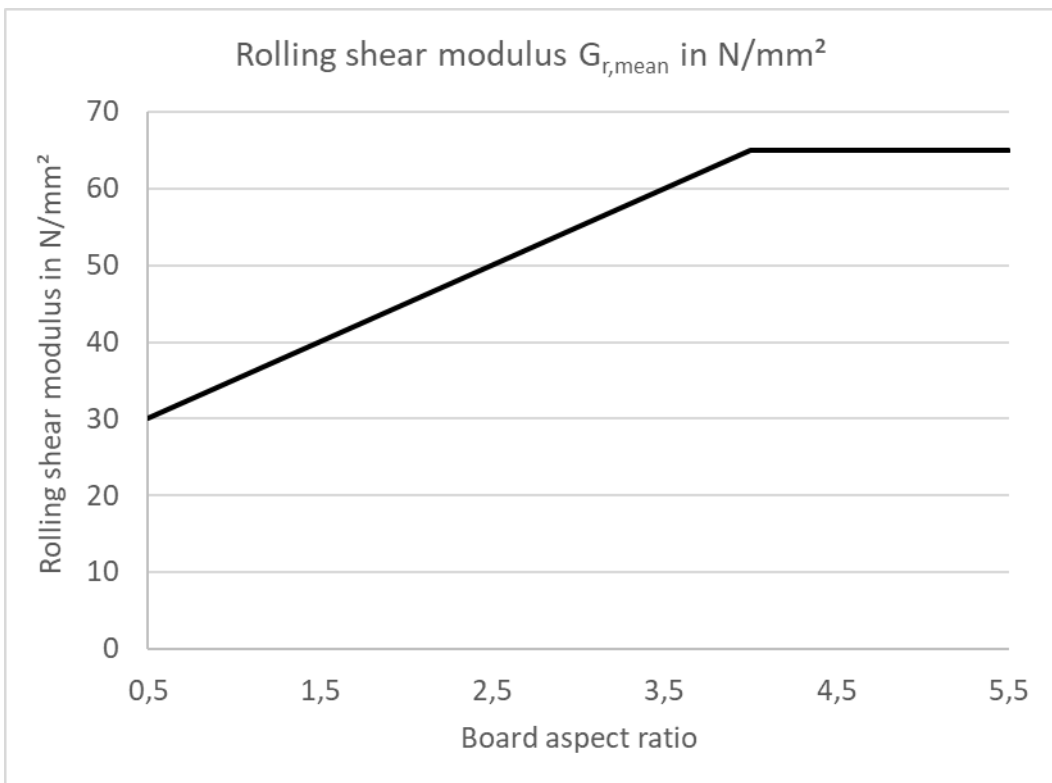
| Characteristic  | Dimensions and specifications  |
|---|--|
| <b>Cross laminated timber element</b>   |  |
| Thickness   | 15 to 66 mm  |
| Tolerance in thickness  | ± 1 mm   |
| Width   | ≤ 1,25 m   |
| Tolerance in width  | ± 1 mm   |
| Length  | ≤ 8,00 m   |
| Tolerance in length   | ± 3 mm   |
| Number of layers  | $2 \leq n \leq 6$  |
| Maximum number of consecutive layers having the same grain direction                    | 2  |
| Maximum width of gaps between adjacent boards in longitudinal layers<br>in cross layers | 150 mm<br>68 mm  |
| <b>Boards</b>   |  |
| Material  | Softwood   |
| Strength class according to EN 338  | Not resawn or resawn non-load-bearing boards:<br>C16, C24, C30   |
|   | Resawn and knot-free boards:<br>≥ C30 or D30   |
| Thickness<br>in longitudinal layers<br>in cross layers                                  | 5 to 40 mm<br>5 to 40 mm   |
| Width   | 10 to 68 mm  |
| Ratio width to thickness of the cross-layer boards or strips                            | ≥ 1:2  |
| Moisture of wood according to EN 13183-2  | 8±2; 9±2, 10±2<br>Within one cross laminated timber element only one of the specified moisture ranges shall be applied |
| Finger joints   | EN 14080   |

**Annex 3**  
**Essential Requirements of the cross laminated timber**

| ER                                     | Requirement   | Verification method  | Class / Use category / value                              |                      |
|--|---|--|---|----------------------|
| <b>1</b>                               | <b>Mechanical resistance and stability</b>  |  |   |                      |
|  | Bending, tension and compression strength and stiffness:<br>For the calculation, the characteristic strength and stiffness values of homogeneous glulam according to EN 14080 shall be used taking into consideration the definitions in annex 2.<br>For boards C16, the characteristic strength and stiffness values of GL 20h, for boards C24, the characteristic strength and stiffness values of GL 24h, and for boards C30 or D30, the characteristic strength and stiffness values of GL 28h shall be used.<br>In addition, the following values apply: |  |   |                      |
|  | Mechanical actions in plane of the cross laminated timber   | Shear strength for the calculation with the gross cross section (5% - fractile)                                      | $f_{v,k}$   | as given in Annex 5  |
|  | Mechanical actions perpendicular to the cross laminated timber  | Rolling shear strength (5% - fractile)   | $f_{r,k}$   | as given in Figure 3 |
|  |   | Rolling shear modulus (mean value)   | $G_{r,mean}$  | as given in Figure 4 |
|  | For references regarding the calculation see annexes 4 to 5. National regulations might have to be followed.  |  |   |                      |
|  | Use of fasteners  | According to EN 1995-1-1   |   |                      |
|  | Creep and duration of load  | According to EN 1995-1-1   |   |                      |
|  | Dimensional stability   | Moisture content during use shall not change to such extent that adverse deformations can occur.                     |   |                      |
|  | <b>2</b>  | <b>Behaviour in case of fire</b>   |   |                      |
| <b>Reaction to fire</b>                |   |  |   |                      |
| Solid wood panels except for floorings |   | Commission Decision 2005/610/EC  | Euroclass D-s2, d0 or better, as given in figures 5 to 7. |                      |
| Floorings                              |   |  | Euroclass D <sub>fl</sub> -s1                             |                      |
| <b>Resistance to fire</b>              |   |  |   |                      |
| Charring rate                          | EN 1995-1-2   | $\beta_0 = 0,65$ mm/min<br>$\beta_n = 0,7$ mm/min  |   |                      |
| <b>3</b>                               | <b>Hygiene, health and the environment</b>  |  |   |                      |
|  | Vapour permeability $\mu$   | No performance assessed  |   |                      |
|  | Content of dangerous substances   | EAD 130005-00-0340   | See clause 3  |                      |
| <b>4</b>                               | <b>Safety in use</b>  |  |   |                      |
|  | Impact resistance   | Soft body resistance is assumed to be fulfilled for walls with a minimum of 3 layers and minimum thickness of 33 mm. |   |                      |
| <b>5</b>                               | <b>Protection against noise</b>   |  |   |                      |
|  | Airborne sound insulation   | No performance assessed  |   |                      |
|  | Impact sound insulation   | No performance assessed  |   |                      |
|  | Sound absorption  | As given in table 1-8  |   |                      |
| <b>6</b>                               | <b>Energy economy and heat retention</b>  |  |   |                      |
|  | Thermal conductivity $\lambda$  | No performance assessed  |   |                      |
|  | Air tightness   | No performance assessed  |   |                      |
|  | Thermal inertia $c_p$   | No performance assessed  |   |                      |



**Figure 3:** Rolling Shear Strength  $f_{r,k}$

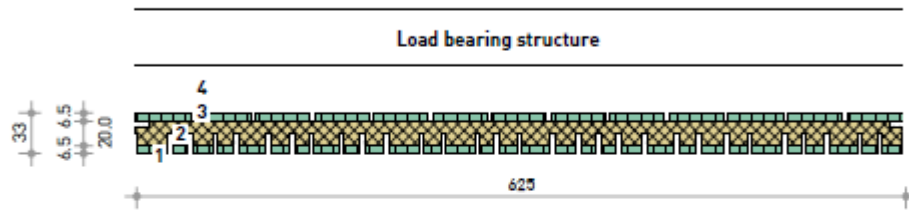


**Figure 4:** Rolling Shear Modulus  $G_{r,mean}$

Classification: B-s2,d0 B (fire behaviour)-s2 (smoke production), d0 (burning droplets)  
 Classification Report: 903 5146 000-9  
 Application: For surface application with or without any joints  
 Subject: LIGNO Akustik light 3G-33 and LIGNO Akustik Sport 3G-33

Lateral section

M 1:5



Longitudinal section

M 1:10



| Nr. | thickness/width (mm) | Material  | Material treatment                    | Tested surface profiles                              |
|-----|----------------------|---|---------------------------------------|--|
| 1   | 6,5                  | Fir or Spruce single-layer board                      | Fir-impregnated or Spruce-impregnated | Slat width 12-25mm or 18-38mm, slot width 4mm or 6mm |
| 2   | 20/58                | Wooden soft-fibre as an absorber, 70% area percentage | -                                     | -  |
|     | 20/24                | Softwood slats, 30% area percentage                   | untreated                             | -  |
|     | 6,5/44               | Longitudinal slats                                    | untreated                             | -  |
| 4   |                      | application with rear - ventilation                   |                                       |  |

Legend:

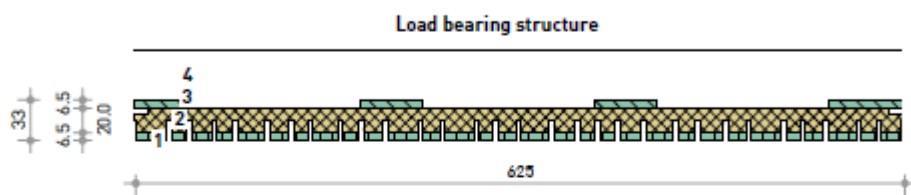
-  Timber Longitudinal
-  Timber transversal
-  Wood fibre
-  Single-layer board

**Figure 5:** Reaction to fire performance For surface application with or without any joints

**Classification:** C-s2,d0 C (fire behaviour)-s2 (smoke production), d0 (burning droplets)  
**Classification Report:** 903 6026 000-9  
**Application:** For surface application with or without any joints  
**Subject:** LIGNO Akustik light 35-33

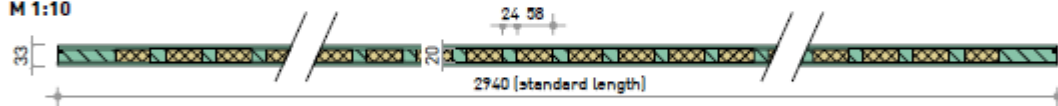
**Lateral section**

**M 1:5**



**Longitudinal section**

**M 1:10**

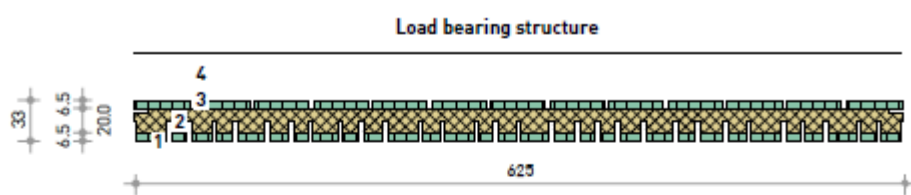


| Nr.                                   | thickness/width (mm) | Material  | Material treatment                    | Tested surface profiles                              |
|---------------------------------------|----------------------|---|---------------------------------------|--|
| 1                                     | 6,5                  | Fir or Spruce single-layer board, slotted             | Fir-impregnated or Spruce-impregnated | Slat width 12-25mm or 18-38mm, slot width 4mm or 6mm |
| 2                                     | 20/58                | Wooden soft-fibre as an absorber, 70% area percentage | -                                     | -  |
| 3                                     | 20/24                | Softwood slats, 30% area percentage                   | untreated                             | -  |
| 4                                     | 6,5/50               | Longitudinal slats                                    | untreated                             | -  |
| 4 application with rear - ventilation |                      |   |                                       |  |

**Classification:** C-s2,d0 C (fire behaviour)-s2 (smoke production), d0 (burning droplets)  
**Classification Report:** 903 6026 000-9  
**Application:** For surface application with or without any joints  
**Subject:** LIGNO Akustik light 3G-33 and LIGNO Akustik Sport 3G-33

**Lateral section**

**M 1:5**



**Longitudinal section**

**M 1:10**



| Nr.                                   | thickness/width (mm) | Material  | Material treatment  | Tested surface profiles                              |
|---------------------------------------|----------------------|---|---|--|
| 1                                     | 6,5                  | Fir or Spruce single-layer board, slotted             | Fir or Spruce-impregnated. With UV wood finish "ADLER Lignovit" or oiled surface with "ADLER Legno-Öl" or varnished surface with "HD-Lux Spritzlack" of Heidelberg Lackfabrik- Dr. Rentsch GmbH. Or oiled surface with "Bianco Öl" of Bioraum GmbH. | Slat width 12-25mm or 18-38mm, slot width 4mm or 6mm |
| 2                                     | 20/58                | Wooden soft-fibre as an absorber, 70% area percentage | -   | -  |
| 3                                     | 20/24                | Softwood slats, 30% area percentage                   | untreated   | -  |
| 4                                     | 6,5/44               | Longitudinal slats                                    | untreated   | -  |
| 4 application with rear - ventilation |                      |   |   |  |

**Legend:**

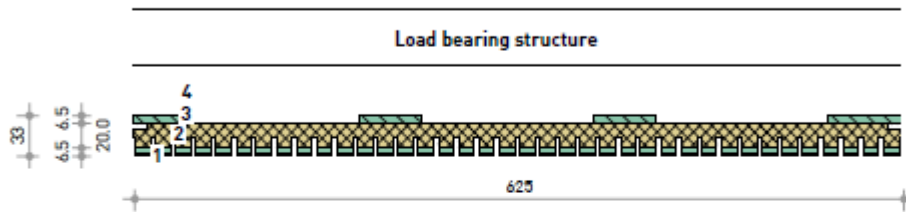


**Figure 6:** Reaction to fire performance For surface application with or without any joints

Classification: C-s2,d0 C (fire behaviour)-s2 (smoke production), d0 (burning droplets)  
 Classification Report: 902 8955 000-6  
 Application: For surface application with or without any joints  
 Subject: LIGNO Akustik light 3S-33

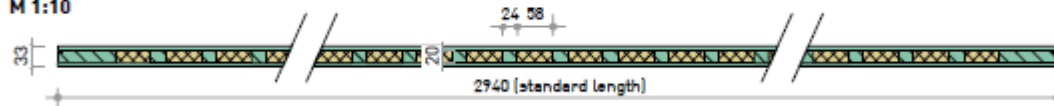
**Lateral section**

M 1:5







**Longitudinal section**

M 1:10



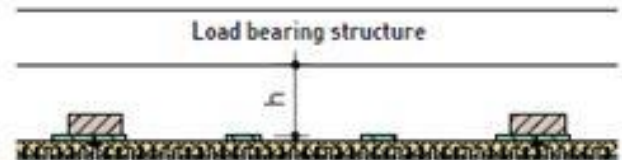
| Nr. | thickness/width (mm) | Material  | Material treatment | Tested surface profiles                              |
|-----|----------------------|---|--------------------|--|
| 1   | 6,5                  | Plywood, Fir with a veneered surface made from oak wood | Fir-impregnated.   | Slat width 12-25mm or 18-38mm, slot width 4mm or 6mm |
| 2   | 20/58                | Wooden soft-fibre as an absorber, 70% area percentage   | -                  | -  |
|     | 20/24                | Softwood slats, 30% area percentage                     | untreated          | -  |
| 3   | 6,5/50               | Profiled surface, longitudinal slats                    | untreated          | -  |
| 4   |                      | application with rear-ventilation                       |                    |  |

**Legend:**

-  Timber Longitudinal
-  Timber transversal
-  Wood fibre
-  Plywood + oak veneer

**Figure 7:** Reaction to fire performance For surface application with or without any joints

Subject: LIGNO Acoustic light 35\_33  
 Application: Acoustic absorption with cavity



#### installed in front of h= 30 mm cavity

| Profile     | $\alpha_w$ | $\alpha_p$ | NRC  | SAA  | SAK | Form. | 125 Hz | 250 Hz | 500 Hz | 1 kHz | 2 kHz | 4 kHz | Testing Report            |
|-------------|------------|------------|------|------|-----|-------|--------|--------|--------|-------|-------|-------|---------------------------|
| 625-12-4    | 0,60       | 0,10       | 0,75 | 0,73 | C   | MH    | 0,10   | 0,30   | 0,75   | 0,95  | 0,90  | 0,75  | BAE 14-330-27             |
| 625-18-6    | 0,60       | 0,10       | 0,75 | 0,73 | C   | MH    | 0,10   | 0,30   | 0,75   | 0,95  | 0,90  | 0,70  | BAE 17-329-02_ STN07.2018 |
| 625-20-4    | 0,65       | 0,10       | 0,70 | 0,72 | C   | M     | 0,10   | 0,35   | 0,80   | 0,95  | 0,80  | 0,60  | BAE 14-330-28_ STN07.2018 |
| 625-23-8    | 0,60       | 0,10       | 0,75 | 0,73 | C   | MH    | 0,10   | 0,30   | 0,75   | 0,95  | 0,90  | 0,75  | BAE 17-329-10_ STN07.2018 |
| 625-12n25-4 | 0,65       | 0,15       | 0,75 | 0,74 | C   | M     | 0,15   | 0,35   | 0,75   | 0,95  | 0,85  | 0,70  | BAE 14-330-29             |
| 625-18n38-6 | 0,65       | 0,10       | 0,75 | 0,73 | C   | M     | 0,10   | 0,35   | 0,80   | 0,95  | 0,80  | 0,65  | BAE 17-329-04             |

#### installed in front of h= 100 mm cavity

| Profile  | $\alpha_w$ | $\alpha_p$ | NRC  | SAA  | SAK | Form. | 125 Hz | 250 Hz | 500 Hz | 1 kHz | 2 kHz | 4 kHz | Testing Report |
|----------|------------|------------|------|------|-----|-------|--------|--------|--------|-------|-------|-------|----------------|
| 625-12-4 | 0,80       | 0,25       | 0,80 | 0,81 | B   | -     | 0,25   | 0,60   | 0,80   | 0,85  | 0,90  | 0,70  | BAE 18-311-01  |
| 625-18-6 | 0,85       | 0,25       | 0,80 | 0,80 | B   | -     | 0,25   | 0,65   | 0,80   | 0,90  | 0,90  | 0,70  | BAE 18-311-04  |
| 625-23-8 | 0,80       | 0,30       | 0,80 | 0,79 | B   | -     | 0,30   | 0,60   | 0,80   | 0,90  | 0,90  | 0,70  | BAE 18-311-06  |
| 625-20-4 | 0,80       | 0,30       | 0,75 | 0,77 | B   | -     | 0,30   | 0,60   | 0,80   | 0,85  | 0,80  | 0,60  | BAE 18-311-02  |

#### installed in front of h= 150 mm cavity

| Profile  | $\alpha_w$ | $\alpha_p$ | NRC  | SAA  | SAK | Form. | 125 Hz | 250 Hz | 500 Hz | 1 kHz | 2 kHz | 4 kHz | Testing Report |
|----------|------------|------------|------|------|-----|-------|--------|--------|--------|-------|-------|-------|----------------|
| 625-12-4 | 0,75       | 0,45       | 0,70 | 0,72 | C   | -     | 0,45   | 0,60   | 0,75   | 0,80  | 0,75  | 0,65  | K_B 6435-09-1  |

#### installed in front of h= 200 mm cavity

| Profile     | $\alpha_w$ | $\alpha_p$ | NRC  | SAA  | SAK | Form. | 125 Hz | 250 Hz | 500 Hz | 1 kHz | 2 kHz | 4 kHz | Testing Report            |
|-------------|------------|------------|------|------|-----|-------|--------|--------|--------|-------|-------|-------|---------------------------|
| 625-12-4    | 0,80       | 0,40       | 0,80 | 0,80 | B   | -     | 0,40   | 0,75   | 0,80   | 0,75  | 0,90  | 0,70  | K_B 6827-10-2             |
| 625-20-4    | 0,75       | 0,50       | 0,80 | 0,78 | B   | -     | 0,50   | 0,70   | 0,75   | 0,85  | 0,80  | 0,55  | BAE 14-330-04_ STN07.2018 |
| 625-12n25-4 | 0,75       | 0,45       | 0,80 | 0,80 | C   | -     | 0,45   | 0,70   | 0,75   | 0,85  | 0,85  | 0,60  | BAE 14-330-03             |

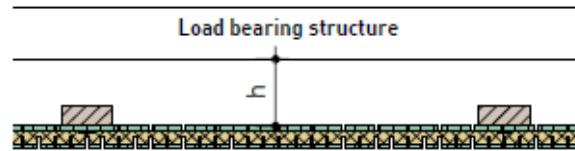
#### installed in front of h= 400 mm cavity

| Profile  | $\alpha_w$ | $\alpha_p$ | NRC  | SAA  | SAK | Form. | 125 Hz | 250 Hz | 500 Hz | 1 kHz | 2 kHz | 4 kHz | Testing Report |
|----------|------------|------------|------|------|-----|-------|--------|--------|--------|-------|-------|-------|----------------|
| 625-12-4 | 0,80       | 0,60       | 0,80 | 0,81 | B   | -     | 0,60   | 0,70   | 0,70   | 0,90  | 0,95  | 0,70  | BAE 14-330-01  |

**Table 1:** Acoustic absorption with cavity



Subject: LIGNO Acoustic light / Sport 3G\_33  
 Application: Acoustic absorption with cavity



installed in front of h= 30 mm cavity

| Profile     | $\alpha_w$ | $\alpha_p$ | NRC  | SAA  | SAK Form. | 125 Hz | 250 Hz | 500 Hz | 1 kHz | 2 kHz | 4 kHz | Testing Report |
|-------------|------------|------------|------|------|-----------|--------|--------|--------|-------|-------|-------|----------------|
| 625-12-4    | 0,60       | 0,10       | 0,70 | 0,68 | C MH      | 0,10   | 0,35   | 0,60   | 0,85  | 0,90  | 0,70  | BAE 18-323-03  |
| 625-22n40-4 | 0,60       | 0,15       | 0,65 | 0,67 | C M       | 0,15   | 0,40   | 0,70   | 0,90  | 0,70  | 0,45  | BAE 19-323-09  |

installed in front of h= 100 mm cavity

| Profile     | $\alpha_w$ | $\alpha_p$ | NRC  | SAA  | SAK Form. | 125 Hz | 250 Hz | 500 Hz | 1 kHz | 2 kHz | 4 kHz | Testing Report |
|-------------|------------|------------|------|------|-----------|--------|--------|--------|-------|-------|-------|----------------|
| 625-12-4    | 0,70       | 0,25       | 0,70 | 0,70 | C -       | 0,25   | 0,50   | 0,65   | 0,80  | 0,90  | 0,70  | BAE 18-323-04  |
| 625-20-4    | 0,65       | 0,30       | 0,70 | 0,69 | C -       | 0,30   | 0,45   | 0,65   | 0,85  | 0,80  | 0,50  | BAE 17-345-03  |
| 625-12n25-4 | 0,70       | 0,25       | 0,70 | 0,70 | C -       | 0,25   | 0,50   | 0,60   | 0,85  | 0,85  | 0,60  | BAE 18-311-08  |
| 625-22n40-4 | 0,65       | 0,25       | 0,70 | 0,67 | C -       | 0,25   | 0,45   | 0,65   | 0,85  | 0,70  | 0,50  | BAE 19-323-19  |

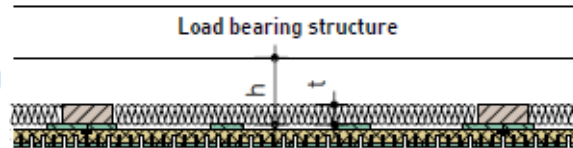
installed in front of h= 200 mm cavity

| Profile     | $\alpha_w$ | $\alpha_p$ | NRC  | SAA  | SAK Form. | 125 Hz | 250 Hz | 500 Hz | 1 kHz | 2 kHz | 4 kHz | Testing Report |
|-------------|------------|------------|------|------|-----------|--------|--------|--------|-------|-------|-------|----------------|
| 625-12-4    | 0,70       | 0,40       | 0,70 | 0,70 | C -       | 0,40   | 0,50   | 0,60   | 0,80  | 0,90  | 0,70  | BAE 18-323-08  |
| 625-20-4    | 0,60       | 0,30       | 0,65 | 0,66 | C M       | 0,30   | 0,40   | 0,55   | 0,85  | 0,80  | 0,60  | BAE 19-323-27  |
| 625-22n40-4 | 0,65       | 0,35       | 0,65 | 0,67 | C -       | 0,35   | 0,45   | 0,60   | 0,85  | 0,70  | 0,50  | BAE 19-323-26  |

**Table 2:** Acoustic absorption with cavity

Subject: LIGNO Acoustic light 3S\_33

Application: Acoustic absorption with extra absorber (hemp)



installed in front of h= 30 mm cavity, backed with t= 30 mm hemp

| Profile     | $\alpha_w$ | $\alpha_p$ | NRC  | SAA  | SAK | Form. | 125 Hz | 250 Hz | 500 Hz | 1 kHz | 2 kHz | 4 kHz | Testing Report               |
|-------------|------------|------------|------|------|-----|-------|--------|--------|--------|-------|-------|-------|------------------------------|
| 625-12-4    | 0,85       | 0,20       | 0,85 | 0,83 | B   | -     | 0,20   | 0,55   | 0,85   | 0,95  | 0,90  | 0,75  | BAE 14-330-25                |
| 625-18-6    | 0,80       | 0,25       | 0,80 | 0,78 | B   | -     | 0,25   | 0,55   | 0,75   | 0,90  | 0,90  | 0,80  | BAE 14-330-23_<br>STN07.2018 |
| 625-20-4    | 0,75       | 0,20       | 0,80 | 0,80 | C   | -     | 0,20   | 0,55   | 0,90   | 0,95  | 0,80  | 0,60  | BAE 14-330-24_<br>STN07.2018 |
| 625-12n25-4 | 0,80       | 0,25       | 0,80 | 0,81 | B   | -     | 0,25   | 0,55   | 0,85   | 0,95  | 0,90  | 0,65  | BAE 14-330-21                |

installed in front of h= 100 mm cavity, backed with t= 30 mm hemp

| Profile  | $\alpha_w$ | $\alpha_p$ | NRC  | SAA  | SAK | Form. | 125 Hz | 250 Hz | 500 Hz | 1 kHz | 2 kHz | 4 kHz | Testing Report |
|----------|------------|------------|------|------|-----|-------|--------|--------|--------|-------|-------|-------|----------------|
| 625-12-4 | 0,85       | 0,40       | 0,85 | 0,83 | B   | -     | 0,40   | 0,65   | 0,85   | 0,90  | 0,90  | 0,75  | BAE 18-311-13  |

installed in front of h= 150 mm cavity, backed with t= 30 mm hemp

| Profile  | $\alpha_w$ | $\alpha_p$ | NRC  | SAA  | SAK | Form. | 125 Hz | 250 Hz | 500 Hz | 1 kHz | 2 kHz | 4 kHz | Testing Report |
|----------|------------|------------|------|------|-----|-------|--------|--------|--------|-------|-------|-------|----------------|
| 625-12-4 | 0,80       | 0,55       | 0,75 | 0,75 | B   | -     | 0,55   | 0,65   | 0,75   | 0,80  | 0,75  | 0,70  | K_B 6435-09-1  |

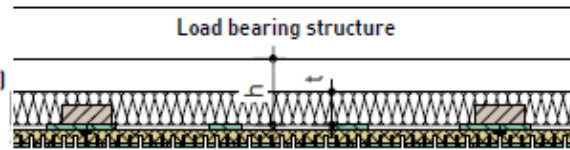
installed in front of h= 200 mm cavity, backed with t= 30 mm hemp

| Profile     | $\alpha_w$ | $\alpha_p$ | NRC  | SAA  | SAK | Form. | 125 Hz | 250 Hz | 500 Hz | 1 kHz | 2 kHz | 4 kHz | Testing Report               |
|-------------|------------|------------|------|------|-----|-------|--------|--------|--------|-------|-------|-------|------------------------------|
| 625-12-4    | 0,80       | 0,55       | 0,85 | 0,83 | B   | -     | 0,55   | 0,80   | 0,75   | 0,85  | 0,90  | 0,70  | BAE 14-330-11                |
| 625-20-4    | 0,75       | 0,55       | 0,80 | 0,80 | C   | L     | 0,55   | 0,80   | 0,75   | 0,90  | 0,80  | 0,55  | BAE 14-330-09_<br>STN07.2018 |
| 625-12n25-4 | 0,80       | 0,50       | 0,80 | 0,80 | B   | -     | 0,50   | 0,70   | 0,75   | 0,90  | 0,85  | 0,65  | BAE 14-330-08                |

**Table 3:** Acoustic absorption with extra absorber (hemp)

Subject: LIGNO Acoustic light 35\_33

Application: Acoustic absorption with extra absorber (fleece)



installed in front of h= 100 mm cavity, backed with t= 50 mm fleece

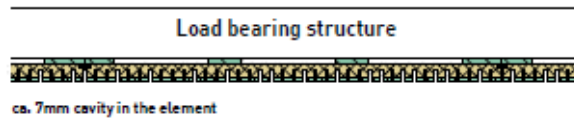
| Profile  | $\alpha_w$ | $\alpha_p$ | NRC  | SAA  | SAK | Form. | 125 Hz | 250 Hz | 500 Hz | 1 kHz | 2 kHz | 4 kHz | Testing Report |
|----------|------------|------------|------|------|-----|-------|--------|--------|--------|-------|-------|-------|----------------|
| 625-12-4 | 0,85       | 0,55       | 0,85 | 0,85 | B   | 0     | 0,55   | 0,75   | 0,80   | 0,90  | 0,95  | 0,70  | BAE 18-311-10  |
| 625-23-8 | 0,85       | 0,55       | 0,85 | 0,84 | B   | 0     | 0,55   | 0,75   | 0,80   | 0,90  | 0,90  | 0,75  | BAE 18-311-12  |
| 625-20-4 | 0,80       | 0,55       | 0,85 | 0,84 | B   | 0     | 0,55   | 0,80   | 0,80   | 0,90  | 0,85  | 0,60  | BAE 18-311-11  |

installed in front of h= 100 mm cavity, backed with t=100 mm fleece

| Profile  | $\alpha_w$ | $\alpha_p$ | NRC  | SAA  | SAK | Form. | 125 Hz | 250 Hz | 500 Hz | 1 kHz | 2 kHz | 4 kHz | Testing Report |
|----------|------------|------------|------|------|-----|-------|--------|--------|--------|-------|-------|-------|----------------|
| 625-12-4 | 0,85       | 0,70       | 0,85 | 0,83 | B   | 0     | 0,70   | 0,75   | 0,80   | 0,90  | 0,95  | 0,75  | BAE 18-311-14  |
| 625-23-8 | 0,85       | 0,75       | 0,80 | 0,82 | B   | 0     | 0,75   | 0,70   | 0,75   | 0,90  | 0,90  | 0,75  | BAE 18-311-16  |
| 625-20-4 | 0,80       | 0,75       | 0,80 | 0,82 | B   | 0     | 0,75   | 0,75   | 0,80   | 0,90  | 0,85  | 0,60  | BAE 18-311-15  |

**Table 4:** Acoustic absorption with extra absorber (fleece)

Subject: LIGNO Acoustic light 35\_33  
Application: Directly installed

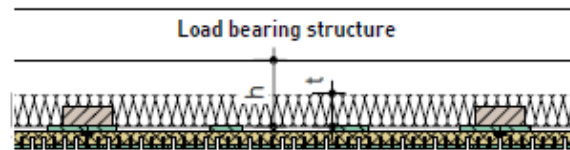


installed without cavity, only on level timber construction

| Profile     | $\alpha_w$ | $\alpha_p$ | NRC  | SAA  | SAK Form. | 125 Hz | 250 Hz | 500 Hz | 1 kHz | 2 kHz | 4 kHz | Testing Report               |
|-------------|------------|------------|------|------|-----------|--------|--------|--------|-------|-------|-------|------------------------------|
| 625-12-4    | 0,40       | 0,05       | 0,55 | 0,57 | D MH      | 0,05   | 0,10   | 0,40   | 0,90  | 0,90  | 0,75  | BAE 14-330-20                |
| 625-18-6    | 0,45       | 0,05       | 0,65 | 0,64 | D MH      | 0,05   | 0,15   | 0,55   | 0,95  | 0,90  | 0,75  | BAE 14-330-15_<br>STN07.2018 |
| 625-20-4    | 0,40       | 0,05       | 0,55 | 0,56 | D MH      | 0,05   | 0,10   | 0,45   | 0,95  | 0,70  | 0,55  | BAE 14-330-17_<br>STN07.2018 |
| 625-12n25-4 | 0,40       | 0,05       | 0,60 | 0,60 | D MH      | 0,05   | 0,10   | 0,50   | 0,95  | 0,85  | 0,65  | BAE 14-330-18                |

**Table 5:** Acoustic absorption directly installed

Subject: LIGNO Acoustic light 35\_33  
Application: Acoustic absorption with extra absorber (mineral wool)



installed in front of h= 30 mm cavity, backed with t= 30 mm mineral wool (glass wool)

| Profile  | $\alpha_w$ | $\alpha_p$ | NRC  | SAA  | SAK Form. | 125 Hz | 250 Hz | 500 Hz | 1 kHz | 2 kHz | 4 kHz | Testing Report |
|----------|------------|------------|------|------|-----------|--------|--------|--------|-------|-------|-------|----------------|
| 625-12-4 | 0,90       | 0,25       | 0,85 | 0,85 | A -       | 0,25   | 0,70   | 0,85   | 0,95  | 0,95  | 0,75  | BAE 18-323-01  |

installed in front of h= 100 mm cavity, backed with t= 30 mm mineral wool (glass wool)

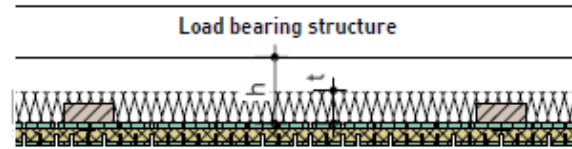
| Profile  | $\alpha_w$ | $\alpha_p$ | NRC  | SAA  | SAK Form. | 125 Hz | 250 Hz | 500 Hz | 1 kHz | 2 kHz | 4 kHz | Testing Report |
|----------|------------|------------|------|------|-----------|--------|--------|--------|-------|-------|-------|----------------|
| 625-12-4 | 0,85       | 0,40       | 0,85 | 0,83 | B -       | 0,40   | 0,70   | 0,80   | 0,90  | 0,95  | 0,75  | BAE 18-323-07  |

installed in front of h= 150 mm cavity, backed with t= 140 mm mineral wool (rockwool)

| Profile  | $\alpha_w$ | $\alpha_p$ | NRC  | SAA  | SAK Form. | 125 Hz | 250 Hz | 500 Hz | 1 kHz | 2 kHz | 4 kHz | Testing Report |
|----------|------------|------------|------|------|-----------|--------|--------|--------|-------|-------|-------|----------------|
| 625-12-4 | 0,85       | 0,70       | 0,85 | 0,85 | B -       | 0,70   | 0,75   | 0,80   | 0,90  | 0,95  | 0,75  | BAE 14-330-32  |

**Table 6:** Acoustic absorption with extra absorber (mineral wool)

Subject: LIGNO Acoustic light 3G\_33  
 Application: Acoustic absorption with extra absorber (mineral wool)



installed in front of h= 30 mm cavity, backed with t= 30 mm mineral wool (glass wool)

| Profile     | $\alpha_w$ | $\alpha_p$ | NRC  | SAA  | SAK | Form. | 125 Hz | 250 Hz | 500 Hz | 1 kHz | 2 kHz | 4 kHz | Testing Report |
|-------------|------------|------------|------|------|-----|-------|--------|--------|--------|-------|-------|-------|----------------|
| 625-12-4    | 0,75       | 0,30       | 0,75 | 0,74 | C   | O     | 0,30   | 0,55   | 0,70   | 0,85  | 0,90  | 0,70  | BAE 18-323-02  |
| 625-22n40-4 | 0,65       | 0,30       | 0,70 | 0,70 | C   | M     | 0,30   | 0,55   | 0,65   | 0,90  | 0,70  | 0,45  | BAE 19-323-10  |

installed in front of h= 100 mm cavity, backed with t= 30 mm mineral wool (glass wool)

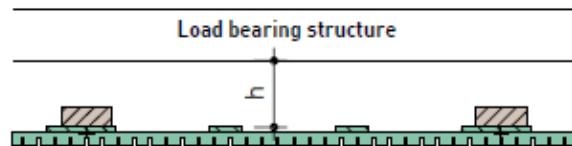
| Profile     | $\alpha_w$ | $\alpha_p$ | NRC  | SAA  | SAK | Form. | 125 Hz | 250 Hz | 500 Hz | 1 kHz | 2 kHz | 4 kHz | Testing Report |
|-------------|------------|------------|------|------|-----|-------|--------|--------|--------|-------|-------|-------|----------------|
| 625-12-4    | 0,70       | 0,40       | 0,70 | 0,71 | C   | O     | 0,40   | 0,50   | 0,60   | 0,80  | 0,90  | 0,70  | BAE 18-323-05  |
| 625-12n25-4 | 0,75       | 0,40       | 0,75 | 0,73 | C   | O     | 0,40   | 0,55   | 0,65   | 0,85  | 0,85  | 0,65  | BAE 18-323-06  |
| 625-22n40-4 | 0,60       | 0,40       | 0,70 | 0,67 | C   | M     | 0,40   | 0,50   | 0,60   | 0,85  | 0,70  | 0,45  | BAE 19-323-17  |

installed in front of h= 100 mm cavity, backed with t= 80 mm mineral wool (rockwool)

| Profile     | $\alpha_w$ | $\alpha_p$ | NRC  | SAA  | SAK | Form. | 125 Hz | 250 Hz | 500 Hz | 1 kHz | 2 kHz | 4 kHz | Testing Report |
|-------------|------------|------------|------|------|-----|-------|--------|--------|--------|-------|-------|-------|----------------|
| 625-20-4    | 0,60       | 0,35       | 0,65 | 0,66 | C   | MH    | 0,35   | 0,40   | 0,55   | 0,85  | 0,85  | 0,60  | BAE 19-323-22  |
| 625-22n40-4 | 0,65       | 0,50       | 0,65 | 0,68 | C   | M     | 0,50   | 0,50   | 0,60   | 0,90  | 0,70  | 0,50  | BAE 19-323-21  |

**Table 7:** Acoustic absorption with extra absorber (mineral wool)

Subject: LIGNO Acoustic light 35\_33 A10G  
 Application: Acoustic absorption with cavity



installed in front of h= 30 mm cavity

| Profile     | $\alpha_w$ | $\alpha_p$ | NRC  | SAA  | SAK | Form. | 125 Hz | 250 Hz | 500 Hz | 1 kHz | 2 kHz | 4 kHz | Testing Report            |
|-------------|------------|------------|------|------|-----|-------|--------|--------|--------|-------|-------|-------|---------------------------|
| 625-12-4    | 0,30       | 0,20       | 0,30 | 0,31 | D   | H     | 0,20   | 0,25   | 0,25   | 0,30  | 0,45  | 0,65  | BAE 17-329-03             |
| 625-18-6    | 0,30       | 0,15       | 0,30 | 0,30 | D   | H     | 0,15   | 0,25   | 0,25   | 0,30  | 0,40  | 0,60  | BAE 17-329-01_ STN07.2018 |
| 625-23-8    | 0,30       | 0,20       | 0,25 | 0,27 | D   | H     | 0,20   | 0,25   | 0,25   | 0,25  | 0,35  | 0,55  | BAE 17-329-09_ STN07.2018 |
| 625-20-4    | 0,30       | 0,20       | 0,30 | 0,31 | D   | H     | 0,20   | 0,25   | 0,25   | 0,30  | 0,45  | 0,70  | BAE 17-329-06_ STN07.2018 |
| 625-12n25-4 | 0,35       | 0,20       | 0,30 | 0,33 | D   | H     | 0,20   | 0,25   | 0,25   | 0,35  | 0,45  | 0,70  | BAE 17-329-08             |
| 625-18n38-6 | 0,25       | 0,15       | 0,25 | 0,26 | E   | H     | 0,15   | 0,20   | 0,20   | 0,25  | 0,35  | 0,60  | BAE 17-329-05             |

**Table 8:** Acoustic absorption with cavity

## **Annex 4**

### **Design of the cross laminated timber**

#### **1 Mechanical actions perpendicular to the cross laminated timber**

Stress distribution within the cross laminated timber has to be calculated taking into account the shear deformation of the cross layers.

For simply supported cross laminated timber elements with 3 layers the stress distribution may be calculated according to EN 1995-1-1 as mechanically jointed beam where the value  $s_i/K_i$  is substituted by  $d_i/(G b_{ef})$  with  $d_i$  = thickness of the cross layer,  $G$  = shear modulus of the cross layer (see Figure 4) and  $b_{ef}$  = effective width of the cross layer.

$$b_{ef} = \frac{b \cdot b_q}{a_q}$$

with

$b$  = cross layer width

$b_q$  = cross board width

$a_q$  = centre to centre cross board spacing

For the design of cross laminated timber, the characteristic strength and stiffness values shall be taken from Annex 3.

For the bending design only the stresses at the edges of the boards are decisive, axial stresses in the centre of the boards are not considered in the design.

Tension loads perpendicular to the element should be avoided.

#### **2 Mechanical actions in plane of the cross laminated timber**

Stress distribution within the element has to be calculated by taking into account only the boards which are oriented in the direction of the actions.

Shear stresses may be calculated with the total width of the cross laminated timber.

For the design of cross laminated timber elements made of layers of soft- or hardwood the characteristic strength and stiffness values of the layers shall be taken from Annex 3.

## Annex 5

### In plane shear strength of Lignotrend Akustik light

#### 1 General

The design rules given in this section amend the design rules for shear design given in EN 1995-1-1.

##### 1.1 In plane shear strength of elements with continuous, edge glued layers

The shear capacity shall be based only on the accumulated capacity of the continuous, edge glued layers. Layers with gaps in between the boards within a layer shall be disregarded when determining the in-plane shear capacity.

##### 1.2 In plane shear strength of elements without continuous, edge glued layers

The shear capacity shall be based on the gross cross section of the Lignotrend LIGNO acoustic panels and the characteristic shear strength  $f_{v,k}$  given in equation (1).

$$f_{v,k} = \min \left\{ \begin{array}{l} 8,0 \cdot \frac{b_{net} \cdot h_{net}}{b \cdot h_{tot}} \\ 2,0 \cdot \frac{2 \cdot \sum I_p}{h_{tot} \cdot a_i} \end{array} \right\} \text{ in N/mm}^2 \quad (1)$$

Where

$$\sum I_p = \frac{b_q}{12 \cdot a_q} \cdot \left[ \frac{b_{1l}}{a_{1l}} \cdot (b_{1l}^2 + b_q^2) + \frac{b_{2l}}{a_{2l}} \cdot (b_{2l}^2 + b_q^2) \right]$$

- $b_{net}$  = Sum of longitudinal or cross board widths within element width  $b$  in mm
- $h_{net}$  = Sum of longitudinal or cross board thicknesses in the element in mm
- $b_{net} \cdot h_{net}$  = Smaller product of  $b_{net}$  and  $h_{net}$  of longitudinal or cross layers, respectively, in mm<sup>2</sup>
- $b$  = Element width in mm
- $h_{tot}$  = Element thickness in mm
- $a_q$  = Centre to centre spacing of cross layer boards in mm
- $b_q$  = Width of cross layer boards in mm
- $a_{1l}$  = Centre to centre spacing of longitudinal layer 1 boards in mm
- $b_{1l}$  = Width of longitudinal layer 1 boards in mm
- $a_{2l}$  = Centre to centre spacing of longitudinal layer 2 boards in mm
- $b_{2l}$  = Width of longitudinal layer 2 boards in mm
- $a_i$  =  $\max\{b_q; b_{1l}; b_{2l}\}$

$$\sum I_p = \frac{b_q}{12 \cdot a_q} \cdot \left[ \frac{b_{1l}}{a_{1l}} \cdot (b_{1l}^2 + b_q^2) + \frac{b_{2l}}{a_{2l}} \cdot (b_{2l}^2 + b_q^2) \right]$$