Retrofitting in knotless silver fir: LIGNO Acoustic light

Efficient acoustic panels in solid timber
This issue of LIGNO trends deals with the LIGNO Acoustic light absorption panels and their numerous applications. These panels are designed as a finished interior surface and they complement the full range of Lignotrend load-bearing cross laminated timber elements.

Rooms can be completed or retrofitted in natural wood, to optimize acoustic efficiency, usability and architectural quality. The standard element surface consists of knotless timber which gives the interior an ambient and contemporary feel.

The LIGNO Acoustic light panels are also constructed using the cross lamination principle meaning they have maximum dimensional stability.

The absorbers which are necessary for effective acoustic absorption are integrated behind timber strips. The standard panels have a wood fibre board absorber layer, certified by natureplus. As a result, speech recognition and clarity is greatly improved within the room, and high noise levels are reduced (coefficients of absorption $\alpha_w$ up to 0.80).

For general noise absorption purposes:

**Complete ceiling panelling**

The elements can be installed directly to the underside of the ceiling or can be suspended from the ceiling. They cover the complete ceiling surface, usually with a shadow gap at the edges or near openings.

Depending on the space of the void above/behind, it is possible to fit lights or ventilation openings flush with the panel surface.

Common suspension systems can be used. However we do recommend Lignotrend’s precise timber construction profile, called U*psi (type F-120) - see page 5

For more sophisticated absorption purposes:

**Resistant wall panelling**

Often, an absorbing wall surface is a better option for acoustical reasons – for example, to prevent flutter echoes. Also the design of the original ceiling surface may mean that it is not possible to treat it.

Wall surfaces can be finished with the Lignotrend panels that are resistant to damage from, for example, ball impact. They can also be decorated at a later stage by sanding or painting the timber without loss of absorption, because the absorber surface will remain untouched.

**Pre-cut panels:**

**Contemporary upgrade for grid ceiling systems**

Lignotrend provides panels called LIGNO Acoustic light 3S-33/A70, which are pre-cut to size, so that they can be inserted into common grid ceiling systems, either in new ceilings or as a replacement for damaged or outdated panels. They are simply inserted into the existing grid system without any additional fixings required.

Grid ceilings are greatly enhanced both visually and acoustically when timber panels are inserted, as the acoustic absorption properties of the wood fibre absorber layer in the Lignotrend panels is comparable to conventional mineral fibre panels. For an example, see page 7.

**Targeted improvement**

**Acoustic sails with integrated lights**

Lignotrend’s acoustic sails provide acoustic absorption in precise locations. They can be suspended individually or in groups using thin wires, and they reduce noise reverberating from the ceiling.

The pre-assembled sails have specially designed recessed lights [Trilux LUCEO brand], so that the illumination within the workplace is improved without dazzling. These sails are popular in offices but are also an ideal solution for classrooms, where room acoustics and illumination may need optimizing. See page 7 for an example.
For a sophisticated ambience: Room acoustics using timber

A health spa extension was added to the Mohren Hotel in Deggenhausertal, near Lake Constance.

The recreation area was designed incorporating large windows and a tiled floor. To create a relaxing and calming atmosphere, the complete ceiling surface was covered with noise absorbing timber panels [LIGNO Acoustic light 3S-62/A50G] to counterbalance the echoes created from the hard glass and tile surfaces.

The architects mounted unobtrusive lights onto the walls to emit a warm glow into the room. Additional indirect light comes from behind the set-back perimeter edges of the timber ceiling.

Approximate calculation (surface 150 m²)

<table>
<thead>
<tr>
<th>Implementation</th>
<th>Reverberation</th>
</tr>
</thead>
<tbody>
<tr>
<td>With LIGNO Acoustic light 3S-62 suspended ceiling, approx. 150 mm void,</td>
<td>0,5 – 0,75 sec</td>
</tr>
<tr>
<td>Comparison: without absorber, surfaces glass / tiles / concrete</td>
<td>1,6 – 2,5 sec</td>
</tr>
</tbody>
</table>

Recommendation for relaxation rooms, e.g. in nursery schools (DIN) 0,5 – 0,8 sec

Recommendation for living rooms (Lipps) 0,6 – 1,0 sec

Natural timber in interior design: Ecological qualities which improve the interior atmosphere

Health aspects are a key priority for Lignotrend, when producing the cross laminated timber elements. The standard version of the acoustic panels, LIGNO Acoustic light, carries the “natureplus” label – a certification of its ecological and toxic-free qualities. The silver fir and spruce used comes from sustainably managed forests (certified according to FSC or PEFC). The glue used for lamination is independently supervised by the German technical agency TÜV to ensure it is free of emissions and the wood fibre absorbers used are also certified by “natureplus”.

The Lignotrend elements also help to regulate the interior atmosphere due to the intricate surface design on the natural timber, which can absorb water vapour from within a room (to a degree harmless for wood) and release it again when the air gets too dry.

The Lignotrend panels can also be easily refurbished in the future by sanding or painting them without any loss of acoustic absorption. This also contributes to their sustainability and longevity, in addition to their flexible usability.
New construction and retrofitting of gymnasiums and multi-purpose halls

Retrofit gymnasium, Duedingen

The sports hall at Duedingen (FR), Switzerland was constructed in 1974 and was urgently in need of refurbishment. Measures had to be taken both to reduce energy consumption and to redesign the interior.

LIGNO Acoustic light 3S panels were installed on the entire ceiling and on the walls as a shock absorbing surface.

Reverberation was reduced by the use of these noise absorbing surfaces, so that the noise level during classes and other events was reduced to the requisite value. The lined surface with narrow gaps appears very uniform, almost like a closed surface.

Important for sports halls: Panels on the walls must be resistant to the impact from balls. Independent laboratory tests have been carried out on various constructions using Lignotrend panels (DIN 18032-3).

Approximate calculation (surface 600 m²)

<table>
<thead>
<tr>
<th>Implementation</th>
<th>Reverberation</th>
</tr>
</thead>
<tbody>
<tr>
<td>With LIGNO Acoustic light 3S-62 suspended ceiling, approx. 150 mm void, approx. 60 % reflective</td>
<td>0,9 – 1,6 sec</td>
</tr>
<tr>
<td>Comparison: without absorber, surfaces glass / parquet / concrete</td>
<td>&gt;&gt; 2,5 sec</td>
</tr>
<tr>
<td>Sports hall (DIN, no multi purpose use)</td>
<td>1,3 – 2,0 sec</td>
</tr>
<tr>
<td>Recommendation for sports halls (Lippa)</td>
<td>1,1 – 1,3 sec</td>
</tr>
<tr>
<td>Auditorium for music / speech (DIN)</td>
<td>0,9 – 1,6 sec</td>
</tr>
</tbody>
</table>

Suspended installation (transversal substructure recommended with type 3S-62 only)

Acoustically absorbing deflective walls avoid flutter echoes arising from noise reflection from horizontally opposite surfaces.
multi-purpose halls

Refurbishment
Multi-purpose hall, Albbruck

The complete interior of this multi-purpose hall was modernized during the refurbishment of the masonry building.

Special attention was focused on achieving an optimum in sound recognition, because the hall is frequently used for music and festival events.

The LIGNO Acoustic light 3S-62 panels were used for both the walls and ceiling. The planner chose the silver fir timber with a knotless surface. In order to ensure that the doors would have a similar appearance to the walls, a special thinner type of panel was selected - LIGNO Acoustic light 2-28 (thickness only 28 mm), to prevent the doors from being too deep.

The obtrusive appearance of the concrete ceiling beams was reduced by suspending the acoustic panels so that they were flush with the lower surface of the beams. The void generated above conceals new installations, for example, the ventilation system and the support structures of sports equipment.

To maintain some positive reflections in the hall (which are necessary for speech clarity), parts of the ceiling panels were not slotted deeply not to have the wood fibre absorber activated.

This difference however cannot be detected by the viewer - reflective and absorbing Lignotrend panels both have the same profile appearance.

Design: Albbruck town
Realisation: Denz, Oberalpfen

Flexible room acoustics

The acoustical properties of the Lignotrend acoustic elements allow the acoustic engineer to respond in a flexible way to the individual absorption and reflection demands.

- **Frequency range absorption:**
  The panels absorb sound frequencies in the relevant range from 250/500 to 4000 Hz. To improve deep frequency absorption, the void behind the panel is made deeper.

- **Reflective surface with identical appearance:**
  Sometimes reflective zones are necessary in acoustical design. To achieve a uniform visual appearance, these special types of reflective elements are produced with shallower gaps than the standard elements, so that the absorber is not effective.

- **Sound dispersion:**
  By brushing the surface of the elements during production, the timber is slightly roughened. The part of sound not absorbed is dispersed by diffusion, which supports an even distribution of sound in the interior space.
Assembly rooms

Communication occurs everywhere where people meet. Whether there are 20 people in a cafeteria, 25 people in a seminar, 50 people practicing in a band or 180 people in a factory canteen, low noise levels and good speech recognition create a sense of well-being and a pleasant atmosphere.

While planning the rooms shown on this page, the designers paid special attention to sufficiently reducing the background noise level and reverberation time. The results are very positive as owners and occupiers appreciate the acoustic quality which ensures that the buildings have a long and flexible future.
New possibilites with thinner panel types

With the thinner types LIGNO Acoustic light 3S-33 only 3,3 cm thick, the typical grooved appearance is now available for a wider field of application in creative interior architecture.

Offices: Acoustic sails set a modern trend in timber

Silence in offices is generally more important than in other types of rooms. The official technical standards demand a reduction of the noise level. However the latest recommendations also call for short reverberation time values.

<table>
<thead>
<tr>
<th>Surface</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single office (Lipps)</td>
<td>0,6 – 1,0 sec</td>
</tr>
<tr>
<td>Open plan office</td>
<td>0,4 – 0,6 sec</td>
</tr>
<tr>
<td>Conference room (DIN/SIA)</td>
<td>0,4 – 0,7 sec</td>
</tr>
</tbody>
</table>

However, the complete covering of a ceiling may affect the thermal effectiveness of the concrete slab above, as sometimes necessitated for the energy requirements. By using acoustic sails, the air can circulate above, and so this disadvantage can be avoided.

The Lignotrend acoustic sail is suspended using thin wires, either as an individual sail or in groups.

Visual upgrade for grid ceilings

Grid ceilings made of timber panels provide an aesthetically pleasing look, whether installing new ceilings or retrofitting interiors.

Lignotrend provides acoustic panels cut exactly to the width and length required. They can be inserted into existing or newly installed grid profiles. Additional cutting will only be necessary at the ceiling’s edges.

Surface designs

Wood type and profile of the elements can be varied:

- **Knotless silver fir or spruce with knots:**
  The light silver fir perfectly complements contemporary groove design. It is available in a choice of patterned or plain. Spruce with knots is mainly used with the 25 mm wide timber strips.

- **Other wood types, inflammability:**
  Other wood types e.g. knotless oak, can also be chosen as the finished surface. Where low inflammability risk is a requirement, we can impregnate the timber in the manufacturing process.

- **Glazes, e.g. against darkening:**
  Very often, a transparent UV protection is applied to the panel’s surface during production. It ensures that the wood retains its natural light colour for a long time. Coloured varnishes are available on demand.

- **Strip profile 625-12-4:**
  The elements’ width of 625 mm is divided by timber strips 12 mm wide and gaps 4 mm wide.

- **Alternative strip profiles:**
  19/21/25 mm strips, 6/8 mm gaps.
Creative interior architecture

Certainly not a standard construction: the ceiling at the Kindergarten of Wenslingen (Switzerland), appears to be “curved”. But the curve was divided into linear segments of elements lengthwise cut into halves. This allowed the unusual “wave” shape of the ceiling which gives the interior a playful and special touch.

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Other possibilities

- **Seamless lengths**
The 35-62 type elements 625 mm wide can be individually produced up to a length of 8 000 mm. The installation is quicker and there is no easily identifiable frontal joint between the elements.

- **Load-bearing structural elements**
Depending on the stage of planning, it may be more economical to use Lignotrend complete structural elements rather than installing panels overhead. The floor, roof and wall structural elements come complete with a finished surface and absorber layer and are installed at the construction stage. A further advantage is the extraordinary levels of sound insulation which is achieved between the neighbouring rooms.

Please ask your nearest Lignotrend application consultant for more information:
www.lignotrend.com/fachberater

Free acoustic calculator:
Test your room’s acoustic properties yourself...

This new online tool helps you compute a realistic estimation of rooms where Lignotrend acoustic panels are to be installed. Reverberation and noise reduction data are calculated and compared to typical statutory requirements. Take a look:
www.lignotrend.com/raumakustik-rechner